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DEPARTMENT OF ENERGY, MINES AND RESOURCES

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an amplifier and filter system for telluric signals

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an amplifier and filter system for telluric signals

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Abstract. A high-performance amplifier and filter system is described which is very suitable for amplifying the variations of potential difference which occur between a pair of electrodes in the ground. Salient characteristics include a high impedance differential input, a band-pass characteristic with −3 dB roll-off points at 10^{-4} Hz and 10^{-1} Hz and low output drift.

Résumé. L'auteur décrit un amplificateur à haute performance et un circuit de filtrage qui est bien adapté à l'amplification des variations de difference de potentiel qui ont lieu entre deux électrodes placées dans la terre Les traites saillants comprennent une entrée différentielle à haute impédance, un filtre passe-bande qui a comme caractéristique des points d'échappement de −3 dB à 10^{-4} Hz et 10^{-1} Hz et une dérive de sortie peu élevé.

Introduction

Electric fields induced in the earth by natural geomagnetic variations have been recorded for over a century, with a great variety of equipment. In recent years, research into the electrical conductivity of the crust and upper mantle has created a demand for portable apparatus which will amplify the telluric signals appearing between a pair of electrodes in the ground, filter the signals, and provide an output suitable for various types of recording meters or magnetic tape recorders. The apparatus currently available suffers from one or more of the following limitations – large size, high power consumption, high cost, inadequate band-pass characteristic, insufficient input isolation to permit operation from a common power supply or susceptibility to damage caused by input transients. This paper describes a new design, shown in block diagram form in Figure 1, which is intended to overcome the limitations mentioned.

Input stage

The primary requirements for the input stage are that it have a differential configuration and that the impedance looking into each input terminal be high. Both these requirements are met by the circuit depicted in Figure 2, the operation of which is described by the expression:

$$E_3 = [R_1(R_3 + R_4)E_2 - R_4(R_1 + R_2)E_1]/R_1R_3.$$

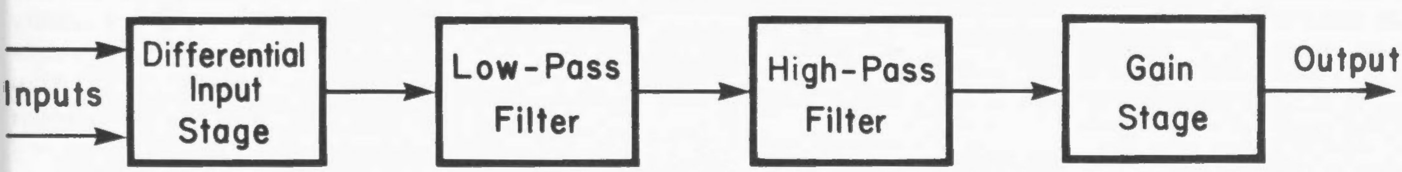

Figure 1. Block diagram of the telluric amplifier.

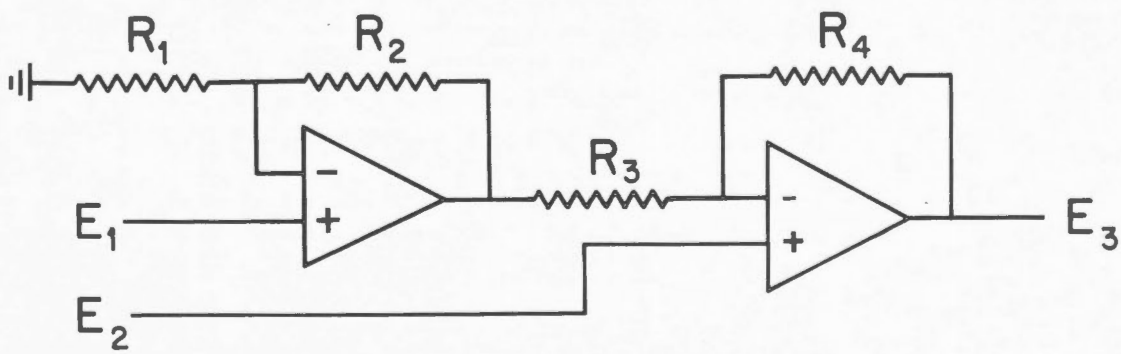

Figure 2. The basic differential input stage.

In the special case used in the telluric amplifier, all resistors have the same value, resulting in:

$$E_3 = 2(E_2 - E_1)$$

If a common-mode voltage is applied to the inputs ($E_2 = E_1$) the output should be zero. A common-mode rejection ratio CMRR defined by:

$$\mathrm{CMRR} = 20 \log_{10}\left\{\frac{\text{common mode input voltage}}{\text{output voltage error}}\right\}$$

and expressed in dB units is often used to characterize the ability of amplifiers to reject common-mode signals. In the case just mentioned (all resistors the same) the upper limit of CMRR is determined by the specification for the operational amplifier, typically 100 dB. A mismatch of 1 per cent in tolerance on any one of the resistors will reduce the circuit CMRR to 40 dB. For this reason, and also to provide an accurate gain for the input stage, the four resistors in Figure 2 should be specified to a tolerance better than 1 per cent. An important advantage of this circuit compared with the conventional differential input configuration is that the source resistances do not form a part of the resistances which determine gain and common-mode rejection.

Both operational amplifiers in Figure 2 are connected in a non-inverting configuration. The input impedance at each terminal is then the input resistance of the operational amplifier multiplied by the loop gain. In the present case this amounts to more than 10^9 ohms. A finite source impedance must be present between each input and the circuit ground point to ensure correct operation. This implies a three-terminal arrangement to measure one telluric component with, for example, north and south electrodes connected to their respective input terminals and an arbitrarily located ground rod connected to circuit ground.

Low-pass filter

A low-pass filter has been incorporated into the telluric amplifier to reject signals with periods shorter than 10 seconds. This circuit, shown in Figure 3, is a special case of the Controlled Source type of active filter[1] where the source is a voltage follower. Such circuits have several advantages over other types of active filter circuits. In particular, the cutoff frequency may be changed to suit the application simply by changing the values of the resistors or the capacitors, without affecting the gain in the pass-band. Use is made of this fact in the design of the high-pass filter stage, described later, which is also a Controlled Source circuit. Other advantages of this design include zero output impedance, a minimum number of frequency-determining components and a small spread of component values. Inspection of Figure 3 reveals that as input frequency tends toward zero (d.c.) the capacitor impedances tend to infinity or open circuit, and the filter is just a unity gain voltage follower and is non-inverting. At the high frequency extreme the capacitors become short circuits and the filter appears as an inverting amplifier with zero gain.

The gain G of the low-pass filter as a function of frequency f is given by the expression:

$$G = [(\pi\sqrt{2}\,RCf)^4 + 1]^{-1/2}$$

This is a Butterworth second-order low-pass filter response with −3 dB roll-off occurring at a frequency $f_0 = 1/\pi\sqrt{2}RC$. The output voltage lags the input by an angle ϕ given by:

$$\operatorname{Tan} \phi = 2\pi RCf\,[(\pi\sqrt{2}\,RCf)^2 - 1]^{-1}$$

High-pass filter

The role of the high-pass filter in this circuit is to attenuate signals having a period longer than 10^4 seconds (about 2 3/4 hours). This eliminates the need for a bias scheme for offsetting the effect of a d.c. potential between electrodes. A high-pass filter with such a long period for the −3 dB roll-off point has only recently become a practical reality because of advances in operational amplifier technology and component fabrication techniques. Practical problems

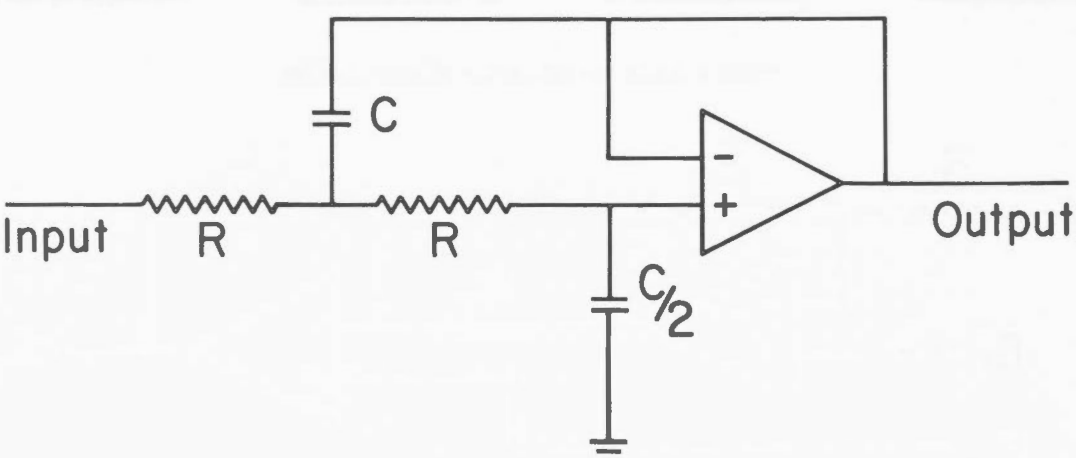

Figure 3. A Controlled Source low-pass filter.

with the high-pass filter are discussed in later sections and need not be of concern at this point.

A schematic for the high-pass stage is presented in Figure 4. It is a second-order Controlled Source circuit very similar to the low-pass stage of Figure 3. Gain G and phase response ϕ for the high-pass filter as a function of frequency f are as follows:

$$G = (\pi\sqrt{2}\,RCf)^2\,[(\pi\sqrt{2}\,RCf)^4 + 1]^{-1/2}$$

$$\tan\phi = 2\pi RCf\,[(\pi\sqrt{2}\,RCf)^2 - 1]^{-1}$$

Figure 5 is a plot of the composite gain and phase response for the low-pass and high-pass stages.

A point of particular interest in the gain versus frequency characteristic is the frequency f_1 at which the gain G has rolled off to 99 per cent of the pass-band value. Squaring the expression for gain versus frequency and solving for f_1 when $G^2 = 0.98$ results in $f_1 = \sqrt{7}\,f_0$, where $f_0 = 1/\pi\sqrt{2}\,RC$ is the frequency at which roll-off is −3 dB.

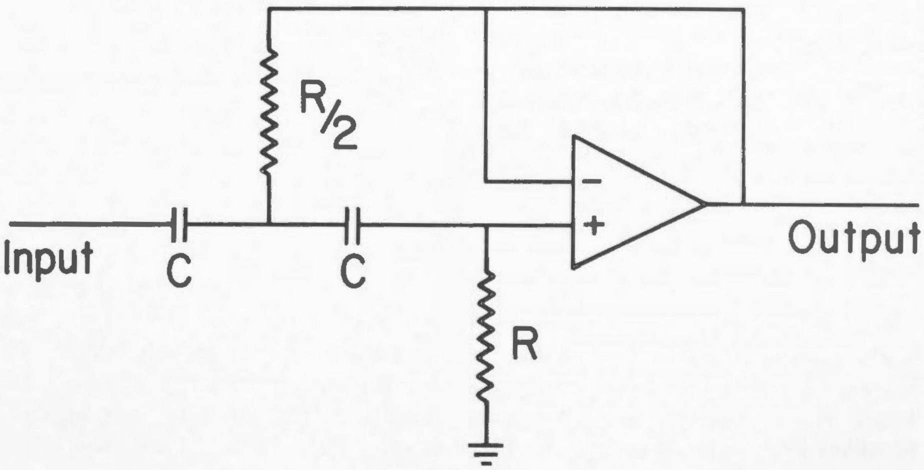

Figure 4. Circuit schematic of the high-pass stage.

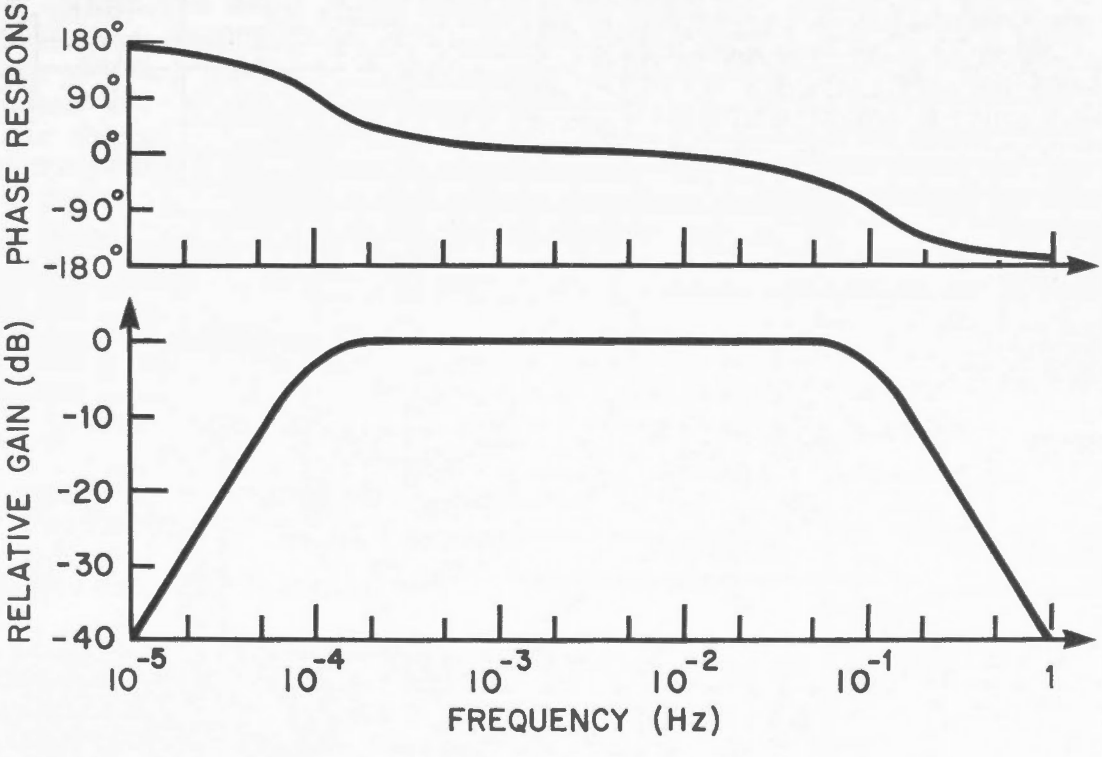

Figure 5. Relative gain and phase response of the telluric amplifier.

Circuit details

Figure 6 is a schematic of the complete circuit, and it includes several important details not mentioned in the earlier discussion. The first of these is the two resistors on the input lines. These serve, in conjunction with input protective diodes built into the operational amplifiers, to protect the input stages from damage arising from transients induced on the telluric lines. Experience has shown that lightning strikes some distance from the lines can induce voltage spikes on the order of tens of kilovolts on the lines (enough to spark across a 1/2 inch air gap), with disastrous effects on the amplifier. The 1 megohm input resistors limit input currents during transients to values that can be accommodated by the protective diodes. The inclusion of these resistors is only possible because of the extremely high input impedance of the input stage, which must be at least two orders of magnitude greater than the effective source resistance.

Another protective feature is the 12-kilohm resistors inserted in series with the amplifier inputs of the low-pass and high-pass stages. Here the problem is one of safely dissipating charges accumulated on the large capacitors in these stages in the event of a sudden shutdown of power. These resistors limit the current discharged into the amplifier input terminals in such an event. Again they are negligible in value when compared with the amplifier's inherent input impedance.

Provision has been made for switching the characteristic of the high-pass filter. This is accomplished with the 2-pole switch depicted in Figure 6. In actual use this is almost an essential capability. The −3 dB roll-off point for the high-pass filter is 10,000 seconds, or about 2 3/4 hours. In a typical field setup there is some d.c. potential between electrodes. When these are connected to the telluric amplifier and power is applied, a period several times longer than the −3 dB period is required before all capacitors can charge to their normal working potential and the high-pass output settle down to zero. This means a wait of perhaps eight hours if no roll-off switch is available. The roll-off switch cuts the −3 dB period to 100 seconds, the circuit can then settle down in about five minutes and be switched back to 10,000 second roll-off with all capacitors fully charged.

Finally, a variable gain stage has been provided as part of the telluric circuit. This is just a simple inverting amplifier of standard design giving a stage gain variable from 1/2 to 50. It must be kept in mind that the input stage of the telluric amplifier has a gain of 2 so that the overall circuit gains are 1, 2, 5, 10, 20, 50, 100.

Drift

Output drift occurs as a result of inherent offset voltage drifts $\dot{V}_{os}$ (derivatives with respect to temperature), offset current drifts $\dot{I}_{os}$ and bias current drifts $\dot{I}_b$ at the operational amplifier inputs[2].

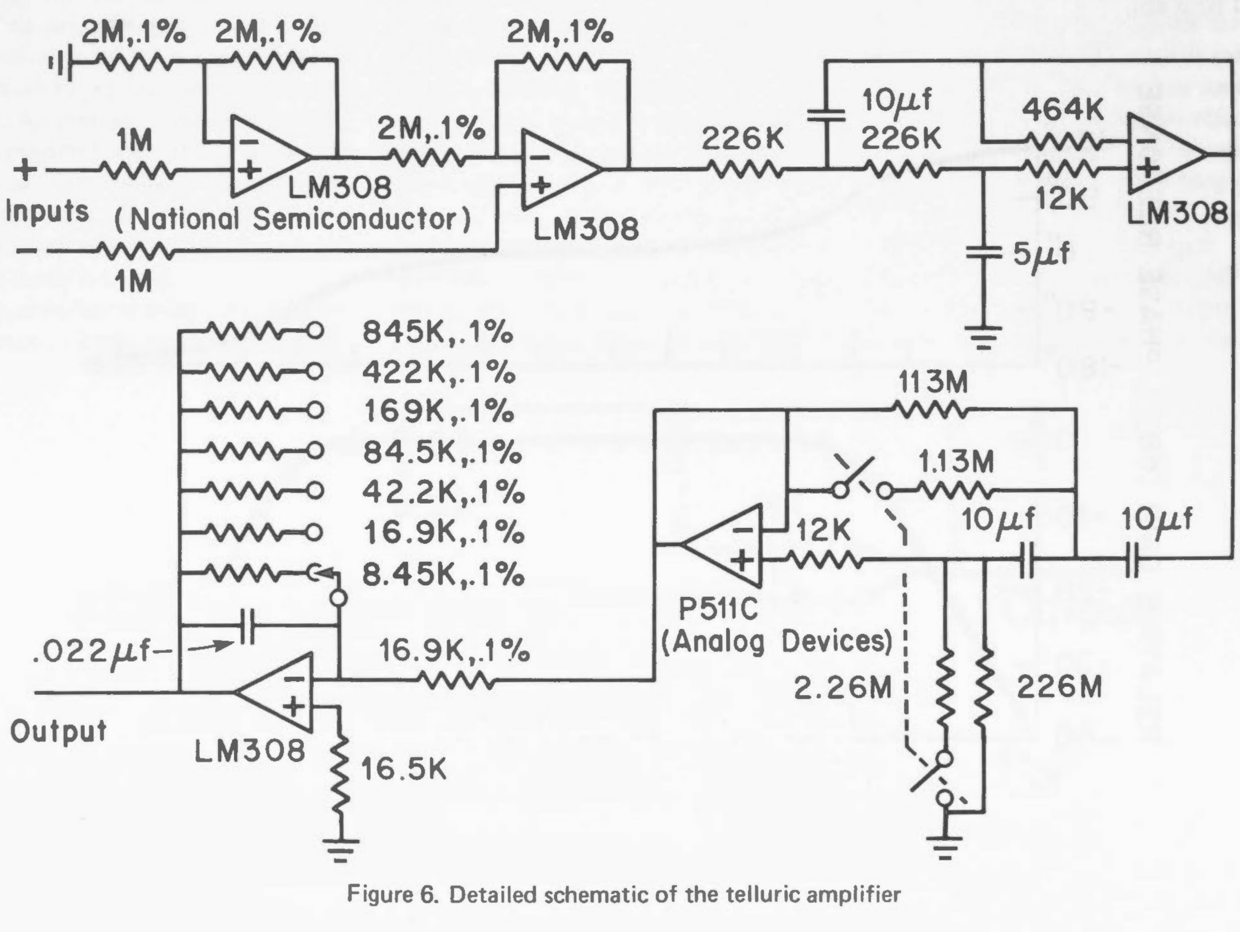

Figure 6. Detailed schematic of the telluric amplifier

The output drift component caused by $\dot{V}_{os}$ for a stage with gain A is equal to $A\dot{V}_{os}$ for a non-inverting stage and $(A+1)\dot{V}_{os}$ for an inverting stage. In the case where both input terminals of an operational amplifier see the same equivalent resistance R_e to ground, the output will experience a drift component of $\dot{I}_{os}R_e$. When one input terminal sees zero resistance to ground (as in the high-pass stage) the bias current drift in the other input will generate an output drift component equal to $\dot{I}_bR_e$.

Worst-case drift specifications for the LM308 are $\dot{I}_{os}$ = 10pA/°C, $\dot{V}_{os}$ = 15uV/°C and for the P511C are $\dot{I}_b$ = 0.5pA/°C, $\dot{V}_{os}$ = 25uV/°C. The following table shows the output drift components (uV/°C) generated within each of the first three stages.

	$\dot{V}_{os}$	$\dot{I}_{os}$	$\dot{I}_b$
Differential input	60	20	–
Low pass	15	5	–
High pass	25	–	113

Since the filters are unity gain these figures may be added to give a total worst-case drift of 238 uV/°C at the high-pass output. Drifts generated within the variable gain stage range from 23 uV/°C at minimum gain up to 765 uV/°C, but are always insignificant compared with that produced by amplification of the 238 uV/°C figure previously obtained. At the minimum gain of 1/2, corresponding to an overall telluric amplifier gain of 1, the worst-case total output drift would be 142 uV/°C.

One can reasonably expect the actual circuit drift to be smaller than 142 uV/°C by a factor of 5 or more. The specifications for typical drifts of the operational amplifiers are one fifth of the worst-case values. It is very unlikely that all drifts would be of such a polarity as to add at the telluric amplifier output. Furthermore the drift contributions from the input stage and low-pass filter, being long-term effects, would be attenuated to some extent by the high-pass filter.

Physical details

Care must be exercised in the selection and handling of components and in the choice of physical layout for the circuit. Resistance values as high as those used in the high-pass filter are readily available. As a rule such resistors come individually packaged and should remain that way until used. Metallized polycarbonate capacitors should be used throughout the circuit. These combine a very high insulation resistance of 100,000 megohms x microfarads minimum with very small physical size (0.66 in. dia. x 0.75 in. length for 10 microfarads, 50V). A 10-microfarad capacitor can be expected to have a resistance of 10,000 megohms, roughly 50 times the largest resistance used in the high-pass filter.

A printed circuit board for this circuit requires careful layout. First, the electrode side of the 1-megohm input resistors should not run close together or close to other circuitry as arcing may occur on the board during an electrical disturbance, with very predictable results for the telluric amplifier. It is also desirable to design so that the high impedance points of the circuit are as far removed from adjacent circuitry as is possible. This applies to anything connected to the non-inverting pin of the P511C amplifier and to the junction of the 10-microfarad capacitors in the high-pass filter. In spite of these restrictions the circuit can be produced on a board 11.5 cm by 14.5 cm. The board should be thoroughly cleaned to remove all traces of solder flux. Trichloroethylene works well for this job. After the circuit has been tested to verify its performance, the board should be given a protective coating to prevent any contamination.

Testing

Use of a sinusoidal oscillator for the purpose of checking the band-pass characteristic and phase response of this circuit is just not practical. Oscillators capable of generating something more than a 10,000-second period are decidedly scarce and in any case the process would be very time-consuming. Fortunately the high-pass filter behaves as an underdamped second order system when provided with a step input (damping ratio, = $1/\sqrt{2}$). This fact, along with the provision for switching in a 100-second roll-off point can be used to create a very convenient test procedure. The circuit is tested in conventional fashion with the −3 dB roll-off set at 100 seconds, to confirm that operation is as predicted. Then a step input is provided and a typical underdamped response characteristic will occur. Next the filter is switched to the 10,000-second −3 dB roll-off and another step input is provided. The performance can then be assessed by comparing the resulting underdamped characteristic with that generated previously in the 100-second mode. In particular, the ratio of the interval between the first two crossings of zero output in the two cases may be used to determine the actual time constant in the latter case.

References

1. "Handbook of Operational Amplifier Active RC Networks," Burr-Brown Research Corp., Tucson, Ariz., 1966.
2. "A Selection Handbook and Catalog Guide to Operational Amplifiers," Analog Devices Inc., Cambridge, Mass., January 1969, p. 4.

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a study of the Sq variation from the eight most quiet days of the IGY period

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a study of the Sq variation from the eight most quiet days of the IGY period

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Abstract. The daily variation of the geomagnetic field is analyzed for the eight quiet days of the International Geophysical Year (1957-58) when the daily planetary character-figure Cp = 0.0. The amplitudes and phases of the first four harmonics of the average variation on these days in the components X, Y and Z are given for each of the 108 stations analyzed. The average daily variation at each station is also illustrated with daygraphs of X, Y, Z, and with vectograms of X, Y. The results are discussed in the light of those obtained by Vestine *et al.* in their analysis of three very quiet days of the Second International Polar Year (1932-33). The positions of the northern and southern foci in five different longitudinal sectors are also estimated. The study of the daily variation curves presents evidence that the northern current system penetrates the southern hemisphere before local noon, and the southern system penetrates the northern hemisphere after local noon.

Résumé. L'auteur analyse les variations quotidiennes du champ géomagnétique des huit jours calmes de l'Année internationale de géophysique (1957-1958) lorsque la donnée planétaire quotidienne était $C_p = 0.0$. Il donne les amplitudes et les phases des quatre premières harmoniques de la variation moyenne de ces jours des composantes X, Y et Z pour chacune des 108 stations analysées. La variation quotidienne moyenne à chaque station est illustrée à l'aide des graphiques quotidiens X, Y et Z, et des vectogrammes de X, Y. L'auteur expose les résultats à la lumière de ceux obtenus par Vestine et coll. dans leur analyse des trois jours très calmes de la Deuxième année polaire internationale (1932-1933). Il estime également les positions des foyers nord et sud dans cinq différents secteurs longitudinaux. L'étude des courbes de variations quotidiennes montre que le système de courant nord pénètre dans l'hémisphère sud avant midi (heure locale) et que le système sud pénètre dans l'hémisphère nord après midi (heure locale).

Introduction

The daily geomagnetic variations on normal days so apparent on magnetograms from low and mid latitude stations are considered to be due to ionospheric currents produced by dynamo-action in the E-layer. It has been shown in the past that these currents and the currents induced by them in the solid earth contribute about 67 per cent and 33 per cent respectively to the daily variations. When quiet day data are used in the analysis the computed daily variation is called Sq variation and the current system which gives rise to such variations is known as the Sq (or vortex current) system. Many studies done in the past on Sq variation have been summarized by Chapman and Bartels (Geomagnetism 1, 2, 1940), Vestine *et al.* (1947), Price and Stone (1964), Matsushita and Campbell (1967) and others. In an earlier study, most of the available geomagnetic data of the IPY period (International Polar Year, January 1932–December 1933; mean yearly sunspot number $\overline{R}$ = 8.4) were analyzed by Vestine *et al.* for days grouped in various ways. In one part of their study they analyzed data from the three days January 3, 4 and February 17, 1933, when the Planetary Character Figure Cp = 0.0, even though there occurred 58 such days during the IPY period. This was done probably because only on these days were the desired data available from all the 33 stations included in the analysis, of which only seven were in the southern hemisphere. During the International Geophysical Year (July 1957–December 1958; $\overline{R}$ = 194.4) data from many more observatories became available. Accordingly, in the present work data from 108 observatories, widely spread over the globe, are analyzed for the eight most quiet days (Cp = 0.0) which are listed in Table I. The use of data for the same days from all the stations ensures its homogeneity, and also the effect of the worldwide day-to-day variability remains nearly the same everywhere. A comparative study of the Sq variation on very quiet days, where the same data are used to the fullest extent possible for different elements and different stations, sheds light on the magnitude of the ionospheric currents during magnetic calm conditions in the IGY and the IPY periods.

Not all the stations included in the present work functioned for the entire IGY period and unfortunately some quiet day data are missing at some stations. In such cases appropriate substitutions of the data are made from other days (in some cases repeating data from one of the days being used). For the station Quetta, data for February 8, 9, March 8, 9, August 19, September 17, October 14 and 15, 1956, when Cp = 0.0, are used as the IGY data are not available to the author. Although the harmonic coefficients and the ranges given in Table II for Quetta are for these days, the ranges were appropriately corrected for the increased activity during the IGY for the purpose of calculations whenever it was felt necessary.

During the unprecedented maximum sunspot-number period of the IGY, the magnetic disturbances at high latitude stations were relatively large even on the international quiet days. However, in the present work no attempt was made to consider the local quiet days.

The data presented in this report will be used to derive the external and the internal part of the dynamo current system responsible for the observed diurnal variations. The interest is to see

Table I

August 23, 1957 August 24, 1957 May 24, 1958	j – season
October 6, 1957 October 8, 1957	e – season
November 5, 1958 November 30, 1958 December 1, 1958	d – season

Table II

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
1. THULE VILLAGE	1	14.7	77.0	34	17.0	346.3	43	13.0	286.2	37
GM = 88.9N, 357.8	2	2.0	310.9		3.1	306.4		7.2	141.7	
GG = 77.5N, 69.2W	3	3.6	196.4		4.4	142.3		2.7	341.7	
DIP LAT. = 81.7	4	3.6	37.8		.2	146.2		2.9	128.7	
2. RESOLUTE BAY	1	32.1	78.4	77	22.2	21.9	73	12.3	232.7	39
GM = 83.0N, 289.6	2	11.5	313.2		15.5	247.0		9.7	347.3	
GG = 74.7N, 94.8W	3	8.5	177.8		8.2	70.7		5.4	132.3	
DIP LAT. = 88.2	4	4.4	29.7		2.2	244.3		1.4	325.1	
3. GODHAVN	1	1.8	122.5	18	26.2	21.8	70	31.7	61.9	85
GM = 79.9N, 32.5	2	6.9	37.8		11.9	245.2		15.8	268.9	
GG = 69.2N, 53.6W	3	1.3	182.4		7.9	118.7		7.0	158.8	
DIP LAT. = 73.51	4	3.2	248.3		3.4	30.2		.5	190.5	
4. MURCHISON BAY	1	10.1	212.2	47	27.5	26.4	58	26.0	55.6	62
GM = 75.3N, 137.3	2	13.8	56.7		5.8	266.8		1.3	230.9	
GG = 80.0N, 18.3E	3	3.4	239.6		2.5	72.7		5.3	3.0	
DIP LAT. = 57.0	4	3.9	39.5		1.1	124.2		2.6	154.3	
5. BAKER LAKE	1	19.4	136.9	61	14.8	347.4	42	13.5	22.3	43
GM = 73.8N, 315.2	2	16.4	341.5		9.0	230.6		7.0	290.1	
GG = 60.3N, 96.0W	3	6.1	188.8		4.4	86.4		6.5	157.2	
DIP LAT. = 82.7	4	.8	103.5		2.5	269.8		3.3	53.9	
6. CHURCHILL	1	18.6	148.7	39	14.9	15.8	51	3.4	76.7	24
GM = 68.6N, 322.6	2	3.2	3.2		13.2	232.9		7.1	322.2	
GG = 58.7N, 94.3W	3	1.4	20.6		3.1	80.3		3.7	252.2	
DIP LAT. = 77.2	4	3.7	307.3		2.4	320.1		1.0	112.3	
7. TROMSO	1	14.5	116.7	39	16.3	32.1	36	7.9	185.5	45
GM = 67.0N, 117.5	2	6.4	300.8		5.4	274.7		10.8	72.1	
GG = 69.7N, 18.9E	3	2.3	198.9		3.2	68.5		7.7	66.6	
DIP LAT. = 66.31	4	2.3	357.5		.9	293.5		4.8	7.1	
8. CHELYUSKIN	1	15.4	143.7	44	4.5	124.2	15	1.4	117.0	17
GM = 65.9N, 177.5	2	8.1	263.1		3.8	261.8		6.9	33.9	
GG = 77.7N, 104.3E	3	3.9	329.7		1.5	328.7		2.1	58.3	
DIP LAT. = 83.4	4	2.4	29.0		.9	28.0		1.9	177.5	
9. COLLEGE	1	20.3	130.9	46	16.4	22.3	44	2.1	133.9	11
GM = 64.5N, 255.4	2	1.9	247.8		8.5	223.9		3.0	199.1	
GG = 64.9N, 147.9W	3	3.3	160.0		2.8	122.6		2.1	162.4	
DIP LAT. = 65.41	4	.8	178.9		.7	123.1		.4	141.3	
10. BIG DELTA	1	19.2	127.5	43	16.0	24.9	44	3.9	225.3	13
GM = 64.4N, 259.0	2	1.9	266.7		8.7	229.4		2.7	156.8	
GG = 64.1N, 145.9W	3	2.6	171.3		2.9	126.3		2.3	167.3	
DIP LAT. = 64.81	4	.8	204.1		.5	99.7		.6	179.0	
11. SODANKYLA	1	16.9	130.5	43	17.2	53.8	40	2.3	241.8	10
GM = 63.8N, 120.0	2	6.9	331.2		6.2	303.2		2.5	19.1	
GG = 67.4N, 26.7E	3	3.0	237.5		3.4	124.8		.3	256.3	
DIP LAT. = 64.81	4	1.4	54.2		1.3	351.6		1.4	338.2	
12. DIXON IS.	1	7.8	100.0	25	4.9	74.8	16	5.1	204.0	13
GM = 63.0N, 161.4	2	7.7	281.5		4.6	279.1		3.0	308.9	
GG = 73.5N, 80.6E	3	.9	32.8		.6	31.1		.8	17.9	
DIP LAT. = 77.5	4	1.9	128.5		1.0	133.9		.1	314.7	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
13. LERWICK	1	19.0	102.4	47	14.0	21.2	40	4.3	69.7	13
GM = 62.5N, 88.6	2	10.2	285.5		7.1	221.9		2.5	293.4	
GG = 60.1N, 1.2W	3	2.1	131.8		4.2	64.2		1.5	92.3	
DIP LAT. = 58.51	4	1.1	22.7		1.6	234.5		.6	345.4	
14. HEALY	1	19.2	135.4	43	14.5	7.2	41	.8	86.6	9
GM = 62.4N, 255.5	2	3.0	237.3		9.3	215.6		2.2	157.6	
GG = 63.9N, 149.0W	3	2.2	159.0		2.6	95.8		1.9	157.9	
DIP LAT. = 63.81	4	1.8	241.4		.7	249.3		.8	126.4	
15. DOMBAS	1	18.6	98.0	46	15.8	17.6	40	2.8	79.2	11
GM = 62.3N, 100.1	2	8.1	266.6		6.4	227.8		2.5	303.5	
GG = 62.1N, 9.1E	3	2.9	134.3		4.0	39.0		1.2	81.9	
DIP LAT. = 59.71	4	1.7	330.3		1.2	221.1		1.1	285.7	
16. MEANOOK	1	17.0	124.1	42	15.4	28.9	46	3.1	140.4	10
GM = 61.8N, 301.0	2	7.6	340.1		9.7	246.7		1.0	210.8	
GG = 54.6N, 113.3W	3	4.0	194.2		4.2	120.4		2.5	117.6	
DIP LAT. = 66.21	4	1.5	66.3		1.7	358.6		1.6	56.7	
17. CAPE WELLEN	1	15.3	93.6	34	4.0	67.5	9	2.1	186.3	6
GM = 61.8N, 237.0	2	4.5	264.8		1.7	242.4		.8	12.4	
GG = 66.2N, 169.8W	3	1.8	107.3		.5	86.9		1.1	126.3	
DIP LAT. = 62.5	4	.8	71.0		.2	97.1		.8	115.1	
18. ANCHORAGE	1	21.6	114.2	48	19.7	18.1	56	1.6	152.0	9
GM = 60.9N, 258.1	2	7.4	274.3		9.1	233.3		1.3	154.6	
GG = 61.2N, 150.0W	3	2.4	168.9		1.2	70.7		2.1	176.0	
DIP LAT. = 60.6	4	3.1	98.4		4.3	74.5		1.7	71.5	
19. TIXIE BAY	1	15.1	108.6	37	13.5	10.7	34	8.9	273.9	24
GM = 60.5N, 191.0	2	5.7	267.1		6.3	209.8		5.7	113.4	
GG = 71.6N, 129.0E	3	1.8	157.6		1.7	33.1		1.3	227.3	
DIP LAT. = 76.11	4	1.3	227.7		1.3	241.8		1.2	165.4	
20. SITKA	1	19.8	112.0	43	18.7	15.6	52	4.4	172.8	12
GM = 60.0N, 275.4	2	7.1	305.5		10.1	230.5		1.5	9.6	
GG = 57.0N, 135.3W	3	1.7	174.9		4.5	83.5		1.8	172.0	
DIP LAT. = 60.41	4	.7	48.4		1.3	317.1		.7	51.4	
21. ESKDALEMUIR	1	18.0	99.8	42	14.3	23.3	46	6.1	91.3	17
GM = 58.5N, 82.9	2	8.6	282.9		9.0	218.1		3.9	271.4	
GG = 55.3N, 3.2W	3	2.1	151.4		5.5	56.8		2.4	93.5	
DIP LAT. = 53.61	4	.7	5.6		2.0	237.7		.6	296.3	
22. LOVO	1	17.2	91.8	43	21.8	14.9	60	4.1	80.2	14
GM = 58.1N, 105.8	2	7.2	261.2		10.5	207.4		3.6	261.1	
GG = 59.3N, 17.8E	3	3.7	123.9		6.4	15.7		1.8	63.3	
DIP LAT. = 57.21	4	1.5	316.6		1.9	199.4		1.4	247.9	
23. NURMIJARVI	1	17.3	97.0	43	15.5	19.5	40	3.0	84.0	12
GM = 57.9N, 112.6	2	7.3	279.7		6.7	226.0		3.0	284.7	
GG = 60.5N, 24.7E	3	4.0	139.7		4.3	27.3		1.1	95.4	
DIP LAT. = 58.21	4	1.7	335.2		1.0	232.7		1.5	255.8	
24. VALENTIA	1	16.6	89.7	39	14.7	14.8	48	10.0	96.9	31
GM = 56.1N, 73.1	2	8.2	261.8		9.5	208.4		7.8	278.2	
GG = 51.9N, 10.3W	3	2.1	106.0		5.6	36.7		4.2	89.7	
DIP LAT. = 50.51	4	.5	326.2		1.9	218.0		1.2	270.0	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
25. RUDE SKOV	1	16.0	101.4	39	17.5	27.6	51	7.0	93.1	22
GM = 55.8N, 98.5	2	6.7	278.5		9.5	225.5		5.7	286.6	
GG = 55.8N, 12.5E	3	3.1	157.0		5.7	47.9		3.1	110.5	
DIP LAT. = 53.81	4	.8	358.3		1.7	240.6		1.8	317.1	
26. AGINCOURT	1	17.0	121.4	48	17.4	24.4	57	1.6	144.2	7
GM = 55.0N, 347.0	2	12.1	321.7		11.3	231.1		1.4	306.4	
GG = 43.8N, 79.3W	3	5.5	162.4		6.5	79.5		1.0	141.0	
DIP LAT. = 60.81	4	1.8	22.7		2.1	293.6		.7	324.8	
27. HARTLAND	1	15.2	93.6	36	15.0	25.1	50	9.8	87.0	28
GM = 54.6N, 79.0	2	7.4	266.3		10.4	217.5		6.8	280.0	
GG = 51.0N, 4.5W	3	1.8	133.3		5.9	52.8		3.5	94.8	
DIP LAT. = 49.21	4	.7	354.1		1.9	239.2		1.1	285.5	
28. WINGST	1	15.9	99.8	39	17.2	24.5	51	7.9	83.3	24
GM = 54.5N, 94.0	2	6.9	273.2		9.5	217.8		5.8	271.4	
GG = 53.7N, 9.7E	3	3.4	151.2		6.0	40.0		3.0	92.9	
DIP LAT. = 51.61	4	.6	15.0		1.6	229.4		1.5	295.4	
29. VICTORIA	1	15.9	113.2	40	17.7	13.4	53	4.9	78.5	17
GM = 54.2N, 293.0	2	8.8	328.4		11.2	221.9		3.6	268.5	
GG = 48.5N, 123.4W	3	3.6	179.0		4.7	71.2		2.7	108.8	
DIP LAT. = 54.91	4	1.0	22.0		2.2	304.2		1.2	343.5	
30. NIEMEGK	1	13.1	104.3	32	18.2	29.6	56	7.3	73.7	23
GM = 52.2N, 96.6	2	5.0	284.4		10.9	224.8		5.0	265.9	
GG = 52.0N, 12.7E	3	3.3	176.5		6.7	49.6		3.0	93.5	
DIP LAT. = 50.0	4	.8	45.6		1.9	244.9		1.7	304.4	
31. DOURBES	1	12.6	92.4	27	16.5	36.1	52	7.8	82.5	21
GM = 51.7N, 88.7	2	4.9	298.7		10.7	232.7		4.8	277.2	
GG = 50.1N, 4.6E	3	1.3	209.5		5.8	75.8		2.3	106.8	
DIP LAT. = 47.9	4	1.2	58.9		1.5	258.3		.8	317.6	
32. YAKUTSK	1	17.2	89.1	42	14.8	.5	44	1.6	178.9	6
GM = 51.0N, 193.8	2	8.7	265.9		8.8	182.8		1.1	84.8	
GG = 62.0N, 129.7E	3	3.7	83.4		4.0	354.1		.8	288.1	
DIP LAT. = 63.2	4	.4	243.0		.8	188.6		.7	98.0	
33. MOSCOW	1	12.9	114.7	35	18.0	37.7	51	4.3	76.4	16
GM = 50.8N, 120.5	2	5.3	322.4		9.7	245.2		3.8	285.6	
GG = 55.5N, 37.3E	3	4.4	182.4		4.8	75.2		2.4	122.4	
DIP LAT. = 54.61	4	1.2	53.0		2.0	271.7		1.4	295.9	
34. SWIDER	1	11.3	113.8	30	18.6	37.6	55	8.1	98.1	25
GM = 50.6N, 104.6	2	4.4	314.4		10.2	238.3		5.7	291.9	
GG = 52.1N, 21.3E	3	3.9	195.9		6.2	75.4		3.1	113.1	
DIP LAT. = 50.91	4	1.1	72.5		2.4	289.7		2.3	337.9	
35. FREDERICKSBURG	1	16.7	117.6	46	18.5	23.1	62	4.7	112.2	17
GM = 49.6N, 349.8	2	10.3	324.0		12.6	230.8		4.2	305.7	
GG = 38.2N, 77.4W	3	5.5	185.7		7.2	79.5		2.6	138.0	
DIP LAT. = 54.41	4	2.3	40.6		2.6	303.1		.8	340.0	
36. KAZAN	1	12.0	115.0	32	17.0	32.7	49	3.4	96.6	12
GM = 49.3N, 130.4	2	5.4	327.0		9.4	236.9		3.1	273.7	
GG = 55.8N, 48.9E	3	4.0	166.1		4.6	68.5		1.8	101.2	
DIP LAT. = 56.4	4	1.3	7.8		1.9	233.1		1.2	264.6	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
37. BELOIT	1	15.7	132.0	43	18.5	40.8	62	6.6	83.7	26
GM =49.2N, 324.8	2	9.5	354.9		13.5	252.9		5.2	302.3	
GG =39.5N, 98.1W	3	5.3	227.2		6.4	106.3		4.5	152.1	
DIP LAT. =52.21	4	2.4	106.4		1.8	358.2		1.7	39.1	
38. FURSTENFELDBRUCK	1	8.0	110.6	23	18.0	26.8	58	8.6	74.5	26
GM =48.9N, 92.4	2	2.1	311.5		11.5	215.4		5.8	263.7	
GG =48.2N, 11.3E	3	3.6	200.9		7.5	41.9		3.2	90.3	
DIP LAT. =45.81	4	1.3	69.5		2.5	225.3		1.3	285.7	
39. LVOV	1	8.6	83.6	25	17.6	8.7	53	8.1	59.6	25
GM =48.0N, 102.0	2	4.3	273.0		10.3	180.2		5.7	229.7	
GG =49.9N, 23.7E	3	4.3	119.5		5.9	352.8		3.1	39.0	
DIP LAT. =47.9	4	1.5	314.5		1.8	185.1		1.5	205.3	
40. WIEN-KOBENZL	1	8.2	123.3	25	18.6	33.9	59	7.9	75.6	23
GM =47.9N, 97.8	2	2.6	339.6		11.3	227.7		5.1	277.1	
GG =48.3N, 16.3E	3	4.3	206.6		6.8	58.9		2.7	100.9	
DIP LAT. =46.01	4	1.8	81.4		2.4	266.6		1.6	316.9	
41. HURBANOVO	1	7.3	136.5	24	17.8	36.7	56	8.0	82.1	25
GM =47.2N, 99.8	2	2.9	6.0		11.1	229.3		5.7	279.5	
GG =47.9N, 18.2E	3	4.5	217.0		6.6	69.7		3.3	117.3	
DIP LAT. =45.61	4	1.9	88.2		1.9	274.5		1.9	318.5	
42. PRUHONICE	1	9.8	108.4	27	18.9	31.3	59	9.0	89.5	25
GM =47.2N, 98.9	2	3.8	303.1		11.2	225.6		5.8	252.8	
GG =50.0N, 14.6E	3	3.8	197.9		7.0	54.3		1.2	121.9	
DIP LAT. =47.8	4	1.5	65.1		2.2	257.6		1.4	328.8	
43. TIHANY	1	6.8	131.3	22	17.7	35.5	58	7.7	74.8	24
GM =46.3N, 99.1	2	2.2	12.8		11.4	231.7		5.3	277.3	
GG =46.9N, 17.9E	3	4.2	220.0		7.0	70.0		2.9	112.0	
DIP LAT. =44.51	4	1.9	91.7		2.5	283.1		1.4	314.7	
44. CASTELLACCIO	1	9.2	168.4	37	21.3	16.7	67	0.0	0.0	0
GM =45.7N, 89.5	2	5.5	2.9		12.3	183.3		0.0	0.0	
GG =44.4N, 8.9E	3	6.8	176.8		8.4	4.4		0.0	0.0	
DIP LAT. =41.41	4	2.6	351.9		3.4	185.9		0.0	0.0	
45. LOGRONO	1	5.4	94.9	14	16.6	39.6	58	11.5	72.3	33
GM =45.4N, 80.7	2	2.1	272.4		12.0	230.1		6.8	256.0	
GG =42.5N, 0.9E	3	1.9	212.8		7.3	63.9		4.4	86.7	
DIP LAT. =39.71	4	1.3	54.3		2.3	263.3		1.6	277.8	
46. TORTOSA	1	1.0	173.6	11	17.4	41.5	62	9.8	82.1	27
GM =43.9N, 79.7	2	1.6	73.0		12.8	233.6		6.5	265.1	
GG =40.8N, 0.0N	3	3.0	249.8		8.2	75.4		2.8	104.2	
DIP LAT. =37.51	4	1.7	67.1		2.6	280.4		1.0	319.7	
47. ODESSA	1	6.8	134.7	23	17.9	31.3	59	6.8	69.7	21
GM =43.8N, 111.1	2	4.1	11.4		11.3	228.9		4.9	264.9	
GG =46.8N, 30.9E	3	4.5	199.5		6.9	68.2		2.0	100.1	
DIP LAT. =45.31	4	2.0	58.3		2.8	271.8		.8	276.6	
48. TOLEDO	1	.5	113.5	10	17.5	35.4	62	11.2	75.7	34
GM =43.6N, 75.7	2	1.5	89.0		12.7	221.3		7.5	258.3	
GG =39.9N, 4.1W	3	2.9	245.2		8.0	56.9		4.4	86.9	
DIP LAT. =36.71	4	1.4	63.8		2.9	246.5		1.6	287.9	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
49. SURLARI	1	5.9	149.3	25	17.0	27.7	56	7.9	66.7	27
GM =42.5N, 106.1	2	4.1	17.4		10.7	221.7		6.0	260.3	
GG =44.7N, 26.3E	3	5.0	197.3		6.7	56.7		3.4	90.3	
DIP LAT. =42.31	4	2.2	51.2		2.5	258.2		1.4	280.6	
50. SAN FERNANDO	1	4.5	275.1	22	16.6	35.4	61	0.0	0.0	0
GM =41.0N, 71.3	2	4.8	103.8		12.4	223.5		0.0	0.0	
GG =36.5N, 6.2W	3	4.1	266.9		7.9	57.2		0.0	0.0	
DIP LAT. =33.21	4	2.0	86.7		2.6	247.7		0.0	0.0	
51. IRKUTSK	1	15.1	115.8	42	16.1	14.7	53	3.0	87.5	12
GM =41.0N, 174.4	2	10.6	328.9		11.5	222.1		2.8	267.9	
GG =52.5N, 104.0E	3	5.3	173.8		5.7	52.3		1.9	101.7	
DIP LAT. =56.9	4	.8	28.9		.7	234.7		.6	288.0	
52. ALMERIA	1	4.3	265.9	20	17.1	38.3	63	9.6	66.7	24
GM =40.6N, 75.3	2	4.5	97.6		13.0	225.3		5.0	244.0	
GG =36.9N, 2.5W	3	4.2	260.7		8.1	67.5		2.4	64.8	
DIP LAT. =33.01	4	1.9	79.3		3.1	263.4		.6	288.4	
53. TUCSON	1	8.9	135.8	30	18.1	18.1	69	10.9	82.4	33
GM =40.4N, 312.2	2	6.9	5.5		14.7	226.9		7.1	281.4	
GG =32.2N, 110.8W	3	5.4	231.2		8.5	78.4		4.0	128.1	
DIP LAT. =40.31	4	2.6	90.0		3.5	305.3		1.6	.6	
54. Y.-SAKHALINSK	1	12.9	107.8	39	15.6	15.3	55	4.1	79.4	11
GM =36.9N, 206.7	2	10.0	306.5		12.0	213.8		2.4	269.3	
GG =47.0N, 142.7E	3	5.6	142.6		6.7	38.6		1.4	101.0	
DIP LAT. =41.51	4	1.4	337.5		1.6	229.9		.5	285.1	
55. TBILISI	1	7.2	170.5	37	17.4	24.5	59	8.3	60.7	30
GM =36.7N, 122.1	2	8.1	28.0		11.9	229.7		6.7	258.9	
GG =42.1N, 44.7E	3	6.0	208.4		6.9	72.6		3.5	105.7	
DIP LAT. =40.91	4	2.9	56.5		2.6	259.7		1.3	300.7	
56. MEMAMBETSU	1	11.3	120.4	38	15.9	16.8	59	4.6	85.0	11
GM =34.0N, 208.4	2	9.6	321.5		12.7	217.7		2.2	287.4	
GG =43.9N 144.2E	3	5.6	161.1		7.6	46.5		1.1	126.6	
DIP LAT. =38.21	4	1.5	4.9		2.0	247.3		.4	255.7	
57. TASHKENT	1	7.9	151.1	37	16.3	17.4	60	6.9	68.6	25
GM =32.4N, 143.7	2	9.0	2.1		12.2	223.1		5.5	259.8	
GG =41.4N, 69.2E	3	5.2	181.5		7.9	59.9		3.6	111.9	
DIP LAT. =41.51	4	2.3	1.4		1.9	253.8		1.2	309.3	
58. VLADIVOSTOK	1	12.3	115.5	41	17.5	16.2	62	9.1	78.3	23
GM =32.3N, 197.9	2	11.1	323.0		13.4	223.0		4.6	272.7	
GG =43.1N, 131.9E	3	6 1	166.3		7.6	55.5		2.5	110.5	
DIP LAT. =40.01	4	1.7	16.0		1.6	256.1		.8	309.6	
59. ASHKHABAD	1	5.7	171.0	30	15.0	11.9	64	7.4	73.6	27
GM =30.3N, 133.1	2	6.1	6.9		12.8	210.2		5.9	267.7	
GG =37.9N, 58.1E	3	3.9	166.8		9.9	55.1		3.7	115.2	
DIP LAT. =41.51	4	3.5	8.1		4.3	256.1		1.7	297.1	
60. SAN JUAN	1	3.0	353.6	15	16.4	6.7	47	6.0	94.2	15
GM =29.9N, 3.2	2	4.5	198.1		9.4	199.6		2.8	305.1	
GG =18.4N, 66.1W	3	1.6	345.7		4.1	54.2		1.2	158.7	
DIP LAT. =32.11	4	.2	355.2		.9	266.4		.1	338.9	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
61. HELWAN	1	16.2	253.2	51	16.7	24.4	57	11.1	92.8	38
GM = 27.2N, 106.4	2	12.5	76.3		11.2	228.8		8.8	305.3	
GG = 29.9N, 31.3E	3	6.8	240.0		7.4	83.5		5.5	150.0	
DIP LAT. = 24.91	4	3.8	91.1		2.6	313.8		2.1	359.5	
62. KAKIOKA	1	5.5	177.2	29	15.1	30.3	60	6.8	99.6	21
GM = 26.0N, 206.0	2	7.2	8.8		13.5	246.6		4.1	357.8	
GG = 36.2N, 140.2E	3	4.4	219.1		8.5	89.1		3.0	222.7	
DIP LAT. = 30.11	4	1.2	103.3		2.0	308.9		.3	71.5	
63. SIMOSATO	1	5.9	210.7	30	14.8	27.8	64	8.4	94.6	26
GM = 23.0N, 202.4	2	7.3	17.4		14.3	243.3		3.9	359.8	
GG = 33.6N, 135.9E	3	4.7	216.8		9.6	84.3		4.2	237.5	
DIP LAT. = 27.91	4	1.5	96.1		2.9	300.1		1.1	108.7	
64. ASO	1	5.6	208.7	27	14.3	15.4	62	11.2	68.1	32
GM = 22.1N, 198.1	2	6.8	349.9		13.7	217.8		6.3	271.5	
GG = 32.9N, 131.0E	3	4.3	176.6		9.1	49.1		3.9	106.0	
DIP LAT. = 28.41	4	1.5	53.1		2.4	250.6		.9	278.5	
65. QUETTA	1	7.1	252.1	22	11.9	22.7	53	7.9	78.9	24
GM = 21.6N, 139.7	2	6.0	73.9		10.6	233.6		4.8	281.8	
GG = 30.2N, 67.0E	3	1.5	280.2		8.8	90.2		2.9	153.2	
DIP LAT. = 27.11	4	.5	13.8		3.0	304.8		1.1	18.3	
66. M BOUR	1	25.6	270.0	67	19.3	68.5	52	12.1	96.0	41
GM = 21.3N, 55.0	2	12.6	146.5		10.9	253.7		8.8	288.3	
GG = 14.4N, 17.0W	3	6.2	344.7		5.3	99.1		5.8	148.8	
DIP LAT. = 9.11	4	3.0	214.8		1.1	323.8		2.9	13.8	
67. HONOLULU	1	15.9	258.2	40	14.8	14.1	56	13.3	67.1	41
GM = 21.1N, 266.5	2	7.3	95.2		12.0	251.4		7.3	288.3	
GG = 21.3N, 158.2W	3	4.5	292.6		7.0	123.4		4.8	158.8	
DIP LAT. = 22.01	4	1.2	131.4		4.0	356.7		2.8	36.3	
68. KANOYA	1	8.2	260.0	22	13.8	22.4	62	11.6	71.0	33
GM = 20.5N, 198.1	2	4.8	23.1		13.8	224.9		6.5	282.6	
GG = 31.4N, 130.9E	3	2.9	188.1		9.0	66.5		3.9	123.4	
DIP LAT. = 26.0	4	.7	137.7		2.2	273.5		1.6	270.3	
69. PARAMARIBO	1	25.2	288.4	60	13.9	39.8	45	15.1	108.4	38
GM = 17.0N, 14.5	2	9.1	143.8		10.3	225.7		8.1	320.5	
GG = 5.8N, 55.2W	3	4.9	336.2		4.4	79.8		3.8	178.2	
DIP LAT. = 17.61	4	1.8	102.3		1.5	303.1		.2	305.8	
70. CHA-PA	1	23.3	276.6	60	9.2	358.7	43	9.7	79.6	27
GM = 11.0N, 173.4	2	11.8	91.2		8.3	214.4		5.3	297.4	
GG = 22.4N, 103.8E	3	6.2	287.4		7.3	69.4		2.8	140.8	
DIP LAT. = 15.81	4	2.4	114.9		3.6	288.2		1.4	3.9	
71. IBADAN	1	56.2	259.1	141	13.8	80.4	34	26.6	262.2	74
GM = 10.6N, 74.6	2	28.6	93.8		6.6	283.8		18.5	82.3	
GG = 7.4N, 3.9E	3	12.1	315.1		2.8	149.2		6.6	281.8	
DIP LAT. = -03.11	4	4.6	137.4		1.9	330.1		2.7	151.2	
72. TATUOCA	1	30.3	271.9	73	18.4	55.1	42	14.7	83.3	39
GM = 9.6N, 20.8	2	13.9	114.2		8.6	229.5		8.7	275.8	
GG = 1.2S, 48.5W	3	6.5	313.1		1.2	96.1		3.2	141.6	
DIP LAT. = 8.91	4	1.2	144.4		1.9	351.8		1.6	42.3	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
73. ALIBAG	1	27.9	259.9	74	8.5	30.1	48	13.1	76.6	45
GM = 9.5N, 143.6	2	15.8	86.4		10.4	246.2		8.8	311.2	
GG = 18.6N, 72.9E	3	7.5	291.4		8.5	79.8		7.0	144.5	
DIP LAT. = 12.91	4	1.6	132.4		3.0	283.6		4.0	338.4	
74. TALARA	1	39.5	271.0	91	12.5	325.3	39	14.3	74.3	34
GM = 6.6N, 347.7	2	15.0	116.0		6.4	122.4		3.1	285.9	
GG = 4.6S, 81.3E	3	6.5	324.3		5.0	189.9		6.2	227.3	
DIP LAT. = 6.31	4	1.6	152.4		3.8	316.0		4.3	16.0	
75. ADDIS ABABA	1	56.7	258.5	147	3.4	172.8	24	5.1	250.7	13
GM = 5.3N, 109.2	2	32.2	97.5		6.4	1.0		2.7	95.4	
GG = 9.0N, 38.7E	3	11.3	316.7		3.7	151.7		.3	236.3	
DIP LAT. = -0.51	4	3.7	200.4		1.7	348.3		.5	328.8	
76. BANGUI	1	34.3	275.5	90	9.3	117.5	31	8.6	248.1	21
GM = 4.8N, 88.5	2	19.6	130.1		8.0	348.1		4.4	88.1	
GG = 4.4N, 18.5E	3	6.3	349.3		4.4	204.7		.8	3.0	
DIP LAT. = -7.11	4	2.3	186.2		2.2	51.6		.8	224.7	
77. CHICLAYO	1	45.2	270.7	102	14.6	312.9	40	17.2	68.6	36
GM = 4.5N, 349.0	2	16.4	116.8		6.1	112.2		5.5	240.5	
GG = 6.8S, 79.8W	3	6.3	334.6		5.5	196.4		3.4	251.6	
DIP LAT. = 4.91	4	1.9	171.0		3.4	324.9		2.3	25.4	
78. GUAM	1	34.9	269.4	80	9.0	64.3	41	9.3	73.3	23
GM = 3.9N, 212.8	2	14.0	111.1		10.2	266.2		3.5	290.8	
GG = 13.5N, 144.7E	3	5.6	324.1		5.9	91.7		2.4	159.1	
DIP LAT. = 6.51	4	1.8	170.4		1.9	301.0		1.4	332.0	
79. FANNING IS.	1	37.9	259.8	79	3.6	32.9	31	19.5	102.6	53
GM = 3.8N, 268.9	2	12.9	99.9		7.1	258.9		11.7	300.0	
GG = 3.9N, 159.4W	3	3.0	348.7		5.2	116.9		6.3	167.5	
DIP LAT. = 5.31	4	2.2	227.8		3.0	312.8		3.4	17.9	
80. MUNTINLUPA	1	35.0	273.2	84	5.7	52.1	34	16.6	94.8	44
GM = 3.0N, 189.7	2	15.8	124.0		8.3	276.0		9.3	300.6	
GG = 14.4N, 121.0	3	6.5	340.0		5.8	110.1		4.6	167.7	
DIP LAT. = 7.21	4	3.2	208.1		2.2	339.1		1.7	25.8	
81. ANNAMALAINAGAR	1	38.8	272.8	97	4.0	83.5	26	14.0	57.3	34
GM = 1.5N, 149.4	2	20.5	109.0		6.4	279.3		6.3	228.5	
GG = 11.4N, 79.7E	3	7.6	339.7		4.6	111.4		1.1	15.3	
DIP LAT. = 2.71	4	2.6	221.6		2.2	332.4		.8	118.4	
82. CHIMBOTE	1	49.8	275.4	115	15.9	277.7	63	19.2	65.2	42
GM = 1.0N, 351.0	2	21.3	119.8		16.3	92.6		8.6	236.1	
GG = 9.1S, 78.6W	3	7.0	338.5		6.8	231.5		2.6	214.5	
DIP LAT. = 3.21	4	1.9	178.1		5.2	306.0		4.1	16.1	
83. KODAIKANAL	1	54.9	273.4	141	13.4	62.7	66	14.3	68.8	31
GM = 0.6N, 147.1	2	28.2	117.1		16.6	261.7		4.3	268.1	
GG = 10.2N, 77.5E	3	14.8	338.8		9.8	100.0		2.8	151.9	
DIP LAT. = 1.71	4	4.9	200.5		2.1	343.3		1.4	28.8	
84. JARVIS IS.	1	68.9	265.4	155	4.2	257.2	15	2.8	93.7	13
GM = 0.5S, 269.0	2	29.4	101.2		3.0	280.6		3.1	275.2	
GG = 0.4S, 160.0W	3	9.1	334.1		3.0	108.5		2.0	125.0	
DIP LAT. = 1.11	4	5.3	212.3		1.9	274.2		1.0	325.5	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
85. HUANCAYO	1	87.2	275.0	194	16.2	280.1	45	12.2	56.5	29
GM=0.6S, 353.8	2	39.7	108.4		9.7	91.9		4.0	227.7	
GG=12.0S, 75.3W	3	11.2	329.9		4.2	228.8		2.7	249.1	
DIP LAT.=1.01	4	3.8	217.5		2.3	324.3		2.0	42.3	
86. TRIVANDRUM	1	60.1	270.3	152	1.5	13.0	17	16.9	327.3	50
GM=0.9S, 146.3	2	32.8	104.7		4.3	255.6		11.8	136.7	
GG=8.5N, 77.0E	3	12.7	327.6		3.4	78.4		3.7	5.0	
DIP LAT.=-0.31	4	4.4	211.0		1.2	303.7		.9	203.8	
87. KOROR	1	67.9	276.3	165	5.7	118.2	27	11.4	2.2	40
GM=3.3S, 203.5	2	33.8	122.2		8.2	313.2		9.2	183.3	
GG=7.3N, 134.5E	3	14.2	348.3		3.5	137.4		4.4	34.6	
DIP LAT.=-0.041	4	5.7	222.5		.3	349.2		1.8	270.6	
88. YAUCA	1	70.3	274.1	155	18.1	256.9	64	30.2	277.1	81
GM=5.5S, 354.0	2	29.0	113.0		14.7	52.4		19.2	93.9	
GG=15.5S, 74.6W	3	8.4	337.7		11.6	219.4		8.0	264.3	
DIP LAT.=-2.21	4	3.4	228.2		2.8	340.2		1.6	346.4	
89. LUANDA	1	26.2	259.2	68	12.2	126.8	45	1.6	317.7	7
GM=7.1S, 80.5	2	14.8	81.0		11.1	331.6		1.2	269.9	
GG=8.8S, 13.2E	3	5.7	260.2		6.7	178.0		.8	134.5	
DIP LAT.=-23.91	4	3.1	62.1		2.6	2.2		1.6	281.2	
90. VASSOURAS	1	37.5	279.8	88	10.8	111.5	44	4.7	192.8	21
GM=11.9S, 23.9	2	16.3	112.6		8.3	353.9		3.7	137.3	
GG=22.4S, 43.7W	3	6.8	306.1		8.7	224.1		5.0	346.9	
DIP LAT.=-11.71	4	.6	99.4		3.7	73.2		1.8	180.4	
91. HOLLANDIA	1	39.8	289.1	92	11.0	149.9	47	14.0	176.6	38
GM=12.5S, 210.3	2	16.7	122.9		12.8	352.0		7.0	7.1	
GG=2.6S, 140.5E	3	6.2	316.0		6.3	207.8		2.0	209.7	
DIP LAT.=-10.91	4	1.1	53.4		2.6	87.4		1.3	197.1	
92. APIA	1	31.8	276.4	74	12.6	185.3	53	7.0	207.8	14
GM=16.0S, 260.2	2	16.0	107.6		13.0	358.3		.4	138.1	
GG=13.8S, 171.8W	3	5.8	303.0		6.6	192.9		.3	22.8	
DIP LAT.=-16.31	4	.9	144.5		.7	334.8		.3	227.5	
93. KUYPER	1	32.1	308.0	79	12.7	164.3	53	16.1	252.7	45
GM=17.5S, 175.6	2	16.1	141.0		13.6	355.8		9.6	85.7	
GG=6.0S, 106.8E	3	7.4	335.2		6.2	203.5		4.2	293.6	
DIP LAT.=-17.61	4	1.0	128.9		3.0	69.6		1.1	143.7	
94. TANANARIVE	1	11.0	284.6	31	16.4	181.3	83	10.2	251.0	30
GM=23.1S, 112.1	2	7.7	120.6		19.2	17.5		6.5	97.8	
GG=18.9S, 47.6E	3	2.3	312.8		12.4	216.4		2.9	298.8	
DIP LAT.=-34.81	4	2.2	62.0		4.0	43.0		1.2	116.3	
95. TRELEW	1	3.8	314.0	13	13.6	199.9	60	14.2	261.5	37
GM=31.7S, 3.2	2	2.4	323.6		13.8	27.7		8.0	85.7	
GG=43.2S, 65.3W	3	2.1	162.7		8.8	214.3		4.4	276.4	
DIP LAT.=-22.41	4	1.3	75.2		1.7	38.6		.9	105.8	
96. HERMANUS	1	8.6	55.7	35	20.2	157.9	79	8.5	241.0	36
GM=33.3S, 80.5	2	8.1	244.3		18.0	1.1		8.1	50.5	
GG=34.4S, 19.2E	3	5.4	103.0		10.6	201.3		5.9	229.7	
DIP LAT.=-46.81	4	1.0	260.0		4.2	13.0		2.7	49.0	

Table II (Cont'd)

Component STATION	N=	X AMP.(γ)	X PH(°)	X RANGE(γ)	Y AMP.(γ)	Y PH(°)	Y RANGE(γ)	Z AMP.(γ)	Z PH(°)	Z RANGE(γ)
97. WATHEROO	1	7.1	25.2	24	18.9	164.2	73	14.0	236.9	63
GM =41.8S, 185.6	2	5.9	247.7		17.8	349.9		16.5	39.0	
GG =30.3S, 115.9E	3	1.6	89.1		8.9	183.7		9.0	225.2	
DIP LAT. =-46.41	4	.9	73.9		2.3	17.9		2.9	43.1	
98. TOOLANGI	1	11.5	68.5	45	19.5	174.8	80	1.7	254.9	6
GM =46.7S, 220.8	2	10.9	260.1		19.5	358.1		1.0	17.6	
GG =37.5S, 145.5E	3	5.1	105.3		9.5	185.6		1.4	201.2	
DIP LAT. =-51.21	4	2.3	308.6		2.0	2.2		.8	.8	
99. AMBERLEY	1	14.8	72.2	48	20.2	166.9	75	1.9	263.5	8
GM =47.7S, 252.5	2	12.7	250.1		19.0	345.1		2.3	18.5	
GG =43.2S, 172.7E	3	5.3	82.5		7.5	168.7		1.1	165.1	
DIP LAT. =-51.31	4	1.3	235.1		.7	35.4		.2	240.0	
100. ARGENTINE IS.	1	25.7	90.7	63	18.4	186.3	56	12.7	305.2	31
GM =53.6S, 3.6	2	12.9	291.1		11.9	28.7		4.6	122.4	
GG =65.3S, 64.3W	3	6.0	117.5		4.8	203.5		2.8	322.2	
DIP LAT. =-38.11	4	.7	352.9		2.0	35.9		1.0	99.2	
101. MACQUARIE IS.	1	14.0	87.0	40	21.6	184.5	65	10.4	26.2	23
GM =61.0S, 243.0	2	9.5	245.3		13.6	358.4		2.8	179.7	
GG =54.5S, 159.0E	3	4.2	97.9		5.6	188.8		2.3	54.0	
DIP LAT. =-67.61	4	1.5	268.5		1.6	350.6		1.0	46.3	
102. BYRD STATION	1	16.0	134.3	49	24.4	199.1	54	6.2	37.9	18
GM =70.5S, 336.0	2	12.0	323.6		7.3	316.2		.3	24.2	
GG =80.0S, 120.0W	3	5.4	38.7		3.5	10.8		2.4	331.6	
DIP LAT. =-61.51	4	2.0	110.6		2.5	61.3		2.1	81.2	
103. LITTLE AMERICA	1	6.1	128.6	18	38.4	223.4	75	13.1	282.8	39
GM =74.1S, 312.1	2	3.7	100.2		5.3	33.8		8.0	350.1	
GG =78.3S, 162.5W	3	2.4	255.5		3.5	263.0		5.1	163.4	
DIP LAT. =-70.61	4	1.6	69.6		3.2	124.9		3.6	264.7	
104. WILKES	1	45.7	333.3	150	42.5	163.3	126	24.3	285.9	75
GM =75.2S, 179.2	2	25.7	164.3		26.9	10.5		18.6	150.5	
GG =66.4S, 110.6E	3	17.1	307.9		11.6	220.7		11.1	348.1	
DIP LAT. =-74.01	4	16.4	126.8		6.2	40.1		4.0	123.4	
105. MIRNY	1	20.1	20.3	64	32.2	158.6	82	20.2	343.2	72
GM =77.0S, 146.8	2	14.3	264.0		18.0	27.2		14.9	159.2	
GG =66.6S, 93.0E	3	1.1	62.9		3.2	205.5		8.5	343.9	
DIP LAT. =-65.51	4	4.3	131.7		2.1	289.1		6.2	203.0	
106. OASIS	1	35.8	338.8	91	54.2	138.8	126	15.9	120.0	43
GM =77.6S, 160.3	2	16.2	175.4		22.6	345.0		5.8	275.9	
GG =66.3S, 100.7E	3	7.6	340.6		8.1	200.3		3.7	31.1	
DIP LAT. =-69.0	4	4.3	130.6		2.5	23.7		6.5	202.8	
107. SCOTT BASE	1	18.8	20.9	51	23.2	138.4	83	12.2	228.5	41
GM = 79.0S, 294.4	2	8.2	103.1		14.1	265.1		6.8	314.5	
GG =77.8S, 166.7E	3	6.9	221.1		7.4	188.3		6.9	125.1	
DIP LAT. =-74.3	4	2.7	53.2		9.2	1.6		5.7	310.2	
108. VOSTOK	1	42.9	77.1	91	38.5	156.4	95	17.4	242.1	42
GM =89.2S, 92.6	2	11.6	261.5		14.0	3.5		3.1	324.7	
GG =78.5S, 106.9E	3	2.7	34.7		.7	142.2		6.2	8.1	
DIP LAT. =-68.31	4	2.8	54.8		4.4	123.6		4.7	131.7	

how well the results agree with those in the literature based on considerably larger volumes of data.

The geomagnetic (gm) and the geographic (gg) coordinates and also the dip latitude of the observatories are given in Table II. Figure 1 gives the location of all the stations included in the present investigation and shows the dip equator, the geomagnetic equator and the geographic equator. In Figure 2 the daily variations on individual days in the H-component are shown for stations Huancayo and Kodaikanal. Clearly the variations are not similar on all these days even though for each one of these days Cp = 0.0. This clearly demonstrates the variability of Sq on quiet days (Mayaud, 1965).

Method

The computations have been made in the following steps:

(1) Columnwise average of the 25 mean hourly values of the eight international quiet days, given in Table I, have been taken–the 25th value on each day is the first of the next day and has been used to remove non-cyclic variation.

(2) The 25 average values obtained above are rearranged if necessary, to the time of the nearest meridian, to which the time is being reckoned at a particular station. This may or may not be the exact local time of the station. A conversion of the data to the exact local time of the station can however be done by a method suggested by Price and Stone (1964).

(3) The difference between the 25th and the 1st value of the above 25 values is the average non-cyclic part for all the eight days under consideration. This is removed linearly from all the 25 values α_i, where i = 1, 2, 3, . . . , 25 i.e.; $\Delta = \alpha_{25} - \alpha_1$, $\beta_i = \alpha_i - \frac{(i-1)\Delta}{24}$.

(4) The deviations are computed from the midnight point by subtracting β_1 from β_i values i.e. $\delta_i = \beta_i - \beta_1$.

(5) The deviations ΔH and ΔD (i.e. δ_i data points for H and D respectively) are later used to compute the deviations ΔX and ΔY of the northerly (X) and easterly (Y) components as follows:

$$\Delta X_i = \Delta H_i \times \cos D - 29.1 \times 10^{-5} \times H \times \sin D \times \Delta D_i$$

$$\Delta Y_i = \Delta H_i \times \sin D + 29.1 \times 10^{-5} H \times \cos D \times \Delta D_i$$

where ΔD_i is in minutes of arc, and D and H are the averages of the daily mean values (including baseline value) of the eight most quiet days under consideration. The deviations ΔX_i, ΔY_i, and ΔZ_i have been plotted in Figure 3 and these give the average daily variation from a zero level at midnight in local time at individual stations. The stations are rearranged in order of their decreasing latitude from the geomagnetic pole.

(6) Using ΔX_i, ΔY_i and δ_i data for Z the amplitudes and the phases of the first four harmonics are computed by Fourier analysis. The amplitudes are next adjusted to compensate for averaging the data for eight days. These are given in Table II for all stations.

(7) The ranges for X, Y and Z components given in Table II are the sums of the absolute values of the maximum (A_{max}) and the minimum (A_{min}) during the 24 hour period, $r = |A_{max}| + |A_{min}|$.

(8) Vectograms (vector diagrams) given in Figure 4 are traced using ΔX_i and ΔY_i data as computed above. The stations are arranged in order of their decreasing geomagnetic latitude. In these vectograms the day part is shown by a continuous line and the night part by a broken line. In the equatorial electrojet belt the north-south variation dominates over the east-west variation, and for higher latitudes on either side of this belt the latter type variation becomes larger until the vectograms degenerate into figures of eight under the focus of the vortex system in either hemisphere. The vectograms are in the clockwise sense to the north, and counter-clockwise to the south of the northern focus, and the reverse is the case with respect to the southern hemisphere. In the auroral and the polar zones the vectograms in general are oval shaped and show equal variations during the day and the night part; also they are clockwise in the northern hemisphere and counter-clockwise in the southern hemisphere (except Wilkes which shows a clockwise rotation). Their large size indicates the concentration of large overhead currents caused by the enhanced particle precipitation and/or electric field in the ionosphere.

Results and discussions

At any station, the local daily variations of the geomagnetic components with the seasonal effects superimposed on them, are influenced by the location of the station with respect to the geographic equator. On the other hand the intensity of the variations depends to a large extent upon the location of the station with respect to the geomagnetic equator and also the dip equator. Thus a study of the daily geomagnetic variations on a global scale has to take into account the locations of the stations with respect to these equators. As seen in Figure 1 the dip equator is considerably to the north of the geographic equator in Africa and South Asia but is significantly to the south of it in South America. This also is the case for the geomagnetic equator. This brings into the picture a longitudinal asymmetry in Sq variations which was considered of secondary importance in the past because of the lack of sufficient data for analysis (Vestine *et al.,* 1947). The availability of a large volume of geomagnetic data during IGY clearly showed this longitudinal asymmetry, making it necessary to divide the globe into different longitudinal sectors. The choice of these sectors has not been standardized so far, and three (Price and Wilkins, 1963; Matsushita and Maeda, 1965) as well as five (Price and Stone, 1964) sectors have been considered in the past. In the present work, the longitudinal sectors of Price and Stone are adopted.

A preliminary study of Table II and of Figures 3 and 4 may be summarized as follows:

(1) Analysis of only a few very quiet days, eight in this case, during a time of very high sunspot number seems to give meaningful daily variation at the majority

of the stations. This is clear from the fact that systematic changes are noted in Figure 3 for each of the components, X, Y and Z, from high latitude stations to the low latitude stations in both hemispheres, and the harmonic coefficients are comparable with those obtained from considerably larger amounts of data (Gupta and Chapman, 1970). Besides the broad features of the daily variation some finer points, which will be discussed here, are also seen clearly.

(2) As expected, larger amplitudes (or ranges) of the daily variation are found during the IGY than during the IPY period. However the form of the variations remains virtually unchanged. For comparison of results, the following latitudinal zones are considered on the basis of the known ionospheric current systems which exercise the major influence within the specified approximate boundaries (the northern and the southern hemisphere latitudes are designated by positive and negative signs respectively):

(i) Equatorial electrojet systems ± 4° dip latitude.
(ii) Vortex (Dynamo or Sq) system ± (4°-60°) gm latitude.
(iii) Auroral electrojet system ± (60° -70°) gm latitude.
(iv) Polar current system ± (70°-90°) gm latitude.

The ratio of the ranges for the IGY period to those for the IPY is found to be nearly the same whether all or only the common stations in the two periods are included in the analysis. Thus these ratios are given for the former case only in Table III, for the three components individually and also combined. It also lists these ratios for the station Huancayo alone. Also given in this Table are the average ranges of IGY for the southern auroral and polar zones as no stations were in operation during IPY south of 60° geomagnetic latitude.

An overall increase in the daily ranges by a factor of 2.3 is seen for the IGY period over that of the IPY and the largest increases are noted in the auroral zone. This observed excess in the auroral zone may be accounted for by the enhanced particle precipitation and/or electric fields in the ionosphere at those latitudes during IGY giving rise to very strong electrojet currents. The effect of the increased ultraviolet flux caused by the excessive activity on the solar disc may also increase ionospheric conductivity but nearly proportionately everywhere. The overall ratio of the ranges for mid and low latitude stations under the northern vortex system is found to be about 1.5 times larger than the corresponding ratio in the southern hemisphere. This excess is most probably caused by the fact that the IPY data used in the present analysis are for January and February when it is summer in the southern hemisphere and the daily ranges are relatively larger there than in the northern hemisphere. The effect of this would be to give a smaller ratio in the southern hemisphere. The overall results given in Table III would be closer to those of Price and Stone (1964) if this factor of 1.5 is taken into consideration.

It also deserves mention that the Y-component in the equatorial electrojet zone does not show any significant change except a small decrease in the range from IPY to the IGY period.

(3) With the availability of the data from several stations, some recent estimates of the latitudes of the northern and the southern vortex foci in mid and low latitudes are made by Price and Wilkins (1963), Price and Stone (1964), Matsushita and Maeda (1965), Fatkullin and Feldstein (1965), and calculated theoretically by Stening (1971). A larger number of stations are used in the present work, and the estimated geographic latitudes of the two foci, and the possible variations in these latitudes because of interpolations, are given in Table IV for five longitudinal sectors of the earth. These latitudes are estimated on the following basis:

At the latitude of the overhead focus Sq(Y) would show a large range and Sq(X) not only would show a small range but also a variation changing from the equatorial to the polar type as the focus moves towards the poles or towards the

Table III

In different zones the ratio of the average range for the IGY to the average range for the IPY period (for the IGY period ranges at individual stations are given in Table II and for IPY period these are measured from Figure 87A, B of Vestine *et al.*). Also given are the ratios for the station Huancayo separately.

	X	Y	Z	X+Y+Z
Polar zone (N) (70° to 90°)	1.5	3.1	2.6	2.4
Auroral zone (N) (60° to 70°)	3.5	3.6	2.0	3.1
Mid and low latitudes (N) (4° to 60°)	2.3	2.9	2.8	2.7
Equatorial zone −4° to +4° dip latitude	1.8	0.8	1.9	1.5
(for Huancayo only)	(2.3)	(0.9)	(1.5)	(1.6)
Mid and low latitude (S) −4° to −60°	2.3	1.5	1.7	1.8
For all latitudes	2.3	2.4	2.2	2.3
*Auroral zone (S) (−60° to −70°)	45.7γ	75.2γ	45.0γ	55.3γ
*Polar zone (S) (−70° to −90°)	116.6	124.0	65.0	101.8

*The Figure 87A, B of Vestine *et al.* does not include any station south of 60° geomagnetic latitude. This is why the average values of the ranges for IGY instead of the Ratio of the ranges are given.

equator relative to the station. This means that a vectogram in the X-Y plane will elongate in the Y-direction tracing approximately a figure of *eight* or several loops depending upon the number of crossings towards the north and the south of the station during a 24-hour period.

The geographic latitudes of the foci of the vortex systems are found to be northernmost in the Europe-African sector and southernmost in the American sector as are also the geographic latitudes of the dip equator. In the northern hemisphere there seems to be a systematic decrease by approximately 5 degrees in the successive eastern sectors relative to the Europe-African sector. No such systematic change is noted in the southern hemisphere, which may partly be because of the fact that the estimated positions of the focus cannot be taken very seriously until more data are available from a closer network of observatories near these latitudes.

Table IV

Average geographic latitudes of the northern and the southern foci in different longitudinal sectors.

	Europe and Africa (E–A) 30°W-30°E	West Asia (WA) 30°E-90°E	East Asia (EA) 90°-150°E	Pacific (PA) 150°E-120°W	America (AM) 120°W-30°W
N	40°±1°	35°±2°	31°±2°	24°±3°	19°±2°
S	25°±2°	25°±2° ?	25°±2°	28°±3°	41°±2°

(4) At mid and low latitude stations the daily variation of Sq(Y) shows a crest in the morning and a trough in the evening in the northern hemisphere, whereas it shows a trough in the morning and a crest in the evening in the southern hemisphere. A knowledge of the hours of these extrema of variation in Sq(Y) provides a measure of the relative movement of the vortex systems in the two hemispheres. Accordingly an examination has been made of the smoothed daily Sq(Y) variations which reveals the following information:

Numbers of hours by which the northern vortex system leads the southern vortex system (a negative sign means a lead of the southern system over the northern system)

	AM	E-A	WA	EA	PA
Morning	0	1	1	2	1.5
Evening	−1	1	1	2	2.5

Clearly this analysis shows that the relative positions of the two vortex systems are not symmetrical in the two hemispheres and in the different sectors, except in the morning hours in the American sector. A similar conclusion was reached earlier by Price and Stone (1964).

The general characteristics of the Sq(Y) daily variation in the two hemispheres (viz. for the northern hemisphere a maximum in the morning and a minimum in the evening) have just been pointed out. If the daily variations at some stations are contrary to these general features one may suspect the penetration of one vortex system into the other. It may be noticed from Figure 3 that at stations Muntinlupa, Guam, Annamalainagar, Kodaikanal, Trivendrum, Koror, Fanning Is., Addis Ababa, Bangui and Jarvis Is., all of which lie within geographic latitudes 0-14°N (and geomagnetic 0-6°N) except Jarvis Is. (.5°S) there are peaks both in the morning and in the evening hours indicating that the southern vortex system penetrates the northern region in the evening and influences the daily variations in the northern hemisphere; similarly the penetration (near the equator) of the northern system into the southern hemisphere may be understood by the presence of a peak at Jarvis Is. The penetration of the southern vortex system can be seen as far north as Alibag and M'Bour and that of the northern system into the southern hemisphere as far south as Hollandia, Vassouras and Apia. These observations may show that the boundary between the two vortex systems at any point in the equatorial plane varies all the time and does not necessarily coincide with the dip equator. Also they do not support the hypothesis (Matsushita, 1960) that the equatorial electrojet constitutes an effective boundary between the two vortex systems, as was also noted by Gettemy (1962). The extent to which the northern vortex system penetrates the southern hemisphere in the morning hours and the southern vortex system penetrates the northern hemisphere in the evening hours may also depend on the magnetic activity of the day. Such a study in different longitudinal sectors would require the analysis of data collected for a long period from several stations within about 20° latitude from the dip equator in both hemispheres.

A study of the penetration of the two vortex systems into the opposite hemispheres has been done on a seasonal basis by Price and Stone (1964) as against the annual basis presented in this work. The phenomenon deserves further attention.

(5) **Equatorial Electrojet**

The Sq(X) ranges are found to be abnormally large in a narrow region around the dip equator which was termed 'equatorial electrojet region' by Chapman (1951). These ranges as obtained in the present analysis are given in column 2 of Table V for 6 equatorial electrojet stations all of which lie between ± 2° of dip equator. Also given for comparison are the ranges obtained by (a) Price and Stone (1964; from 1958 International Quiet Days), (b) Chapman and Rao (1965; 1958 International Quiet Days) and (c) Gupta and Chapman (1970; July 1957–December 1959 i.e. IGY/C all available days). It is immediately noticed from the ranges obtained in various ways by these authors that the electrojet intensity is largest in South America followed successively by that in East Asia (Koror), the Pacific, India and Africa. Analysis of the IQSY data from these

Table V

Ranges at equatorial stations of the X(H) component computed variously by several authors during specific intervals of the IGY/C period data; column 3–of the eight most quiet days (Cp = 0.0) of the IGY; column 4 and 5–of International Quiet Days of the year 1958, column 6–of available all days during the IGY/C period.

Station	Dip Latitude	Gupta	Price-Stone	Chapman-Rao	Gupta and Chapman 1970
Huancayo	1.0°	194γ	185γ	191γ	178γ
Addis Ababa	−0.5	147	147	136	135
Kodaikanal	1.7	141		128	135
Trivendrum	−0.3	152	151	142	141
Koror	−0.04	165	173	166	170
Jarvis	1.1	155	150	154	160

stations may further elaborate on this. A further comparison of the Sq(X) ranges in the different longitudes at stations close to those given in Table V indicates that the ranges tend to decrease rather rapidly as the distance of the station from the dip equator increases in either hemisphere.

As far as Sq(Y) ranges are concerned it is found that these are large at the equatorial electrojet stations of Chimbote (61), Kodaikanal (67) and Yauca (64) which are respectively at 3.2°, 1.7° and −2.2° dip latitudes.

In earlier investigations Onwumechilli and Alexander (1959) had found a large range of Sq(Z) at Ibadan and later Forbush and Casaverde (1962) and Chapman and Raja Rao (1965) found even larger ranges of Sq(Z) at the South American station Yauca. The results of the present investigations of data for the most quiet days confirm these findings. The Sq(Z) range at Ibadan and Yauca are found to be respectively 74γ and 81γ. The range at Yauca is larger than that found anywhere in the electrojet zone so far. In this connection Chapman and Raja Rao (1965) observed, "This great Z-perturbation occurs quite close to the centre line of the electrojet at a distance not much, if any, more than about twice the height of the electrojet." From the centre line of the jet on the ground the distance where Z-perturbation becomes maximum may be found as follows:

Assume an infinite line current of intensity i flowing eastward at a height of h km from the surface. The magnetic intensity F at a point P at a distance of x km from the base of h may be given by Ampères Law by the relation

$$\oint F\, ds = 4\pi i$$

$$\text{or } F = \frac{2i}{r} \text{ where } r^2 = x^2 + h^2$$

(See Chapman and Bartels 1940, p. 27.)

$$H = \frac{2i}{r} \cdot \frac{h}{r} = 2i \cdot \frac{h}{x^2 + h^2}$$

Y = 0 as the current is assumed to be of infinite length in the Y-direction.

$$Z = \frac{2i}{r} \cdot \frac{x}{r} = 2i \cdot \frac{x}{x^2 + h^2}$$

the extrema of Z fall at $\frac{dZ}{dx} = 0$ i.e. x = ± h. This shows that the Z-perturbation due to the electrojet would have its maximum value at distances equal to the height of the electrojet on either side of jet centre line. More realistic models of the electrojet assumed in the past taking into consideration the induction inside the earth have been worked out and the reader is referred to Chapman (1951) and Onwumechilli (1967).

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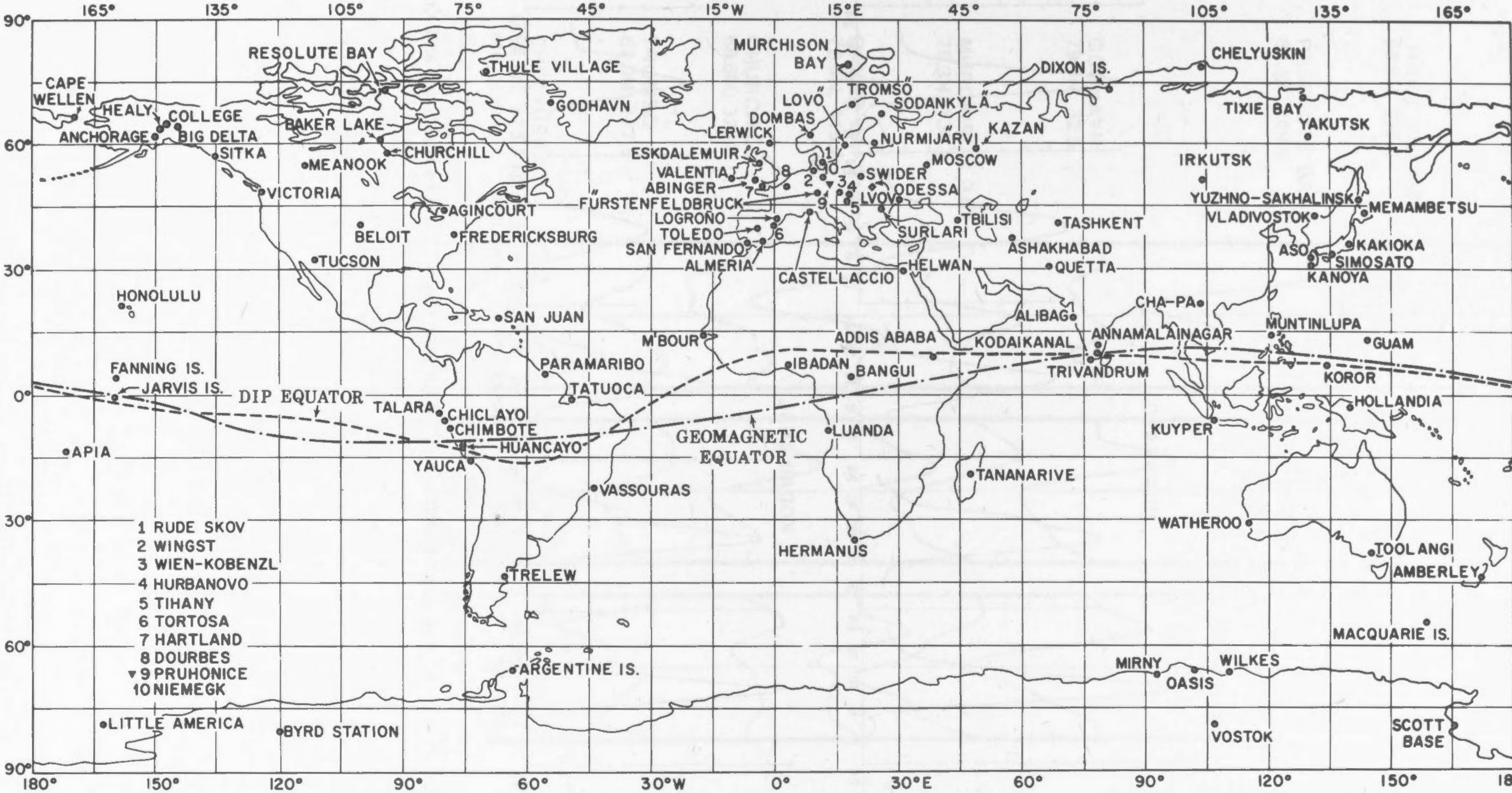


Figure 1. The world map shows the locations of the stations included in the analysis. Where space permits, the names are indicated alongside the station; in Europe the map is crowded and ten stations are numbered and their names are given on a separate list on the map. The geomagnetic equator is shown by the chain line and the dip equator by a broken line.

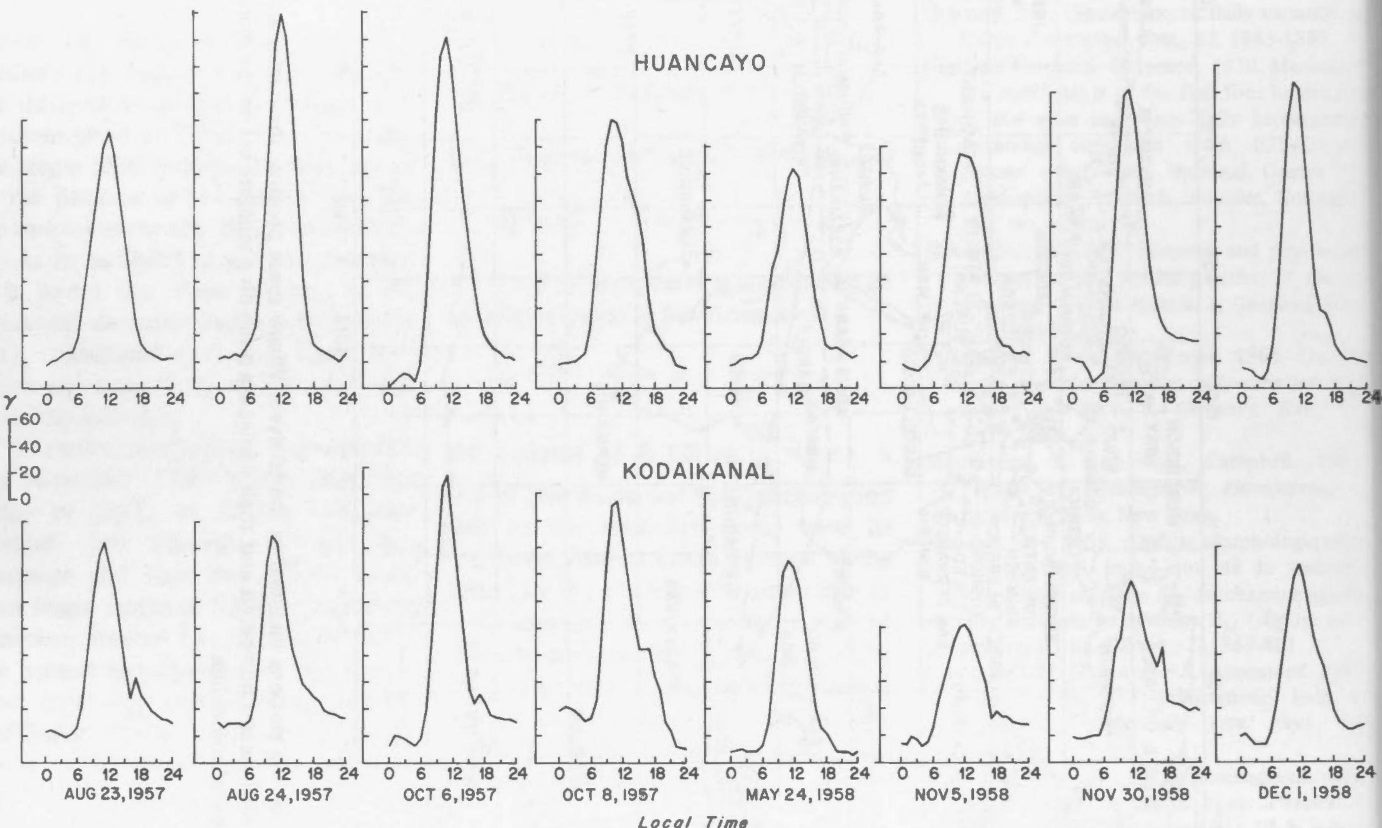


Figure 2. Daily variations of H on the individual eight days (Cp = 0.0 for each day) at stations Huancayo and Kodaikanal.

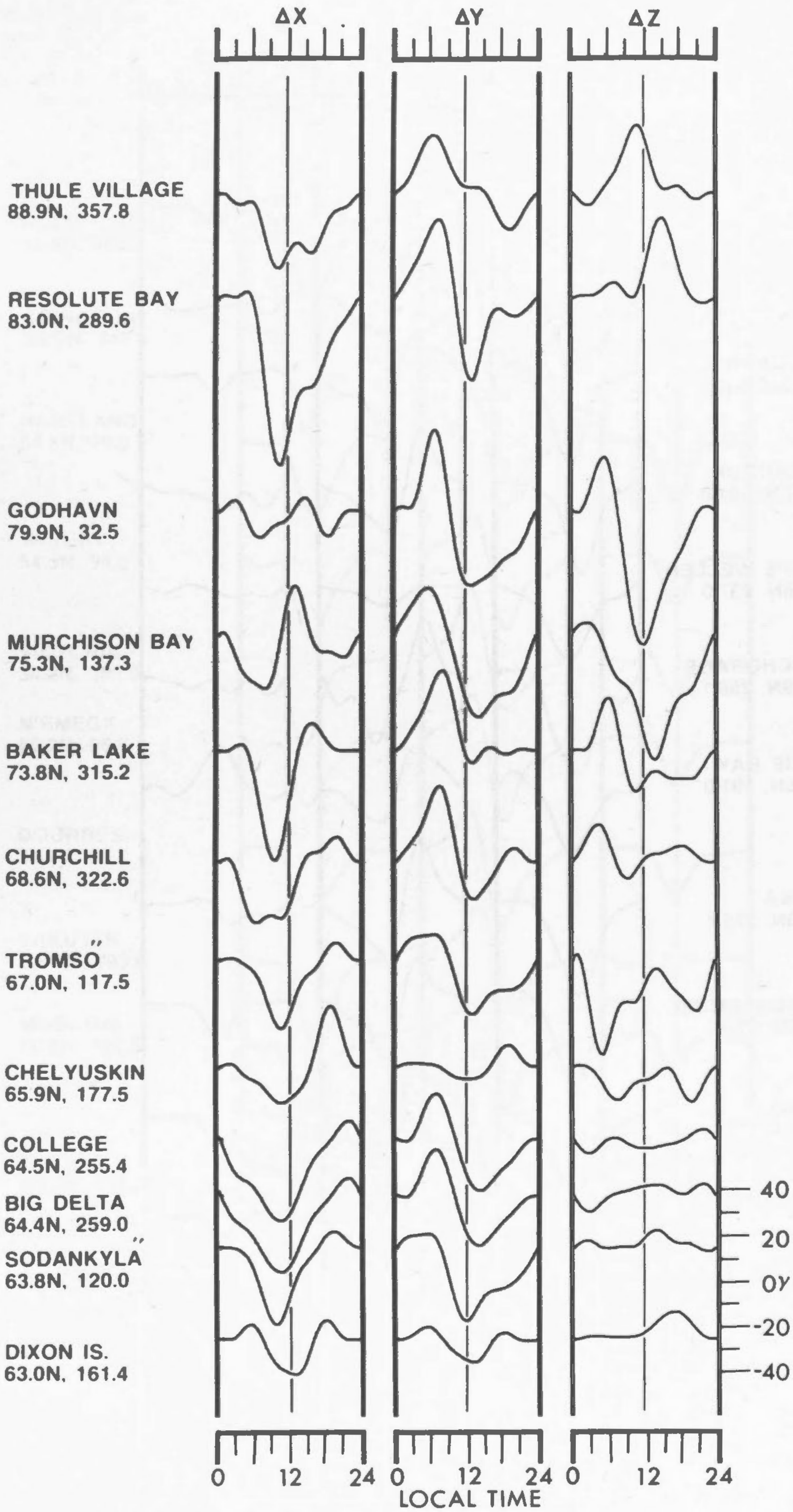


Figure 3a

Figure 3. Solar daily variation of Sq for the components X, Y and Z for the eight most quiet days (Cp = 0.0) of the IGY period; geomagnetic coordinates (in degrees) are indicated underneath the station.

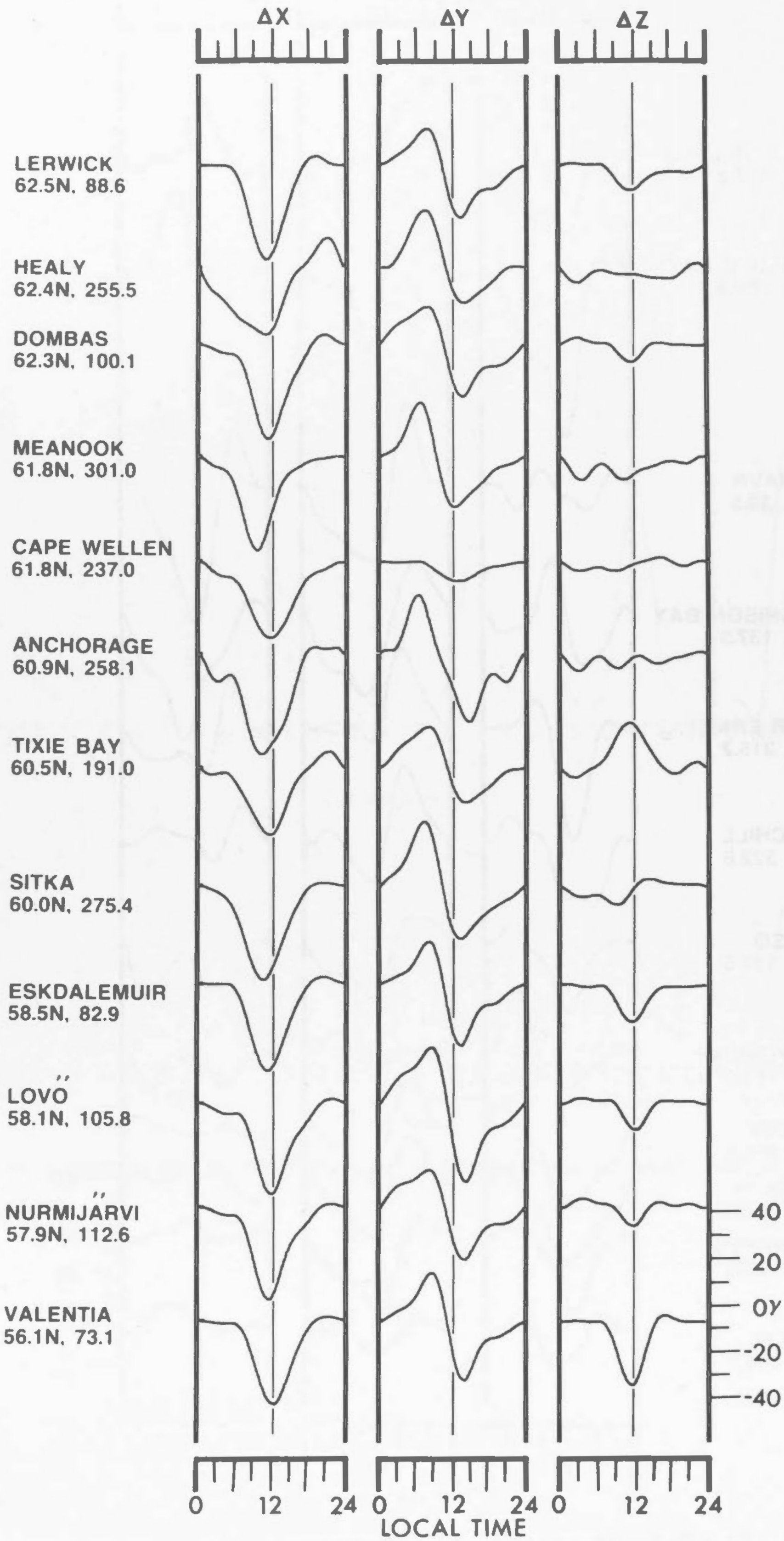

ΔX
ΔY
ΔZ
LERWICK
62.5N, 88.6
HEALY
62.4N, 255.5
DOMBAS
62.3N, 100.1
MEANOOK
61.8N, 301.0
CAPE WELLEN
61.8N, 237.0
ANCHORAGE
60.9N, 258.1
TIXIE BAY
60.5N, 191.0
SITKA
60.0N, 275.4
ESKDALEMUIR
58.5N, 82.9
LOVÖ
58.1N, 105.8
NURMIJÄRVI
57.9N, 112.6
VALENTIA
56.1N, 73.1
40
20
0γ
-20
-40
0
12
24
0
12
24
0
12
24
LOCAL TIME

Figure 3b

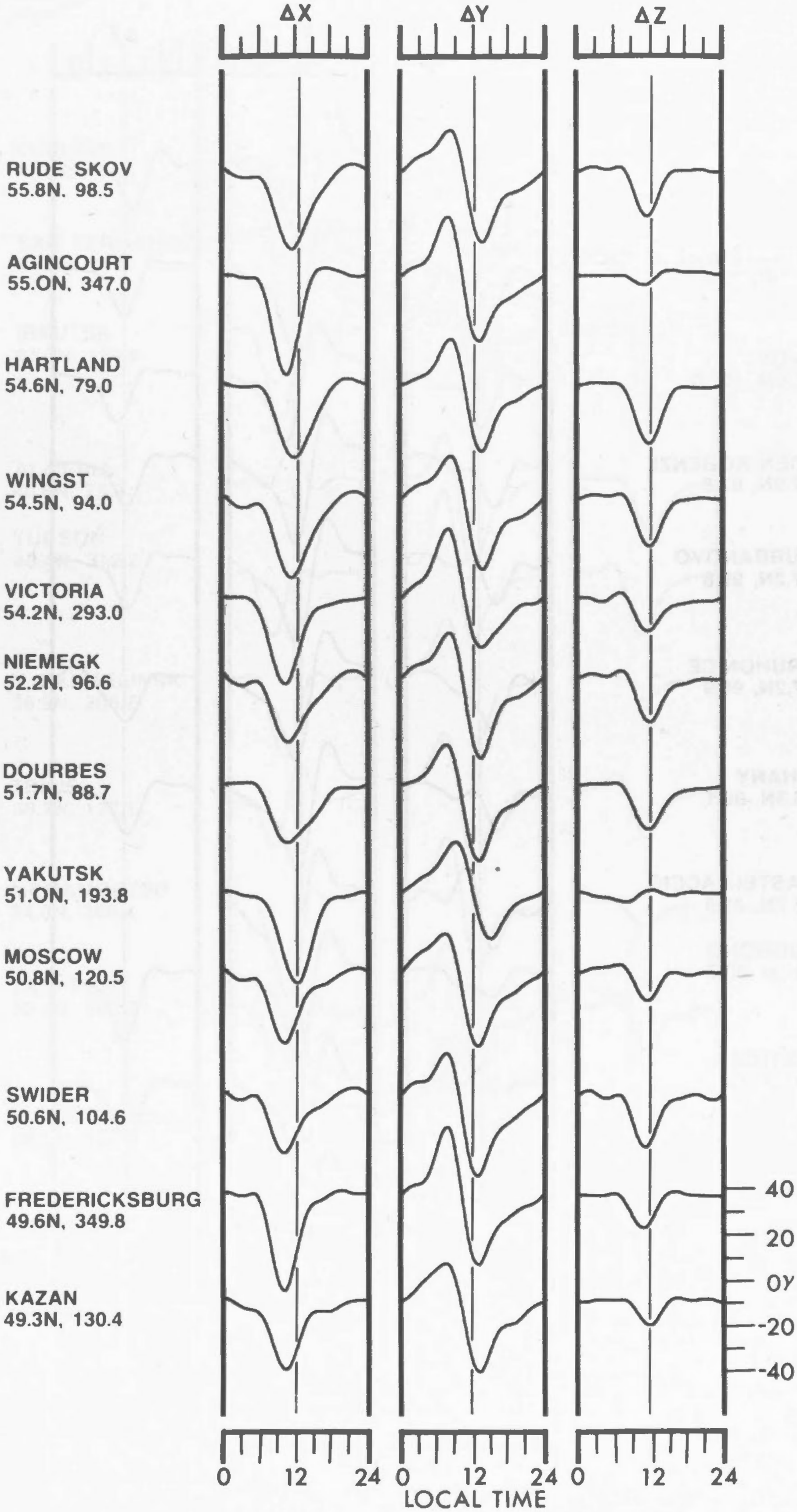
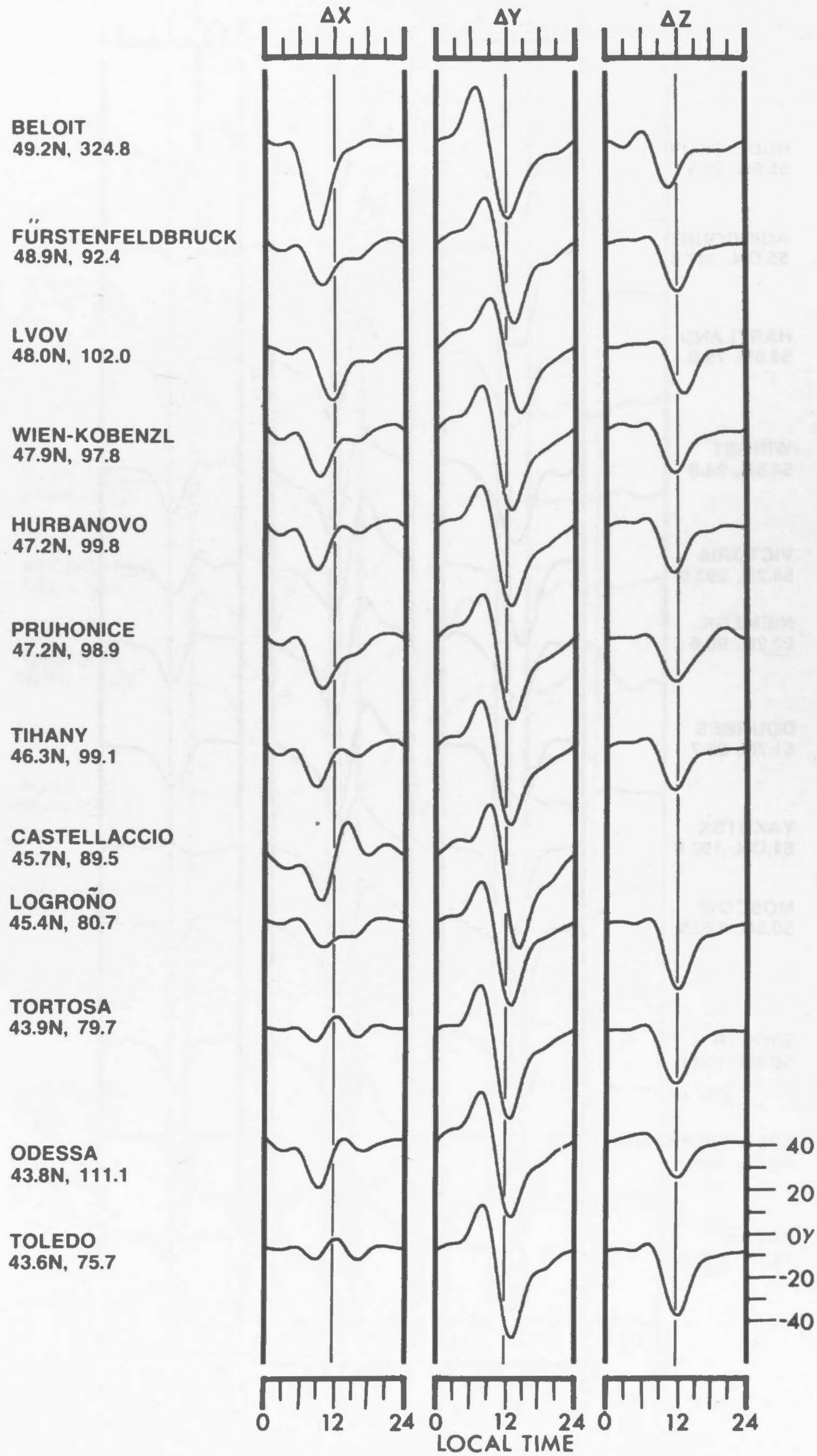

ΔX
ΔY
ΔZ
RUDE SKOV
55.8N, 98.5
AGINCOURT
55.0N, 347.0
HARTLAND
54.6N, 79.0
WINGST
54.5N, 94.0
VICTORIA
54.2N, 293.0
NIEMEGK
52.2N, 96.6
DOURBES
51.7N, 88.7
YAKUTSK
51.0N, 193.8
MOSCOW
50.8N, 120.5
SWIDER
50.6N, 104.6
FREDERICKSBURG
49.6N, 349.8
KAZAN
49.3N, 130.4
40
20
0γ
-20
-40
0
12
24
LOCAL TIME

Figure 3c

Figure 3d


ΔX
ΔY
ΔZ
BELOIT
49.2N, 324.8
FÜRSTENFELDBRUCK
48.9N, 92.4
LVOV
48.0N, 102.0
WIEN-KOBENZL
47.9N, 97.8
HURBANOVO
47.2N, 99.8
PRUHONICE
47.2N, 98.9
TIHANY
46.3N, 99.1
CASTELLACCIO
45.7N, 89.5
LOGROÑO
45.4N, 80.7
TORTOSA
43.9N, 79.7
ODESSA
43.8N, 111.1
TOLEDO
43.6N, 75.7
40
20
0γ
-20
-40
0
12
24
0
12
24
0
12
24
LOCAL TIME

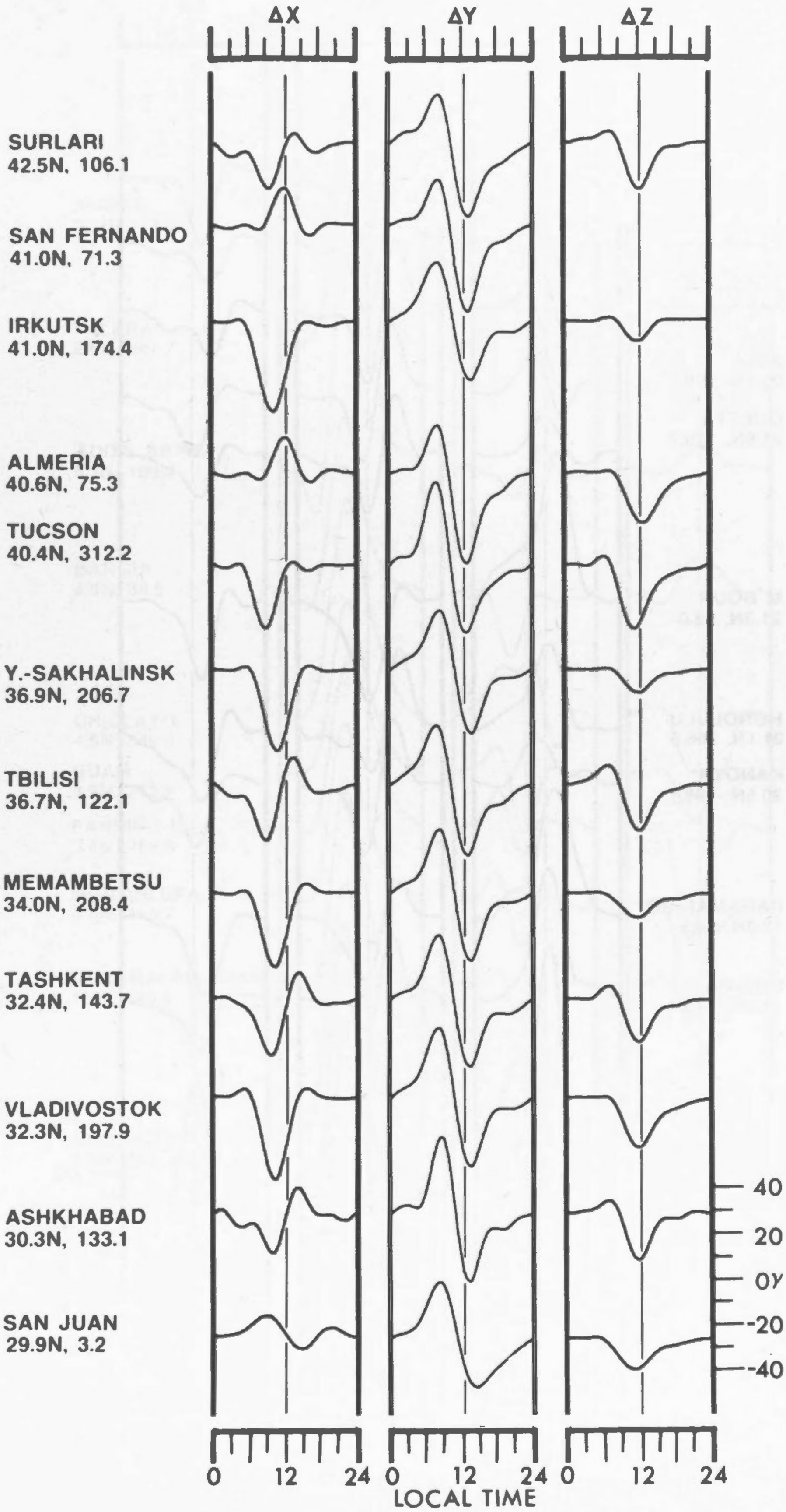

ΔX
ΔY
ΔZ
SURLARI
42.5N, 106.1
SAN FERNANDO
41.0N, 71.3
IRKUTSK
41.0N, 174.4
ALMERIA
40.6N, 75.3
TUCSON
40.4N, 312.2
Y.-SAKHALINSK
36.9N, 206.7
TBILISI
36.7N, 122.1
MEMAMBETSU
34.0N, 208.4
TASHKENT
32.4N, 143.7
VLADIVOSTOK
32.3N, 197.9
ASHKHABAD
30.3N, 133.1
SAN JUAN
29.9N, 3.2
40
20
0γ
-20
-40
0
12
24
LOCAL TIME

Figure 3e

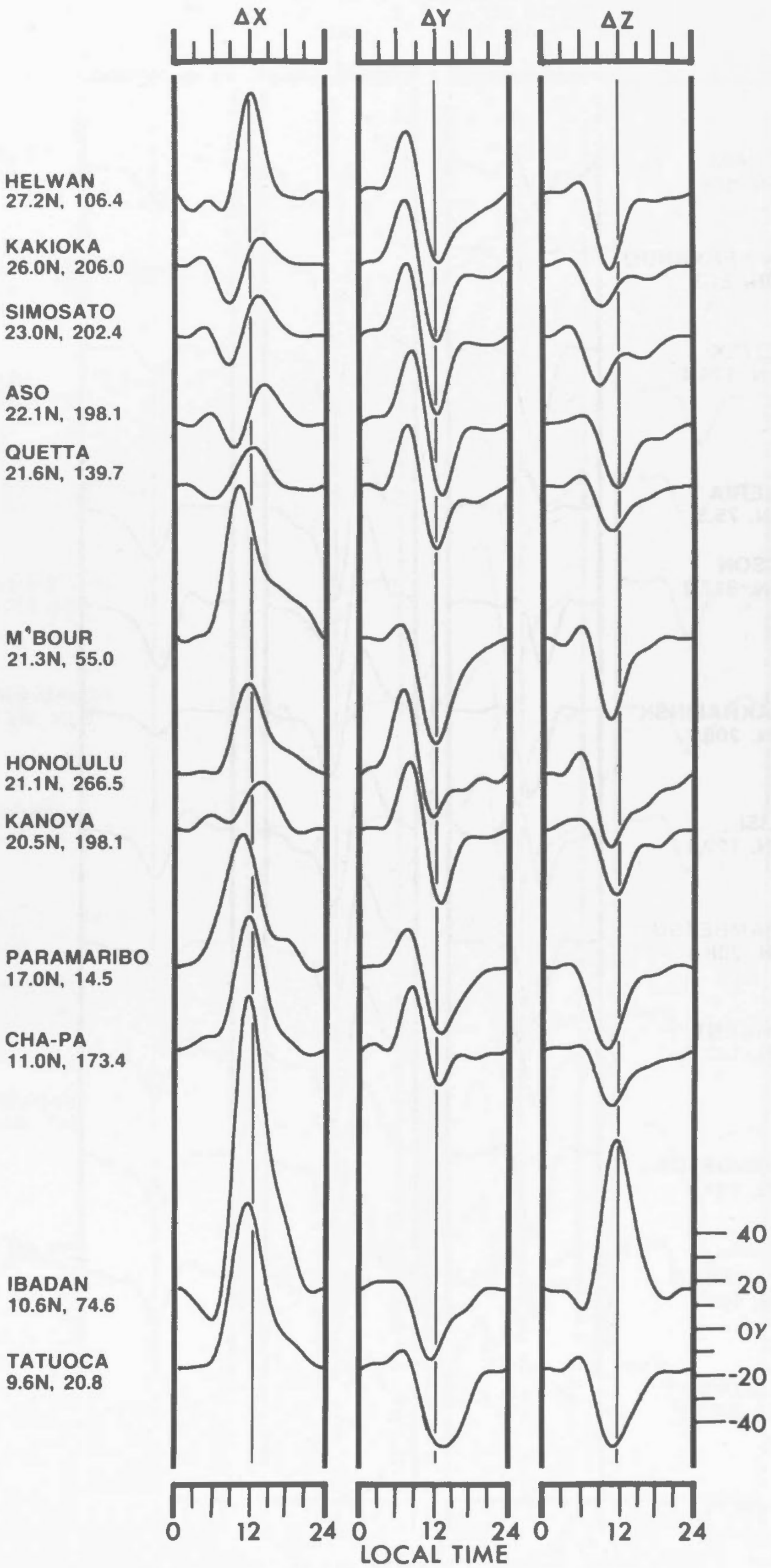

ΔX
ΔY
ΔZ
HELWAN
27.2N, 106.4
KAKIOKA
26.0N, 206.0
SIMOSATO
23.0N, 202.4
ASO
22.1N, 198.1
QUETTA
21.6N, 139.7
M'BOUR
21.3N, 55.0
HONOLULU
21.1N, 266.5
KANOYA
20.5N, 198.1
PARAMARIBO
17.0N, 14.5
CHA-PA
11.0N, 173.4
IBADAN
10.6N, 74.6
TATUOCA
9.6N, 20.8
40
20
0γ
-20
-40
0
12
24
LOCAL TIME

Figure 3f

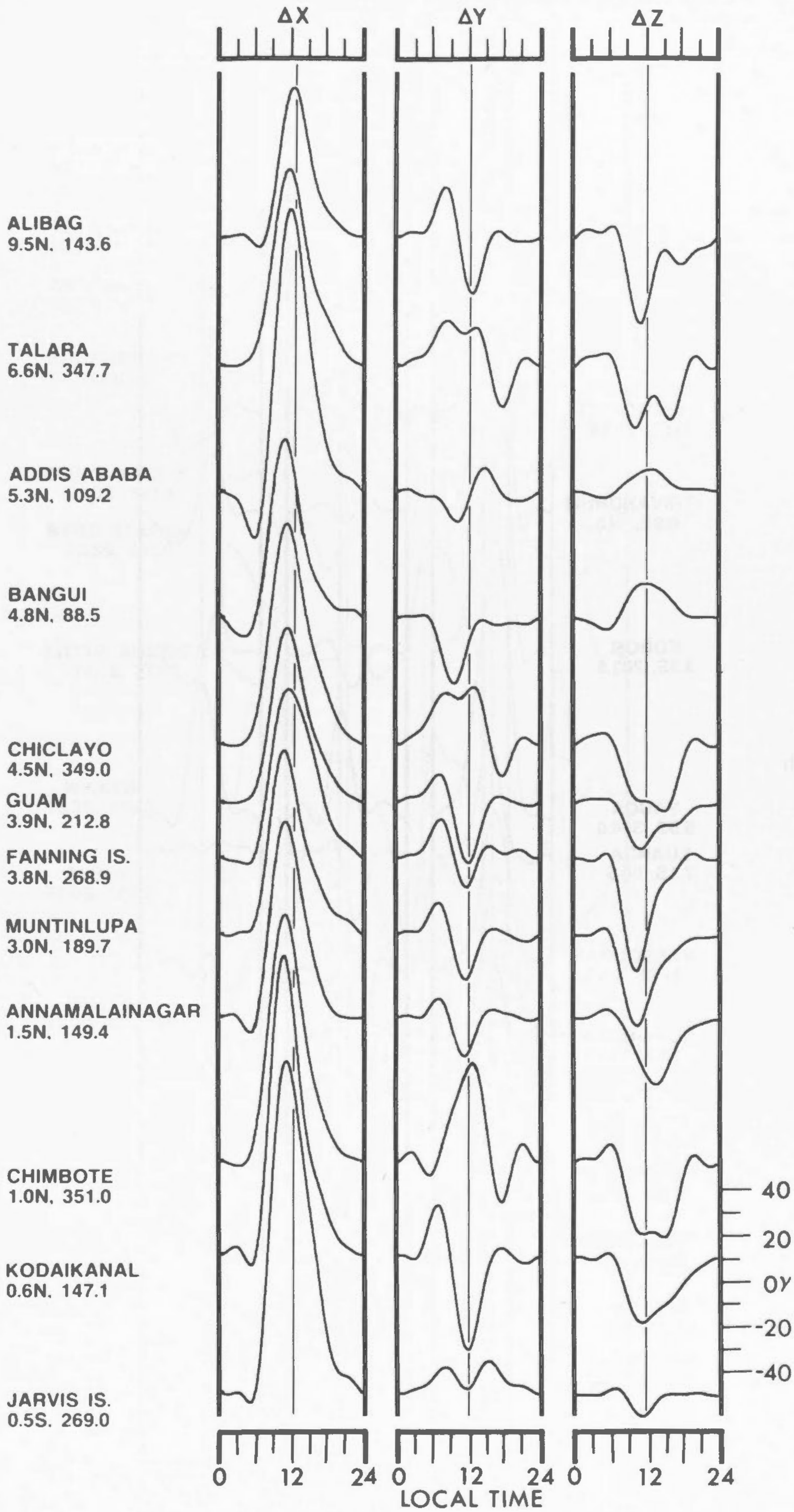

ΔX
ΔY
ΔZ
ALIBAG
9.5N. 143.6
TALARA
6.6N. 347.7
ADDIS ABABA
5.3N. 109.2
BANGUI
4.8N. 88.5
CHICLAYO
4.5N. 349.0
GUAM
3.9N. 212.8
FANNING IS.
3.8N. 268.9
MUNTINLUPA
3.0N. 189.7
ANNAMALAINAGAR
1.5N. 149.4
CHIMBOTE
1.0N. 351.0
KODAIKANAL
0.6N. 147.1
JARVIS IS.
0.5S. 269.0
40
20
0γ
-20
-40
0
12
24
LOCAL TIME

Figure 3g

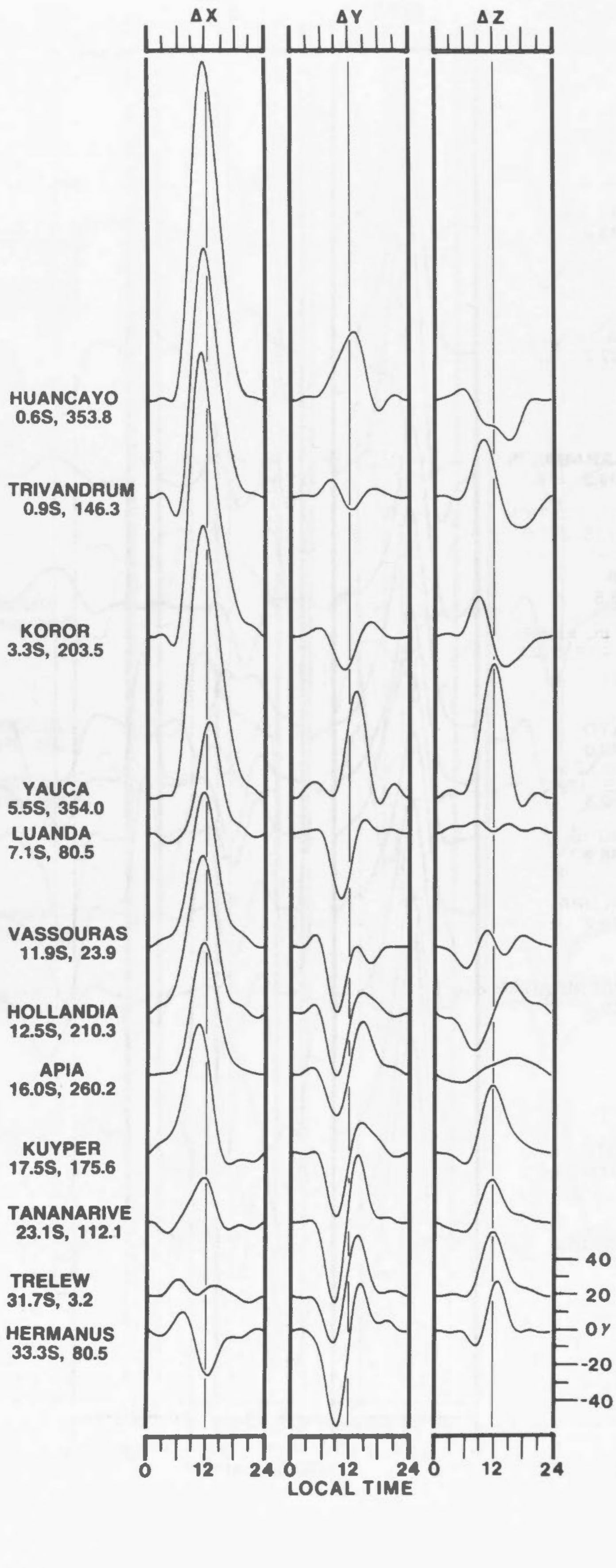

ΔX
ΔY
ΔZ
HUANCAYO
0.6S, 353.8
TRIVANDRUM
0.9S, 146.3
KOROR
3.3S, 203.5
YAUCA
5.5S, 354.0
LUANDA
7.1S, 80.5
VASSOURAS
11.9S, 23.9
HOLLANDIA
12.5S, 210.3
APIA
16.0S, 260.2
KUYPER
17.5S, 175.6
TANANARIVE
23.1S, 112.1
TRELEW
31.7S, 3.2
HERMANUS
33.3S, 80.5
40
20
0γ
-20
-40
0
12
24
LOCAL TIME

Figure 3h

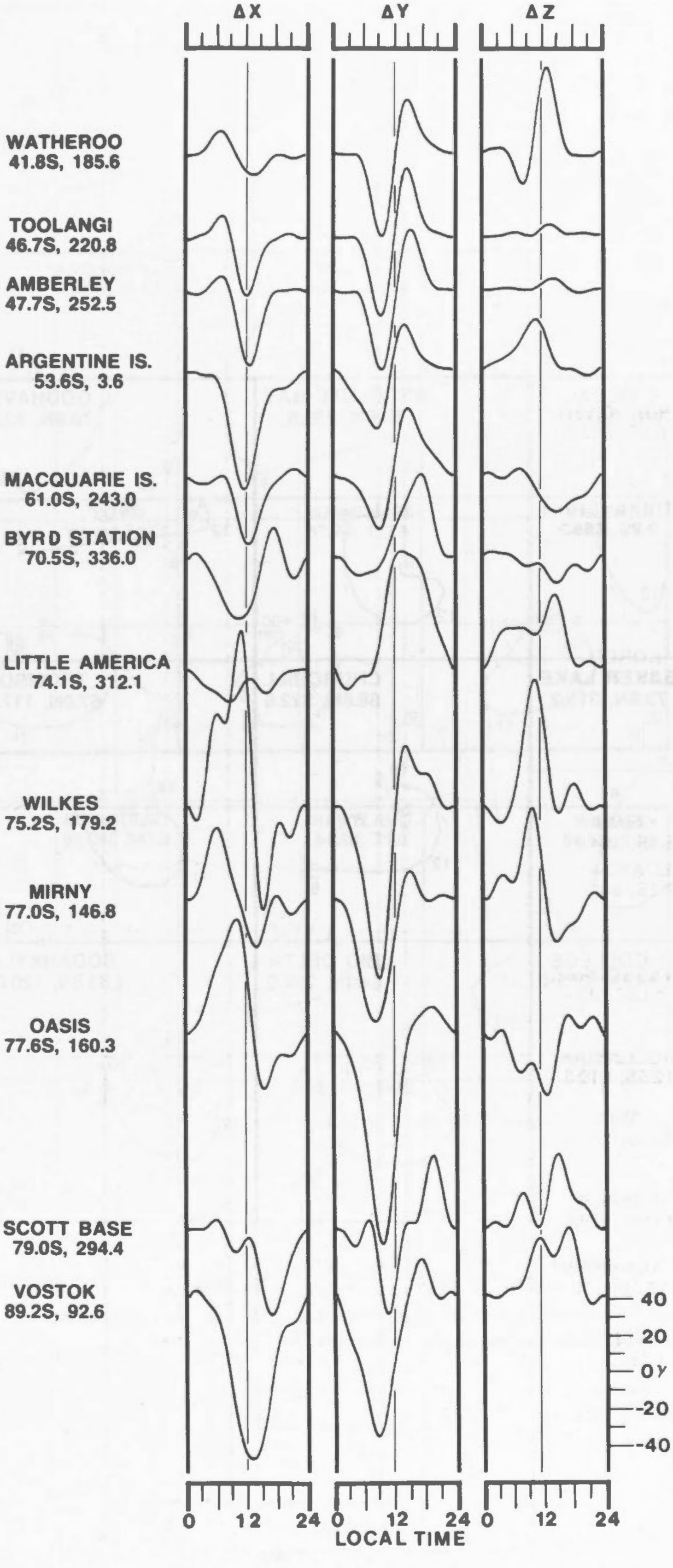

ΔX
ΔY
ΔZ
WATHEROO
41.8S, 185.6
TOOLANGI
46.7S, 220.8
AMBERLEY
47.7S, 252.5
ARGENTINE IS.
53.6S, 3.6
MACQUARIE IS.
61.0S, 243.0
BYRD STATION
70.5S, 336.0
LITTLE AMERICA
74.1S, 312.1
WILKES
75.2S, 179.2
MIRNY
77.0S, 146.8
OASIS
77.6S, 160.3
SCOTT BASE
79.0S, 294.4
VOSTOK
89.2S, 92.6
40
20
0γ
-20
-40
0
12
24
0
12
24
0
12
24
LOCAL TIME

Figure 3i

Figure 4a

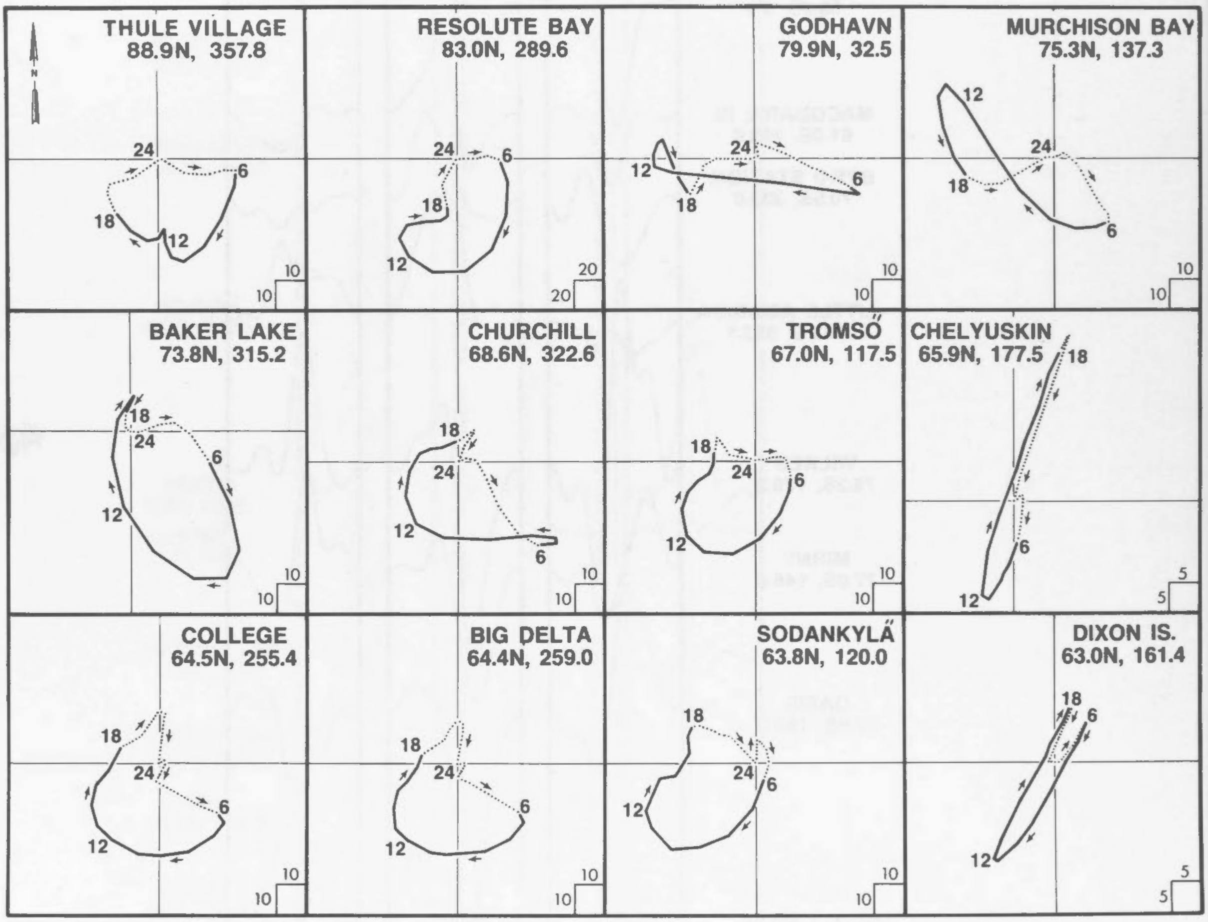


Figure 4. Vectograms obtained from the X and Y deviations of the eight most quiet days (Cp = 0.0) of the IGY period; the geomagnetic coordinates (in degrees) are indicated underneath the station. The day part is shown by a continuous line and the night part by a broken line. The scales for the X and Y axes are given on the lower right-hand corner.

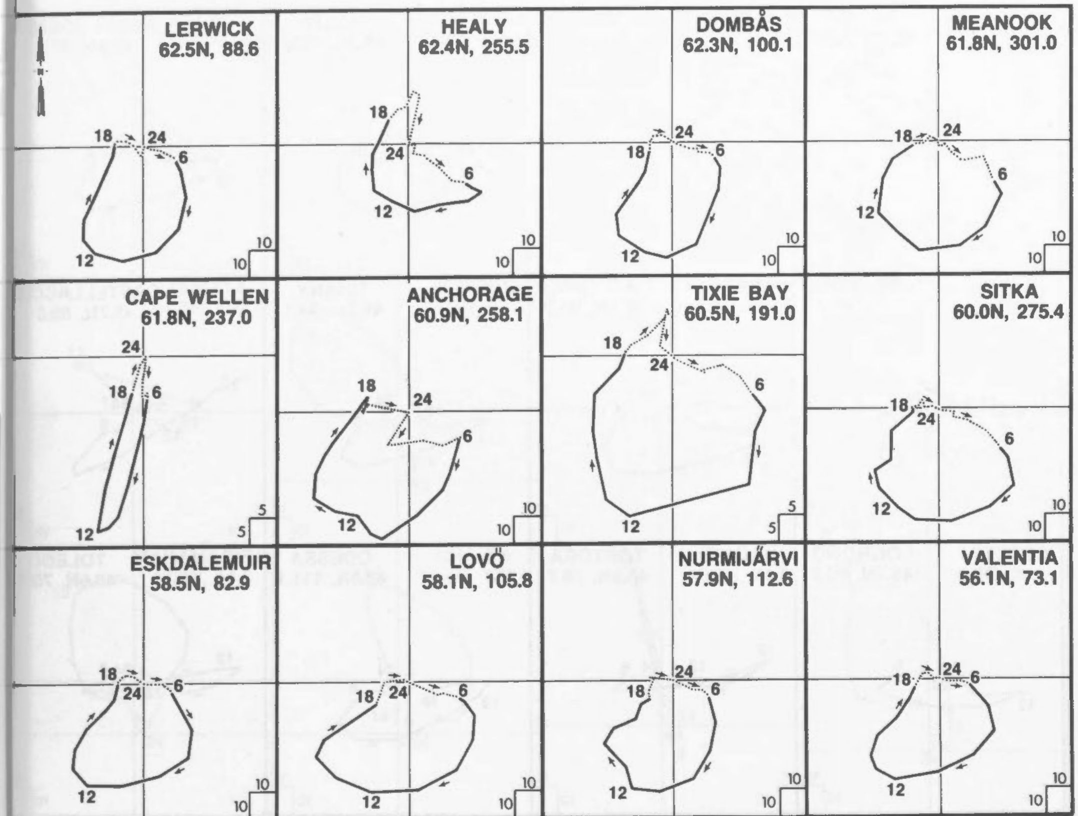


Figure 4b

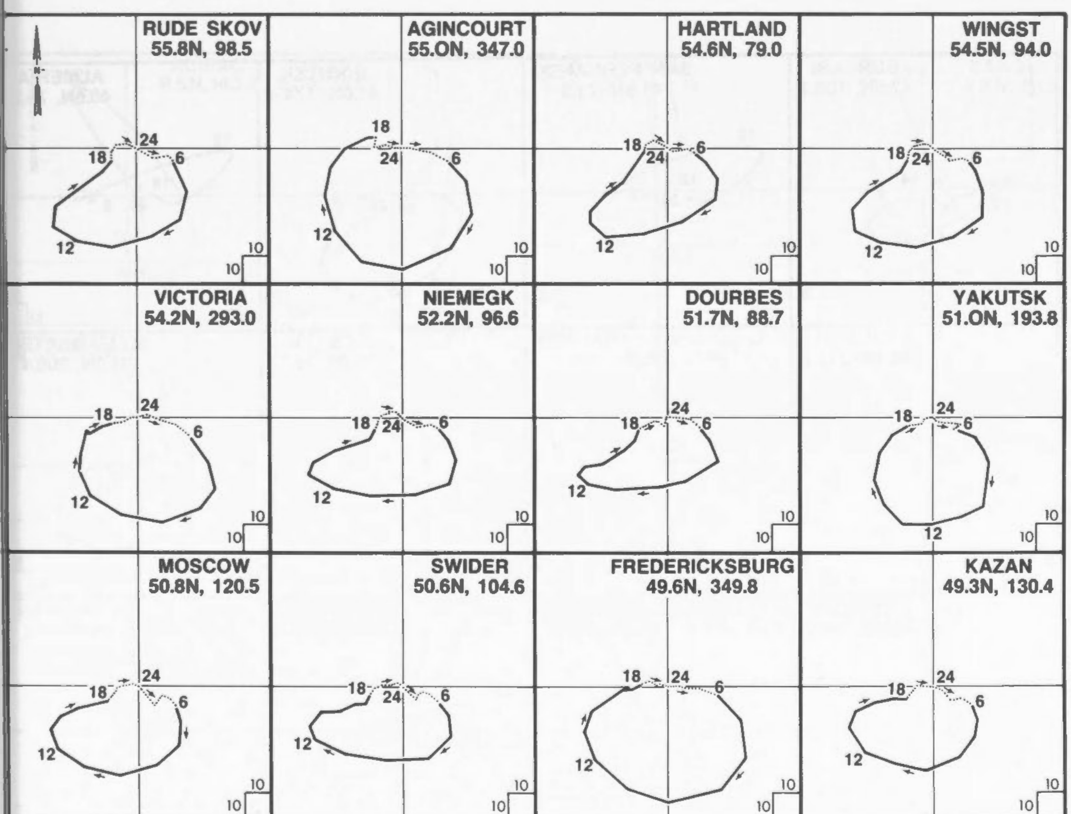


Figure 4c

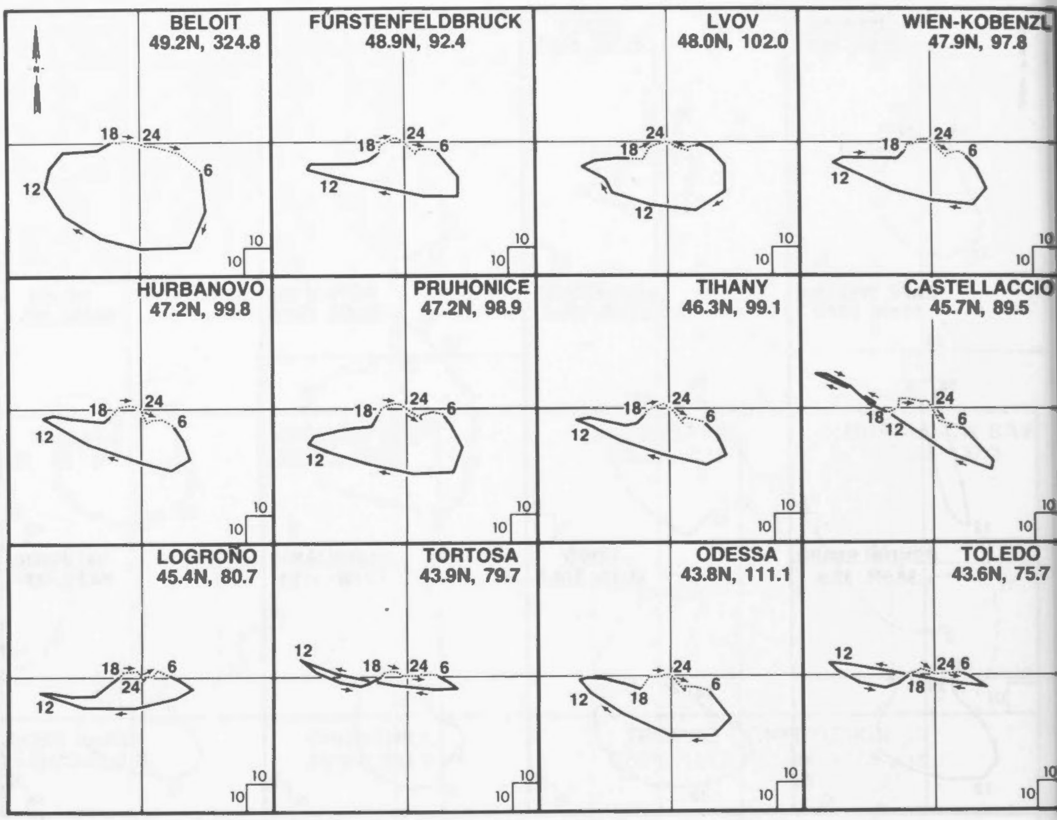


Figure 4d

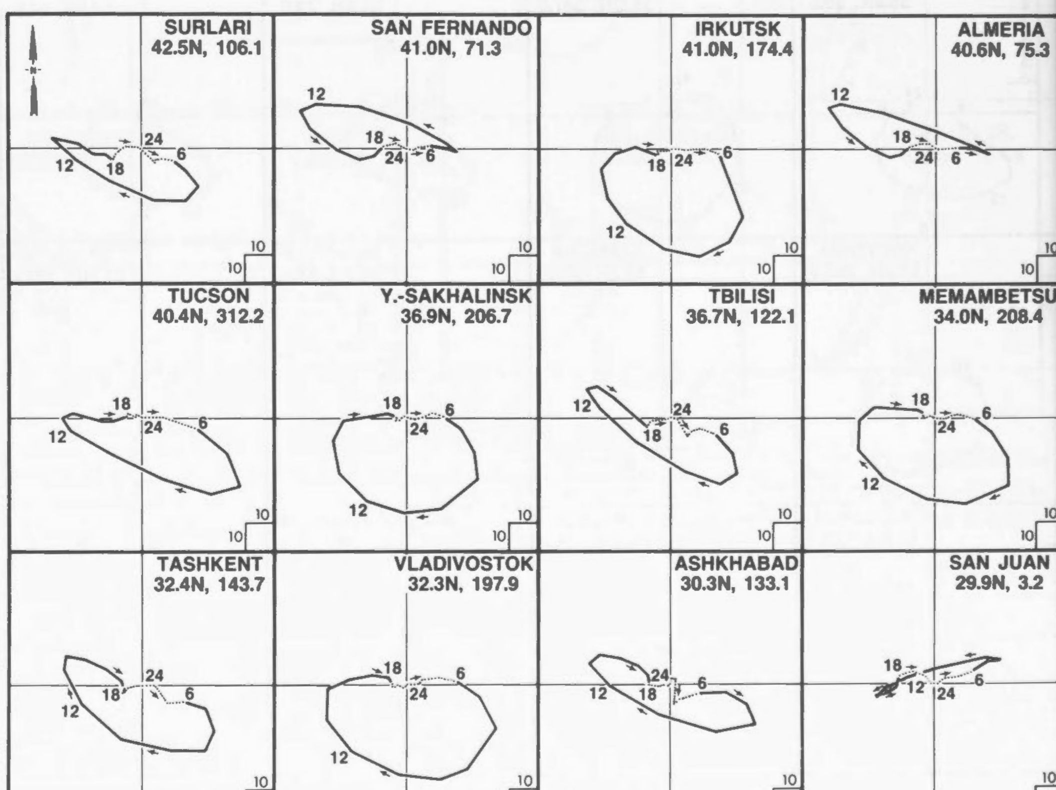


Figure 4e

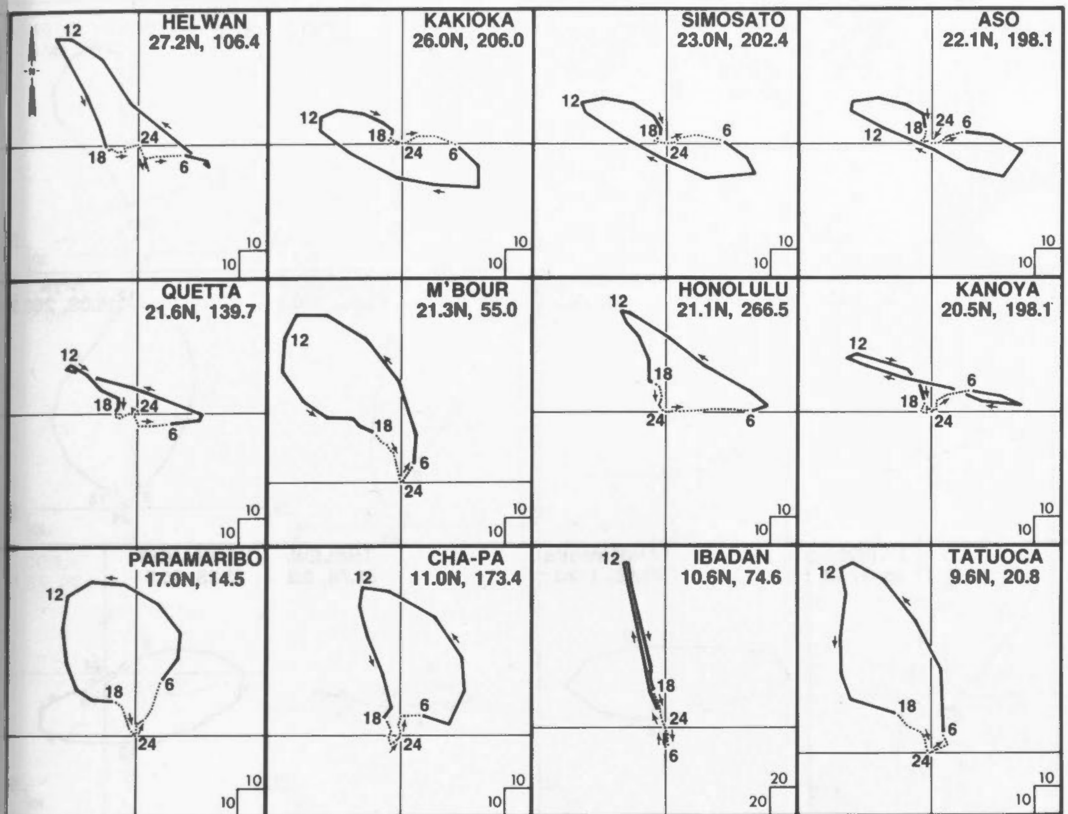


Figure 4f

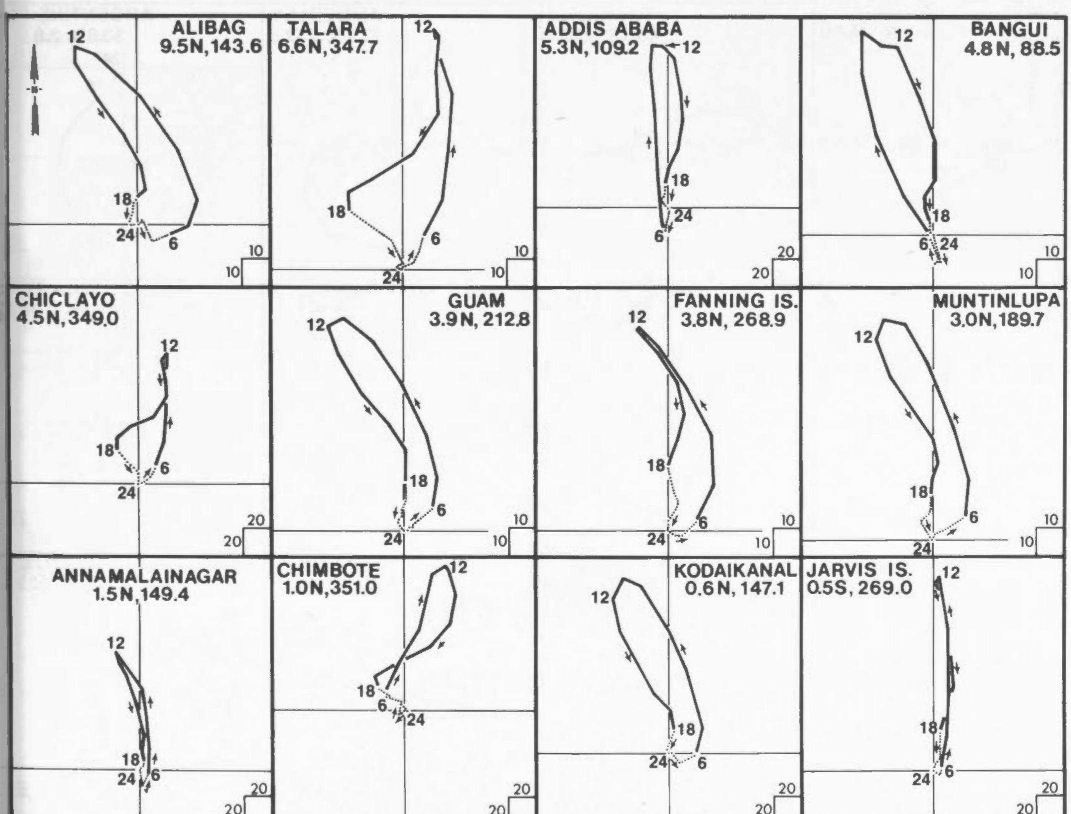


Figure 4g

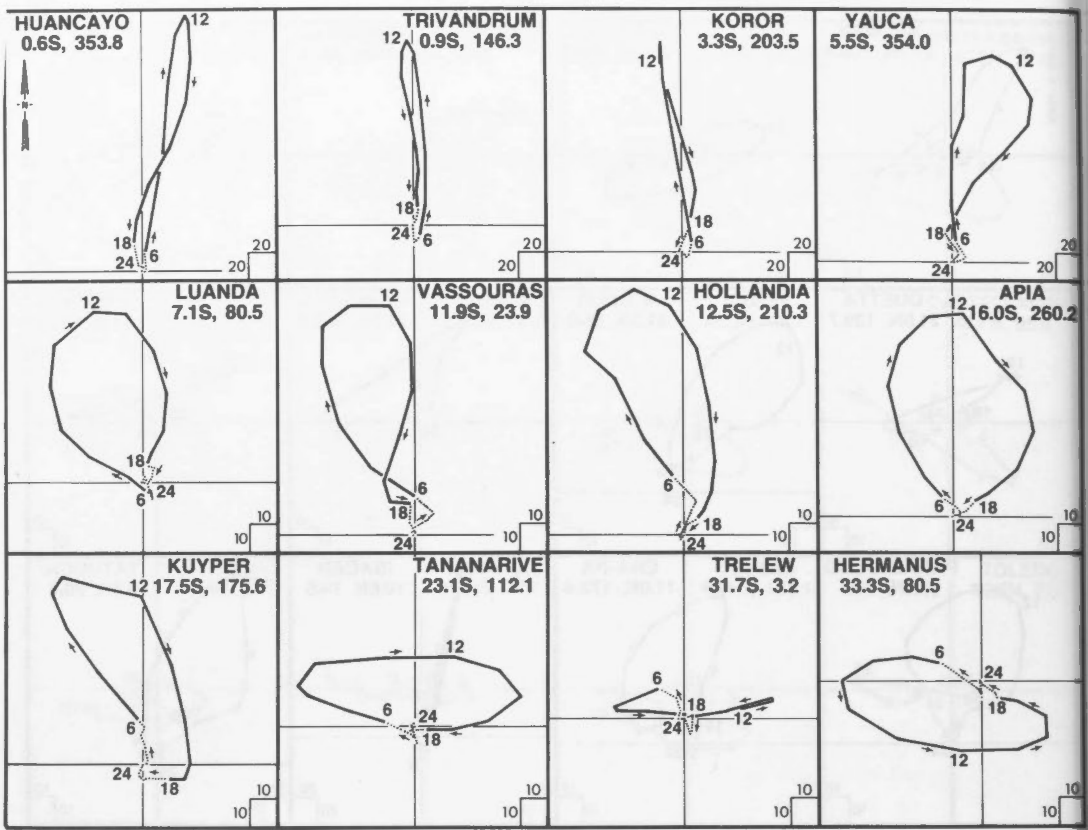


Figure 4h

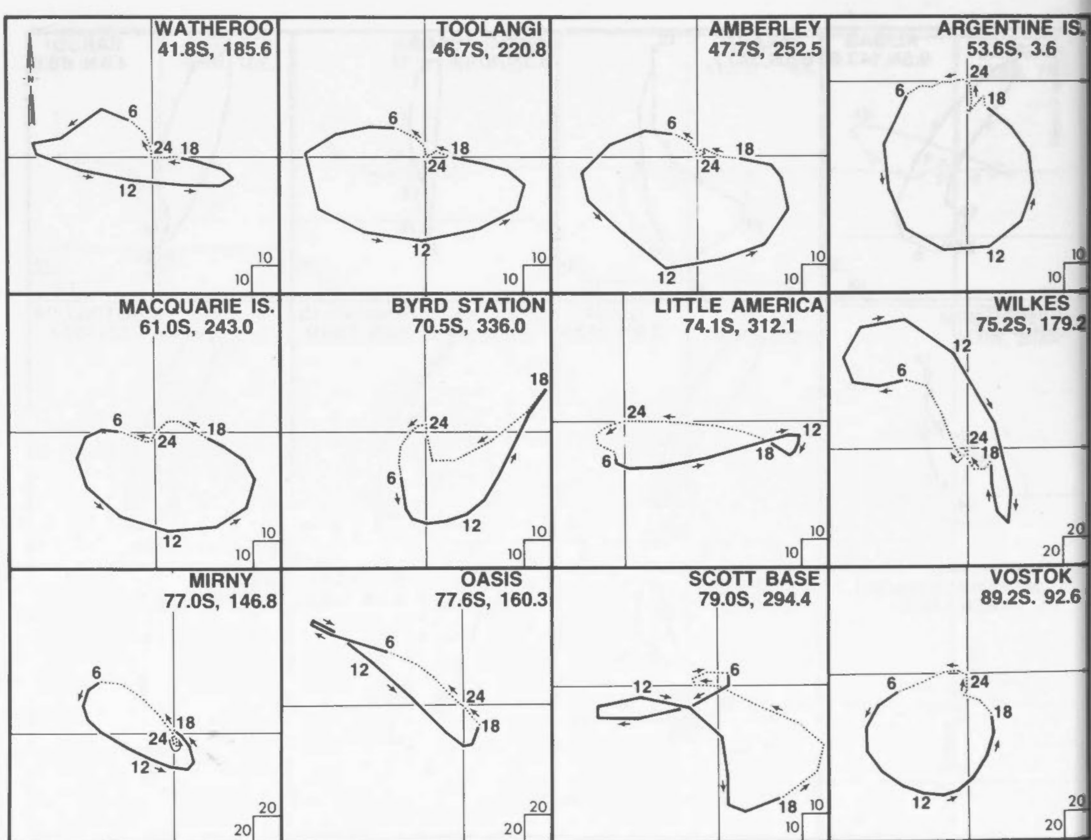


Figure 4i

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an alternating field demagnetizer for rock magnetism studies

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an alternating field demagnetizer for rock magnetism studies

J.L. ROY, J. REYNOLDS and E. SANDERS

Abstract. The design of solenoids with inside radii of 4 or more cm and capable of producing alternating fields of a few thousand oersted is given. It is shown that, to produce such high fields, large wire sizes are required, the ohmic resistance being the main determining factor of the field attainable. A multi-layer solenoid (5.7 cm core radius) designed to produce fields of 3,800 oersted peak on an input of 230 volts is described. Practical considerations such as field uniformity, core sizes, heating problems, high voltages and methods of preventing anhysteretic remanent magnetization are discussed. The circuit, the semi-automatic operation and other details of an apparatus consisting principally of a solenoid, a tumbler and an induction coil are given. Several workers have extensively used the apparatus for rock magnetism studies.

Résumé. Les auteurs décrivent le concept de solénoïdes à rayons intérieurs de 4 cm ou plus, pouvant produire des champs alternatifs de quelques milliers d'oersteds. Ils démontrent que l'obtention de tels champs exige des fils d'un gros diamètre, la résistance ohmique étant le principal facteur déterminant du champ accessible. Ils analysent un solénoïde à couches multiples (rayons du noyau: 5.7 cm) conçu pour produire des champs maximaux de 3,800 oersteds sur une force de 230 volts et traitent de considérations pratiques comme l'uniformité du champ, la dimension des noyaux, des problèmes de température, de haute tension et des méthodes de prévention d'aimantation rémanente anhystérétique. Ils expliquent le circuit, le fonctionnement semi-automatique et autres détails d'un appareil constitué principalement d'un solénoïde, d'un interrupteur à bascule et d'une bobine d'induction. Dans l'étude du magnétisme des roches, plusieurs spécialistes ont beaucoup utilisé l'appareil.

Introduction

Alternating magnetic field (AF) demagnetizers are commonly used in rock magnetism to examine the coercive force spectrum of the natural remanent magnetization (NRM) of rock samples. The NRM is often composed of two or more magnetizations which may have been acquired by different magnetization processes at different times in the history of the rock. Magnetizations of different origins usually have different coercive force spectra and can often be separated by AF cleaning using the following procedure. The sample is subjected to AF of, say, $\widetilde{H} = 50$ oe which is then smoothly reduced to zero in the absence of a continuous (or unidirectional) field such as the earth's field. This effectively removes the magnetization of low coercivity i.e. the lower portion of the coercive force spectrum. By treatments in successively higher $\widetilde{H}$, it is then possible to analyze the coercive force spectrum (or spectra) and determine if one or more magnetizations are contained in the rock. Rimbert (1958) has shown that many different magnetizations, viscous remanent magnetization (VRM), isothermal remanent magnetization (IRM) and thermoremanent magnetization (TRM), for example, can be successfully separated by AF cleaning in fields of 1,000 oe or less.

When magnetite is the magnetic material, fields of 1,000 oe are adequate to cover all or most of the coercive force spectrum and therefore, a large portion of the AF work is done in fields of 0 to 1,000 oe. However there are rock samples (red beds, baked contacts of igneous rocks and hematitic igneous rocks for example) where the magnetization is little affected by such fields (Opdyke, 1961; Irving *et al*, 1972; Roy and Fahrig, 1973) owing mainly to the high coercivity of hematite which is present in most sedimentary and many igneous rocks. There is then a requirement for solenoids capable of producing higher fields so that a larger portion of spectra of high coercive forces can be uncovered.

Design requirements

The AF demagnetization must be performed in the absence of any continuous field; otherwise, an anysteritic remanent magnetization (ARM) may be acquired (e.g. see Thellier et Rimbert, 1954, 1955). It is therefore desirable to annul the earth's magnetic field. Care must be taken that the AF solenoid and other components close to the rock sample are built of sufficiently non-magnetic materials. In some instances, higher harmonics in the alternating current may produce unwanted fields at the sample. These can be virtually eliminated by filtering (As, 1957).

Smooth reduction of the alternating field is important. Three methods can be used: 1) the sample may be taken out of the solenoid, 2) the solenoid may be pulled away from the sample, or 3) the field may be reduced. In the first method, care must be taken that the earth's field is well compensated over the travel path of the sample. In the third method, the field should be reduced by means of an induction type apparatus, rather than an autotransformer, for a continuous decrease. The disadvantage of the first and second methods over the third is that the current is applied at its maximum value for a longer time. For high fields where large currents are required, the heating problems would then be accentuated. Because of the close relation between heating and current (and consequently field) the third method is to be preferred.

Rotation of the sample about 2 or 3 axes during demagnetization may be used. To provide room for these rotating apparatuses (tumblers), it is usually necessary to design a solenoid with a radius larger than would be required otherwise; in such case, the current to attain a set field needs to be larger and more heat will be generated. On the other hand, demagnetization is provided in all specimen directions and a single run is equivalent to several runs on a stationary sample placed in different orientations. Thus the heating problems arising from the use of tumblers are not as momentous as they might appear. The rotating action also diminishes the effect of continuous fields.

Solenoid design

The field $\widetilde{H}$ oe at the centre of a single-layer solenoid can be calculated from

$$\widetilde{H} = \frac{4\pi NI}{2L\text{x}10}\cos\alpha = \frac{4\pi nI}{10}\cos\alpha \quad .....1$$

where I is in ampere, N is the total number of turns, n is the number of turns/cm length, L is the half length and $\alpha = \tan^{-1} r/L$ where r is the mean radius (Figure 1). $\widetilde{H}$, I and V (volts) are rms values. This formula is accurate for multi-layer solenoid calculations to within a few per cent and its simplicity warrants its use for calculating the approximate field of such solenoids.

Since $\widetilde{H}$ is proportional to I and

$$W = VI = R_t I^2 \quad .....2$$

where W is the power in watts and R_t is the total resistance (ohms) of the solenoid including dielectric losses (Terman, 1943, pp. 84-85), much heat has to be dissipated and the method of cooling is of prime importance. Water-cooled solenoids handle larger currents while air-cooled solenoids are less cumbersome and simpler to construct. In this article, we are considering air-cooled solenoids and so, because of heating problems, we regard 20 amp as a practical upper limit. Also, because the solenoid must accommodate a tumbler, 4 cm for the inside radius (r_1, Figure 1) is considered a practical lower limit.

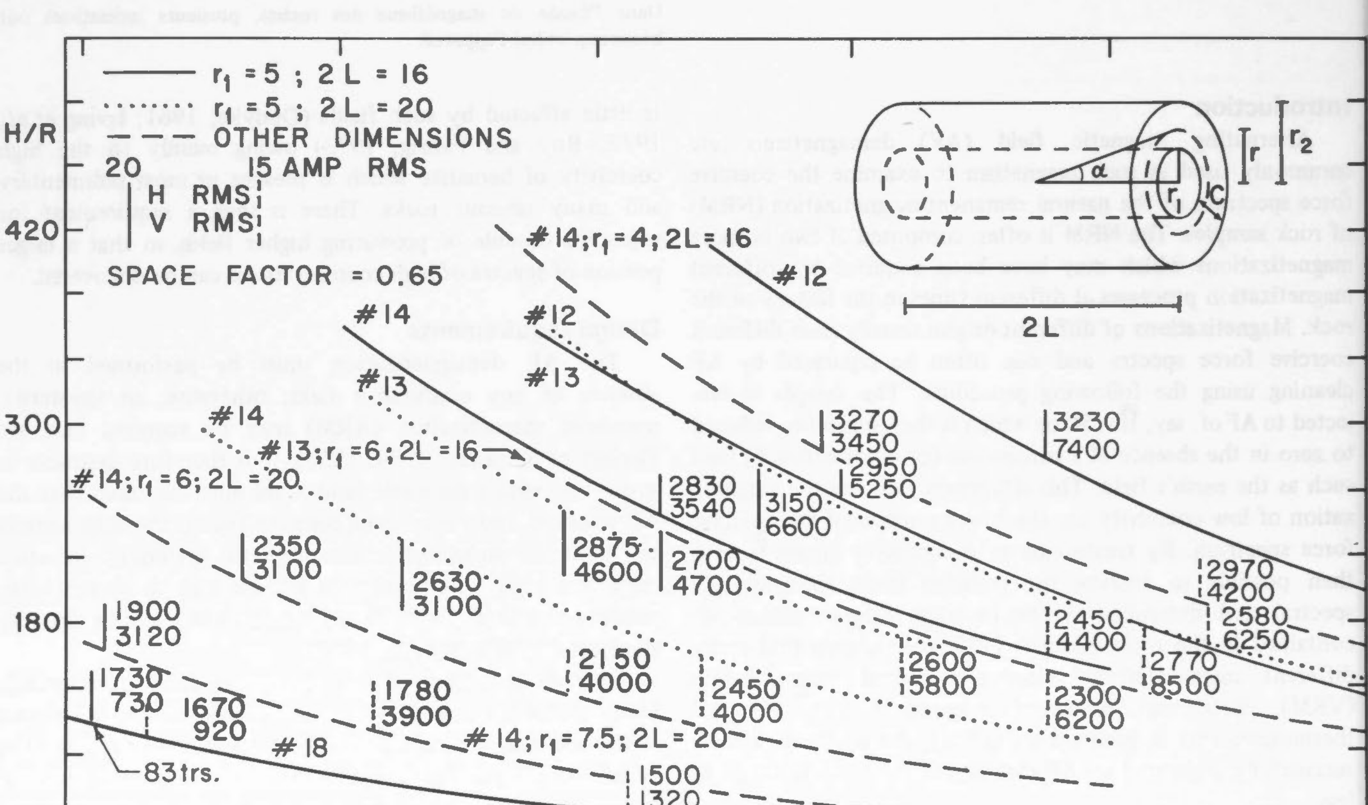

Figure 1. Curves of the ratio of the rms alternating field over total resistance of the solenoid for multi-layer solenoids of different inside radius (r_1) and length (2L) using different wire gauges (B+S). The vertical lines indicate the number of turns/cm that will let 20 or 15 amp. pass through the solenoid; the upper figure gives the alternating field H rms produced by that current; the lower figure gives the rms voltage across the solenoid for resonance tuning.

Uniformity of field

Before designing the solenoid, the uniformity of the field over the space occupied by the sample should be determined. Using formulae given by Gray 1921 (p. 222), the uniformity of the field near the centre and within a cubic space of side = 2.4 cm (comparable to the usual specimen size) has been calculated for different practical dimensions (Table I) of multi-layer solenoids. The departures of the field within that space from the field at the centre were larger axially than radially and the maximum departures calculated are given in Table I. It is evident that the uniformity of the field depends much more on the length of the solenoid than on the radius or the thickness of the windings i.e. more on L (compare Nos. 1,5,10 and 11) than on r (compare Nos. 5 and 7) or c (compare Nos. 3,4,5 and 6). Within reasonable limits, the length is almost exclusively the determining factor of uniformity and the table shows that if one chooses to build a solenoid 16 cm long, the field will be uniform to within 0.8 per cent.

Table I

[illegible]uniformity of field in a cube of side = 2.4 cm at the centre of a multi-layer solenoid. The maximum departures (from the value at the centre) shown are along the axis.

No	L	r_1	r	c	departure	mean cos
1	10	5	8	6	.0043	.7835
2	10	6	9	6	.0044	.7488
3	8	5	6.5	3	.0080	.7776
4	8	5	7	4	.0078	.7562
5	8	5	8	6	.0074	.7180
6	8	5	10	10	.0064	.6594
7	8	6	9	6	.0078	.6773
8	8	6.25	10	7	.0073	.6451
9	8	7.5	10.5	6	.0066	.6773
10	6	5	8	6	.0122	.6234
11	4	5	8	6	.0213	.4832

L, r_1, r and c in cm.

Maximum fields

The field $\widetilde{H}$ is proportional to cos α, n and I respectively (Equation 1). For given L and r_1,

$$\cos\alpha = \frac{L}{\left[L^2 + \left(r_1 + \frac{c}{2}\right)^2\right]^{1/2}} \qquad \ldots\ldots 3$$

can be increased only by reducing the thickness of the winding (c), that is by reducing either n or the wire size. A reduction of n is impractical since $\widetilde{H}$ would then be reduced (Equation 1). So a reduction of wire size as a means of increasing $\widetilde{H}$ should be investigated. Comparison of the

$$\text{means}\cos\alpha = \frac{L}{2}\left[\frac{1}{(r_1^2 + L^2)^{1/2}} + \frac{1}{(r_2^2 + L^2)^{1/2}}\right] \qquad \ldots\ldots 4$$

given in Table I shows that no drastic increases can be obtained by reducing the wire size. For example, comparing Nos. 3 and 5, the reduction of the space occupied by the wire (c from 6 to 3 cm) increases $\widetilde{H}$ by only 9 per cent. So, the variation of cos α is not an important factor in the determination of the maximum field attainable.

The following equations show that the remaining two factors – I and n – cannot be considered separately. Without tuning, the current that can be passed through a solenoid is

$$I = V/(X_L^2 + R_t^2)^{1/2} \qquad \ldots\ldots 5$$

where X_L is the inductive reactance. However the reactance can be made equal to zero by introducing in the circuit a capacitive reactance $X_C = X_L$ so that the current is effectively determined by

$$I = V/R_t \qquad \ldots\ldots 6$$

The resistance of the conductor is approximately

$$R_t = 4\pi nL\left(r_1 + \frac{c}{2}\right) R_c \qquad \ldots\ldots 7$$

where R_c is the resistance in ohm per cm of wire, so that

$$I = V/4\pi nL\left(r_1 + \frac{c}{2}\right) R_c \qquad \ldots\ldots 8$$

showing that n is inversely proportional to I. It is then evident that an appreciable increase of both n and I can be accomplished only by increasing V or reducing R_c. Practical considerations (availability of input voltage) and heating problems (Equation 2) limit the increase of V so that R_c must be given special consideration.

From equations 1 and 8, we get

$$\widetilde{H} = \frac{V\cos\alpha}{10L\left(r_1 + \frac{c}{2}\right) R_c} \qquad \ldots\ldots 9$$

showing that for a given input voltage, R_c and c remain the only (non negligible) variables and both depend on the wire gauge of the conductor.

The choice of wire gauge

When a solenoid is in operation, the temperature will vary causing the resistance to change. The variation of temperature will also affect the dielectric losses by modifying the distributed capacity between the different parts of the solenoid. Therefore, the resistance of the solenoid cannot be given a single value. However, in order to compare resistance and wire gauge, it is reasonable to assume that the variations will be approximately the same for all gauges. Hence, in subsequent calculations, R_c is considered a constant for a given gauge and is the resistance per unit length at 65°C which is taken as the upper operating temperature. The B and S (AWG) gauge system is used.

To design a solenoid capable of producing so many oersteds, the number of turns/cm is determined first. For example, to obtain 4,000 oe peak (2,830 oe rms)

$$n = \frac{10\ \widetilde{H}}{4\pi\ I \cos\alpha} = 161 \text{ trs/cm} \quad \ldots\ldots 10$$

taking I = 20 amp and cos α = 0.7 as a mean suggested from Table I. In order to admit 20 amp in the circuit, the wire gauge should be large enough (R_c small enough) to reduce R_t adequately (Equation 7).

The resistance R_t using different gauges has been calculated for different r_1 using Equation 7 and L = 8 cm; the results are given in Table II. The number of turns/cm^2 admissible for each gauge has been calculated using 0.65 as the space factor, which is the ratio of the space occupied by the bare conductor over the available space (cx2L). Such a table is useful to obtain a rough estimate of the required gauge. The thickness of insulation used and the method of winding the solenoid will affect the space factor. In general, it is relatively easy to improve upon the space factor used for compilation of Table II. However the use of the conservative space factor prevents the choosing of too small a gauge.

Table II

Resistance R_t in ohms using different wire sizes for a solenoid (length = 16 cms) of 161 trs/cm. The space factor = 0.65

				R_t when			
B+S	trs/cm^2	c	R_cX10^5	r_1 =7	r_1 =6	r_1 =5	r_1 =4
10	12.4	13.0	3.82	8.3	7.7	7.1	6.5
11	15.6	9.7	4.85	9.2	8.4	7.6	6.9
12	19.8	8.1	6.12	10.9	9.9	8.9	7.9
13	24.8	6.5	7.74	12.8	11.5	10.3	9.1
14	31.2	5.1	9.74	15.0	13.4	11.9	10.3
18	78.9	2.0	24.70	32.0	28.0	24.0	20.0

c = thickness of windings; r_1 = inside radius;
R_c = ohm/cm length.

If the input voltage is, say, 230V, R_t should be $\leq$ 11.5 ohms in order to admit 20 amp. Table II shows that if r_1 = 6 cm, No. 13 gauge should be chosen; No. 18 gauge, for example, would allow a current of 8.2 amp only. These observations show that great care should be given to the choosing of the wire gauge and it is evident that one should design a solenoid for maximum $\widetilde{H}$/R rather than $\widetilde{H}$/I as Equation 1 might lead one to believe. From Equations 1,3,6 and 7 we get

$$\frac{\widetilde{H}}{R_t} = V/40\pi Ln\left[\left(r_1+\frac{c}{2}\right)^2+L^2\right]^{1/2}\left[\left(r_1+\frac{c}{2}\right)R_c\right]^2 \quad \ldots\ldots 11$$

This ratio, taking V=230 volts, has been plotted against the number of turns/cm in Figure 1 for different gauges, r_1 and L. The number of turns which will allow 20 or 15 amp are shown on the individual curves by vertical lines; along these lines, the upper figure gives the rms field $\widetilde{H}$ and the bottom figure the rms voltage V_c across the coil calculated from

$$V_c = (X_L{}^2 + R^2)^{1/2}\ I = [(2\pi fL)^2 + R^2]^{1/2}\ I \quad \ldots\ldots 12$$

where f = 60 hertz.

The graph shows that the field increases with the wire diameter and that a required field (for given r_1 and L) can be reached only by choosing a wire not smaller than a certain gauge.

High voltage

The wire gauge, however, should not be larger than required because the voltage across the solenoid (Equation 12) will be larger than necessary. The solenoid inductance can be obtained from

$$L_x = \frac{rN^2}{2.54}\left[\frac{2F - 0.03193\,(0.693 + B_s)\ c}{2L}\right] \text{ microhenries} \quad \ldots\ldots 13$$

where F and B_s are factors given in Terman, 1943 (pp. 54 and 56) or to within 3 per cent (for the dimensions used in this paper) from

$$L_x = \frac{1.26\ (r\,L\,n)^2}{6\,r + 18\,L + 10c} \text{ microhenries} \quad \ldots\ldots 14$$

To reach a given $\widetilde{H}$/R, an increase in wire size requires a large increase of n as shown in Figure 1. For example, between Nos. 12 and 13, $\widetilde{H}$/R = 256 is reached for n = 188 and 162 respectively giving a ratio of 1.16. Since L_x is proportional to the square of n, the use of No. 12 instead of No. 13 will result in an increase of V_c of about 30 per cent. Unnecessary voltage increases should be avoided because of the added danger primarily; larger and/or more condensers will also be required.

Description of an AF demagnetizer

Field compensation. The earth's field and its diurnal variations are automatically compensated by a set of 3 orthogonal pairs of square (side = 244 cms) coils, which is part of an array of 5 identical sets (Roy *et al.*, 1969). Constant currents provide compensation for each component of the earth's field and a negative feedback system keeps the residual field at the centre of the coil system to within 2 γ. The field over the space occupied by the rock sample to be demagnetized is uniform to within 0.01 γ (Roy *et al.*, 1972). There are provisions for producing continuous fields for ARM experiments under controlled conditions.

Tumbler. The rock sample is rotated simultaneously about 3 axes. Primary rotation is provided by a fiberglass tube (Figure

2) which is rotated about an axis parallel to the solenoid axis (Figure 3). Its angular speed is 110 rpm and the speed ratios about the second and third axes are 0.954 and 0.896 respectively. The sample is inserted in a nylon holder (Figure 3; on the table) which fits into the opening of the inner cylinder. Except for a few brass screws on the tumbler support, the assembly is built of nonmetallic and very weakly magnetized materials – fiberglass, nylon, linen-base bakelite, and laminated beech. After machining, a component was not utilized unless the magnetic moment was so weak that the field produced at any part of the sample was less than 1 γ. Standard steel cutting tools were used but great care was taken to keep them clean at all times in order to avoid magnetic particles to become imbedded into the component. It was found that the likelihood of this occurring depends on the pliability of the material; hence greater care had to be taken with nylon than fiberglass. Cut-ins and rounding off of components provide for maximum rigidity of the assembly in the smallest possible space. The tube diameter is 9.5 cm but the bottom gear (Figure 2) describes a circle of 5.3 cm radius about the main axis. The inside radius of the solenoid is 5.7 cm leaving a clearance of 0.4 cm between solenoid and tumbler.

Solenoid. The No. 13 wire has a 'formel film' and a coat of thermosetting epoxy cement (Formset heavy insulation "H" synthetic from Canada Wire and Cable Company Ltd.). The rated maximum operating temperature is 105°C. After winding the solenoid on a form, it was heated to 200°C to set the epoxy cement. After removal on the form, 3 coats of airsetting epoxy and four strips of fiberglass were applied for additional strength. The advantages of a self-supporting over a form-supported solenoid are that the inside radius can be made smaller and that the cooling rate is faster. Particulars of the solenoid are given in Table III. Several banks of 4 microfarads (μf) condensers are used for the capacitive reactance as shown in Figure 4. The capacitance calculated from the rated value = 13.20 μf and from X_L = 13.07 μf. Fine tuning to within 0.002 of resonance was obtained experimentally by the least impedance method, i.e. by adding and removing condensers for maximum current for a fixed voltage. The condensers are rated at 2,500 V dc and 12.5 watt – second. The addition of 2 more layers of winding would, according to calculations and Figure 1, increase the maximum field (for 20 amp by 130 oe to 2,820 oe). However this would cause a large increase of 740 V to 4,800 V across the solenoid and the condenser banks.

The solenoid constant (Table III) has been calculated from the formula given by Gray, 1921 (p. 216)

$$\frac{\tilde{H}}{I} = \frac{4\pi L\, n \log}{10C} \left[\frac{r_2 + (r_2^2 + L^2)^{1/2}}{r_1 + (r_1^2 + L^2)^{1/2}} \right] \quad \ldots\ldots 15$$

Operation. The circuit is given in Figure 4. The variac is set manually according to a chart giving variac setting vs. field. Upon switching the inductrol motor on, the field increases to the designated value where it remains after the automatic switch-off by means of a microswitch on the inductrol. The field is reduced in a like manner by manual start and automatic stop. The time of each operation can be adjusted from 15 sec to 8 min. The variac permits using the full range of the inductrol (max to min setting) even when demagnetizing in low fields. The switching on the 1 ampere meter automatically adds a 50-ohm resistance in series in the circuit. This effectively expands the variac range for more accurate setting for fields lower than 190 oe. The inductrol (Canadian General Electric) is wired so that its output/input voltage ratio is 2.0. It was found that the output-input coupling could not be reduced to zero. The ratio of the minimum and maximum couplings is 0.007; this means that if a specimen is demagnetized in a 3,000 oe field, the field remaining when the inductrol reaches its minimum coupling is about 21 oe. This field is then reduced by slowly lowering the variac setting to zero. The current and noise leaking through the variac and inductrol then corresponds to a field of 0.12 oe on high range setting and 0.03 oe on low range. The solenoid is thereafter slowly rolled away from the tumbler which at all times remains in the centre of the field compensating coils. For the time being, the maximum peak field must be limited to 3,000 oe; this limit is imposed by the capacity of the present inductrol which is rated at 2.5 kilowatts.

Table III

Particulars of the AF solenoid.

Wires gauge B+S	13
Length (2L), cm	16
Inside radius (r_1), cm	5.7
Thickness of winding (C), cm	5.2
Turns (number of) (N)	2460.
Turns (number of/cm) (n)	153.8
Layers (number of)	30.
Space factor	0.78
Resistance (R at 65°C), ohm	9.94
Length of conductor, meter	1287.0
Mass, Kg	33.3
Current (I), ampere	20.0
Inductance (L_x), henry	0.54
Inductive reactance (X_L)*, ohm	203.
High voltage (V_c)*, volt	4060.
Field (maximum H rms)*, oe	2690.
Field (maximum H peak)*, oe	3800.
Capacitance (rated), μf	13.2
Capacitance (from X_L), μf	13.07
Constant H/I	
calculated (Equation 15), rms oe/Amp.	134.5
oerstedmeter (measured), rms oe/Amp.	135.1
gaussmeter (measured), rms oe/Amp.	133.4
average peak oe/Amp.	190.0

*calculated for I = 20 amperes.

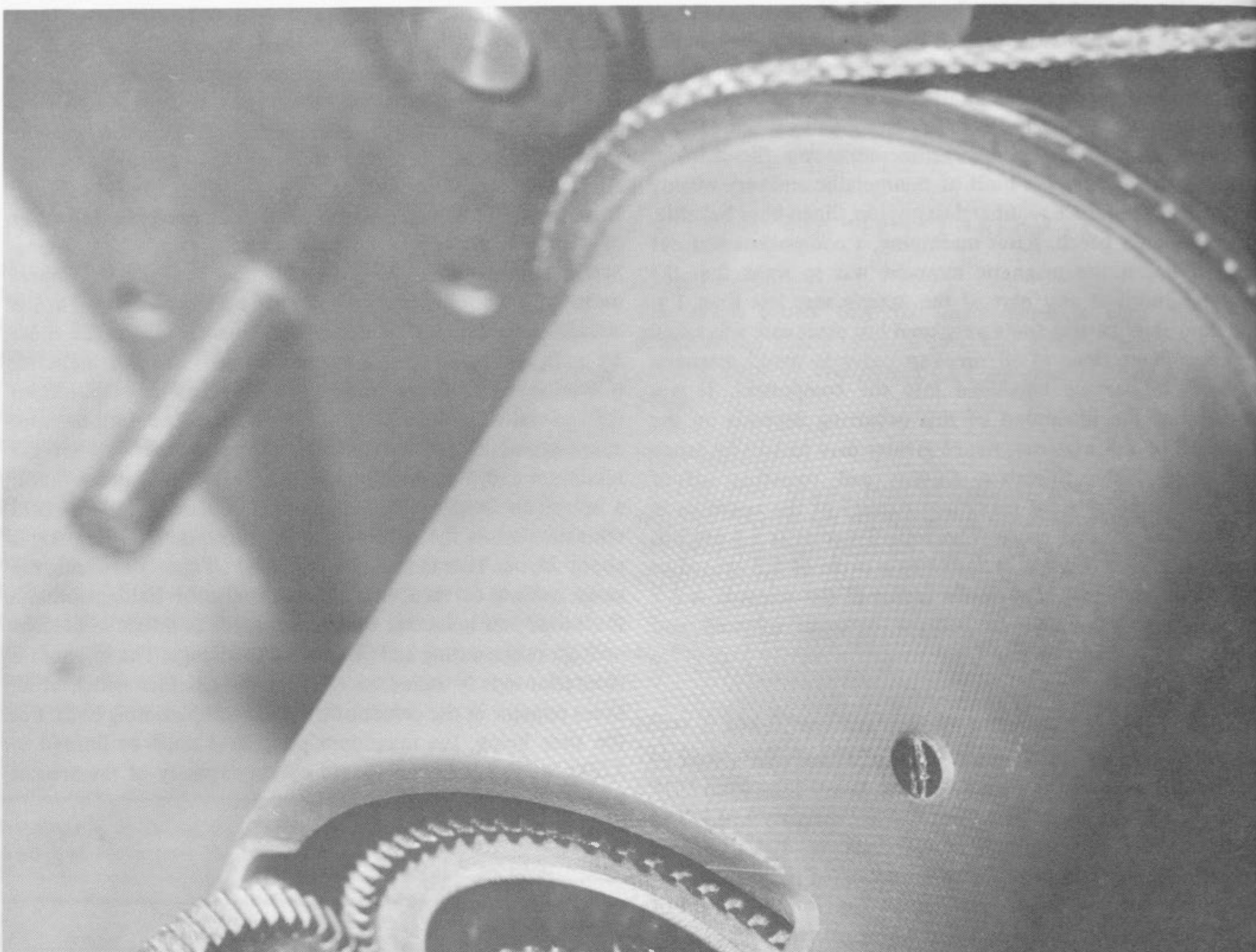

Figure 2. Rotating apparatus.

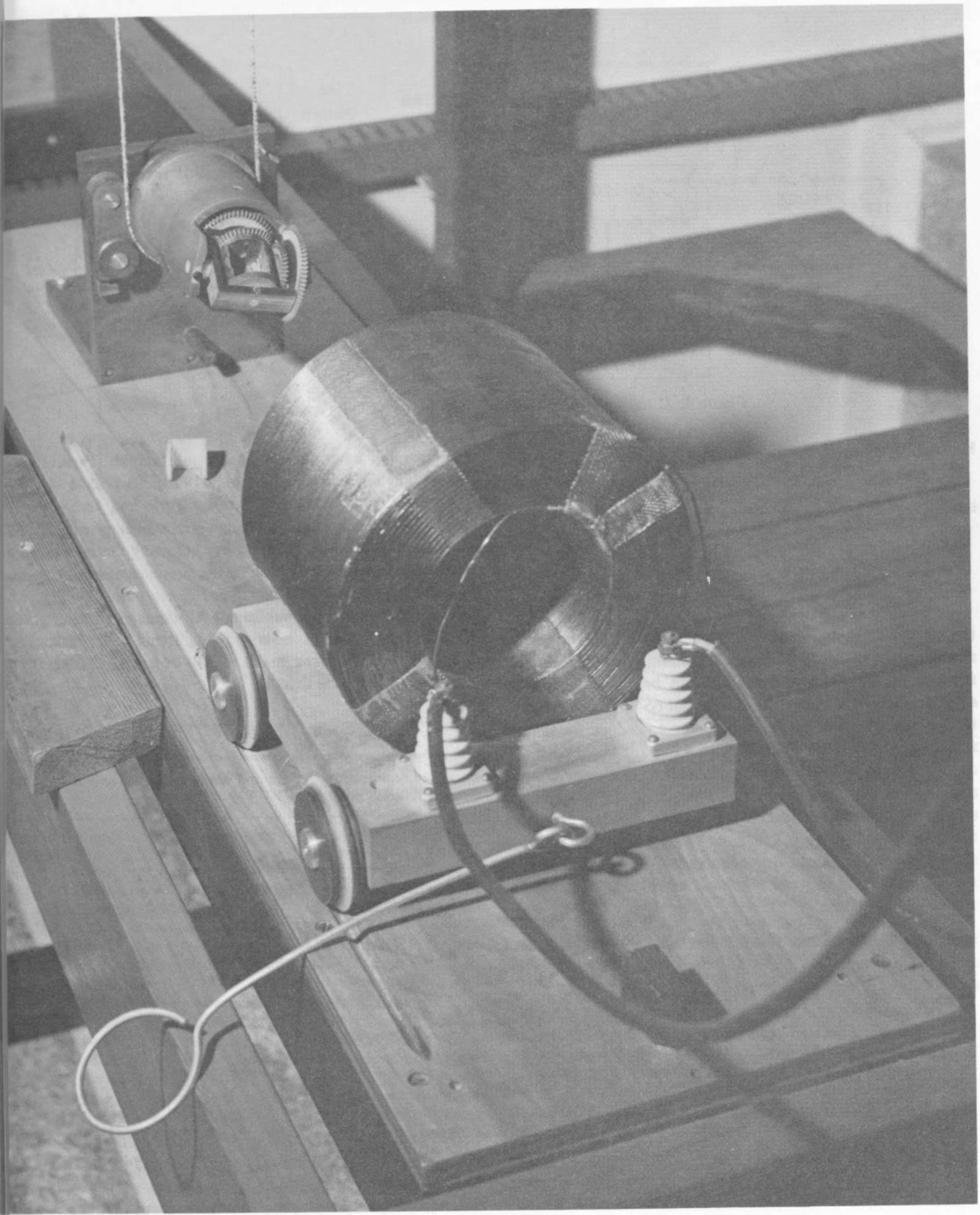

Figure 3. Solenoid on its trolley.

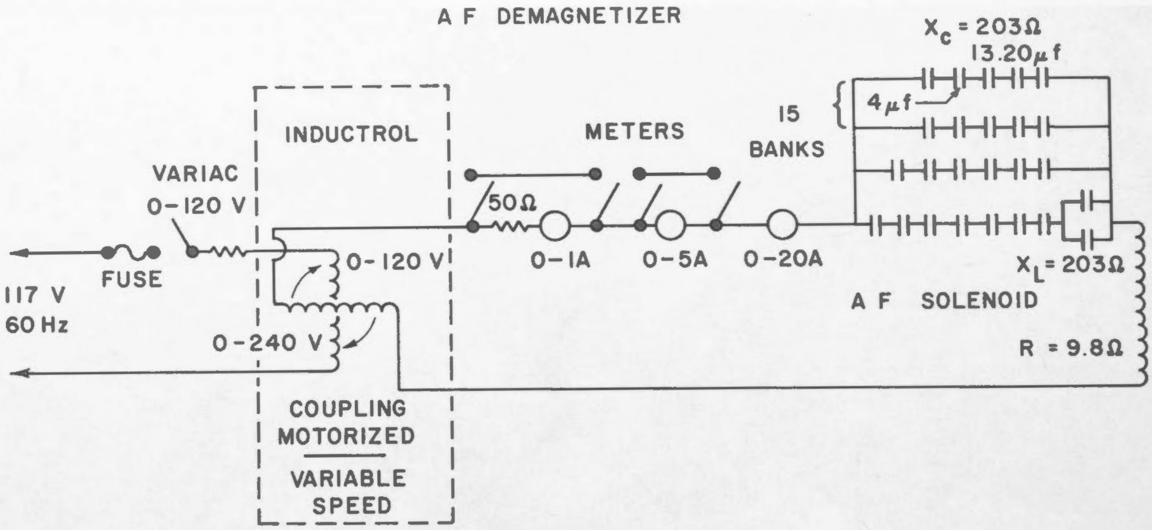

Figure 4. Circuit of the alternating field demagnetizing apparatus.

Heating. Using the following formulae

$$\text{temp. change } (^\circ\text{C}) = \frac{\text{Heat (in calories)}}{\text{mass (grams) x specific heat}} \qquad \ldots\ldots 16$$

$$\text{Heat (in calories)} = 0.24\ R_t\ I^2\ t(\text{sec}) \qquad \ldots\ldots 17$$

the increases in temperature of the solenoid can be calculated and are given in Table IV. The last column gives the estimated number of consecutive runs that can be made before the solenoid reaches a temperature of about 65°C. The increase in temperature depends on the time taken to reduce the field to zero (40 sec for $\tilde{\text{H}}$ peak ≤ 500 oe to 4 min for $\tilde{\text{H}}$ peak = 3,800 oe), on the pause between runs (time taken to change sample) and the continuous heat dissipation (≃ 70 watts when the solenoid temperature is at 65°C). In calculating these estimates, the rise time has been taken as 15 sec and the time at maximum field as 10 sec. Since few consecutive high-field runs are allowed, such runs can be mixed with lower field runs to increase cooling time.

Insulation. The thickness of insulation is 3.3 mils and the rated dielectric strength is 3,600 volts/mil. Since the dielectric strength is approximately inversely proportional to the square root of the thickness, the strength between 2 adjacent wires is 6,500 V. The greatest difference of voltage between 2 adjacent wires of the solenoid is at the end of 2 of the 30 layers and is 3800/15 = 253 V.

Performance. The apparatus has been in operation for over 4 years. During that time, approximately 30,000 demagnetizations have been made including a few hundred pilot or stepwise demagnetizations where progressively higher demagnetizing fields have been applied to the same sample. Numerous examples of AF demagnetization performed with the apparatus have already been published; see Park, 1970; Manzoni, 1970; Brooke *et al.*, 1970; Park and Irving, 1970; Roy and Fahrig, 1973. The Park and Irving paper shows the effectiveness of the apparatus in removing ARMs which were previously acquired by subjecting the samples to a 2,500 oe AF demagnetization in the presence of a continuous (no tumbling) 0.3 oe field (see their Figures 1 and 10). Figure 5 gives a more recent (unpublished) AF demagnetization curve of a baked sediment obtained by Irving and Park. The direction changes between 0 and 300 oe are 4° and between 300 and 3,000 oe less than 1°.

Table IV

Estimated temperature changes and demagnetization runs allowed for different applied currents.

I (amp.)	watts	temp increase °C /min*	number of runs allowed⁺
20	3950	18.5	2
15	2220	10.4	4
10	990	4.6	8
8	643	3.0	16
5	250	1.2	65
3	90	0.4	∞

*When corresponding current is continually applied and assuming that there is no heat dissipation.

⁺See text.

Acknowledgments

We wish to thank E. Irving who instigated the project and for his help for the tumbler design. We are indebted to J.K. Park, W.A. Robertson and E. Irving for the setting up of the apparatus. The photographs of the apparatus were taken by E. Gelinas.

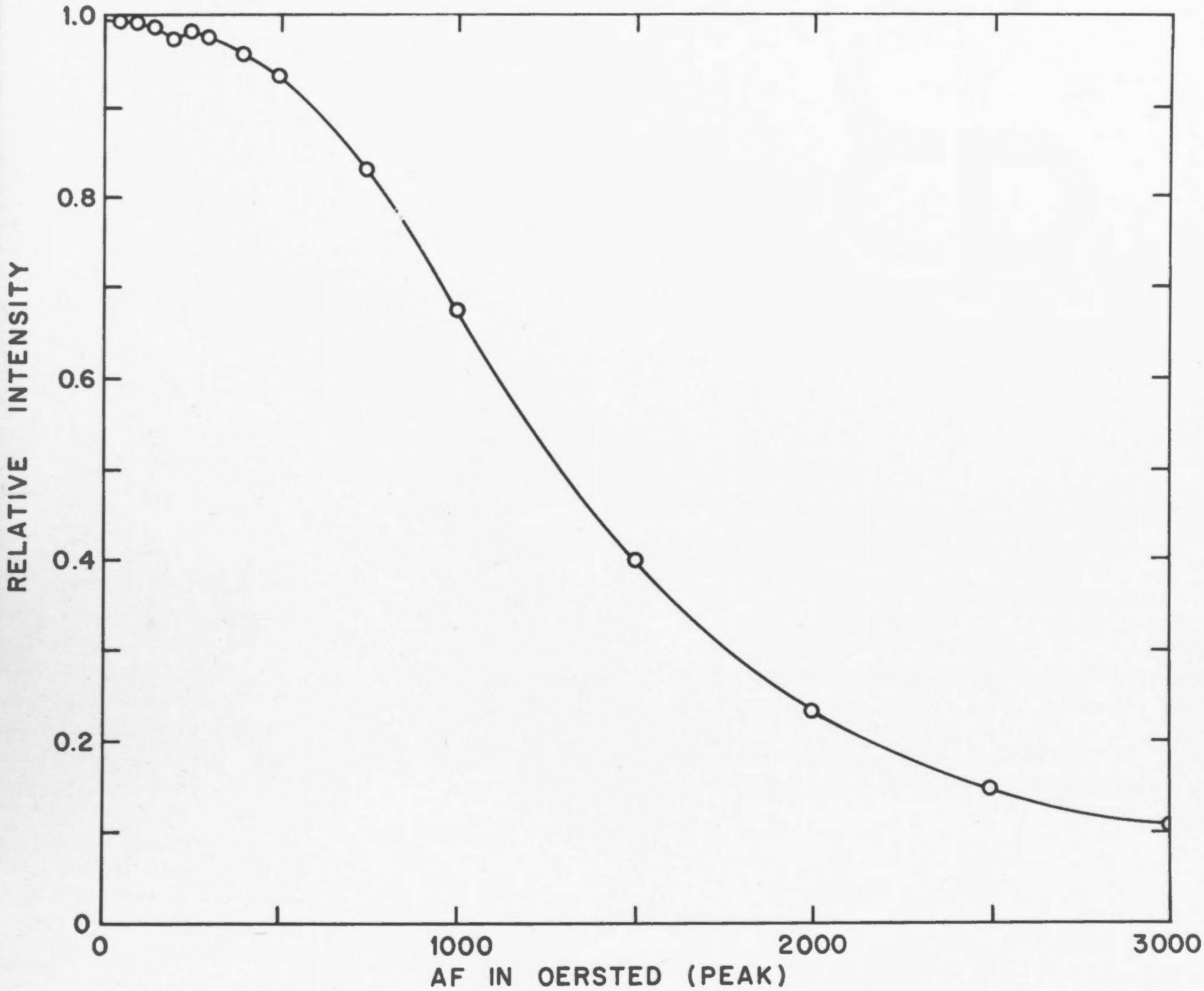

Figure 5. Alternating field demagnetization of a baked sediment (from Irving and Park).

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record of observations at victoria magnetic observatory 1971

D. R. AULD and C. W. WALKER

DEPARTMENT OF ENERGY, MINES AND RESOURCES

OTTAWA, CANADA 1973

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Bernard Caner

It is with great sadness that we report the death of Bernard Caner, at the age of 44, on February 2, 1972.

Dr. Caner was born in Bucharest, Romania. He received the Diploma in Radio Engineering from the École Centrale de TSF (Paris) in 1951, a B.Sc. in General Science from the University of London in 1955, a B.Sc. in Physics from the University of Alberta in 1960, an M.Sc. in Geophysics from the University of British Columbia in 1964, and a Ph.D. from the same university in 1969. He was officer-in-charge of Victoria Magnetic Observatory from its founding in 1957.

Dr. Caner made a remarkable contribution to geomagnetism in these 15 years, in spite of the limited resources at his disposal. He first set out to reduce as far as possible the time required for the routine operation of the magnetic observatory, without sacrificing standards. Having developed techniques and equipment for semi-automatic scaling and processing of observatory data, he and his assistant had time to devote to research projects in rapid variations and particularly to the study of electromagnetic induction in the earth's crust. He planned and organized extensive field experiments, often in cooperation with university groups, developed instruments especially adapted for induction research in western North America, and published nearly 20 research papers of high quality in the last 10 years. He was generous in assisting geophysicists both in Canada and in other countries. His untimely death is a severe loss to the international scientific community.

record of observations at victoria magnetic observatory 1971

D. R. AULD and C. W. WALKER

Geographic Coordinates: 48° 31′; 123° 25′
Geomagnetic Coordinates: 54.3°; 292.7°
Officer-in-Charge: B. Caner
Assistant: D.R. Auld

Introduction

The Victoria Magnetic Observatory was established in 1957, on the grounds of the Dominion Astrophysical Observatory, Royal Oak, about 10 miles north of Victoria, British Columbia. Information on the site can be found in the publication containing the record of observations for the period 1957-1958 (Caner and Loomer, 1961).

Magnetic equipment

As of January 1, 1971 a digitally recording magnetometer system (Andersen, 1969) had been installed and was in operation at the observatory. It records values of D, H, Z and F once per minute, on digital magnetic tape, in a format which can be read directly by a computer.

The elements D, H and Z are derived from three fluxgate sensors mounted inside a Helmholtz coil system. One pair of coils continuously nulls H, and the second pair Z, so that the fluxgates operate in essentially zero field. A proton precession magnetometer, with its sensor 8 m from the fluxgates, measures F.

Voltages proportional to the absolute values of the magnetic north, magnetic east, and vertical components are sampled in quick succession by a digital voltmeter each minute. Then follows a measurement of F by the proton magnetometer. The four readings are recorded on digital magnetic tape, together with the date, time, and station identification. The variations in D, H and Z are also recorded continuously by a strip-chart recorder.

The remaining observatory equipment was unchanged from that described in the preceding publications (Caner and Perry-Whittingham, 1962; Caner *et al.*, 1963; Auld and Moseley, 1965; Auld and Andersen, 1966; Auld and Andersen, 1967; Auld and Fetterley, 1970).

The adopted scale values for Ruska magnetograms are as follows:

D:	Jan. 1	to	Dec. 31,	0.94 min/mm or 5.15 ± 0.02γ/mm
				(γ/mm)
H:	Jan. 1	to	May 10,	2.37 ± 0.02
	May 10	to	Nov. 4,	2.30 ± 0.02
	Nov. 4	to	Dec. 31,	2.33 ± 0.02
Z:	Jan. 1	to	May 10,	4.02 ± 0.02
	May 10	to	July 31,	4.04 ± 0.03
	Aug. 1	to	Aug. 31,	4.08 ± 0.03
	Sept. 1	to	Dec. 31,	4.12 ± 0.03

Absolute observations and baseline values

The procedures used were essentially those described by Auld and Moseley (1965) for the period following September 11, 1961 and by Auld and Fetterley (1970).

Baseline drift in all three components was negligible. The rms value of the observed minus adopted baselines is ± 0.3

1971 Ruska Baseline Values

Declination D	Jan. 1 (0000) – Aug. 8 (0004)	22° 9.2′	East
	Aug. 8 (0004) – Dec. 31 (2400)	22° 8.9′	
			(γ)
Horizontal intensity H	Jan. 1 (0000) – May 10 (1557)	18874	
	May 10 (1557) – July 10 (1633)	18926	
	July 10 (1633) – Nov. 4 (1812)	18921	
	Nov. 4 (1812) – Nov. 18 (1933)	18860	
	Nov. 18 (1933) – Dec. 31 (2400)	18917	
Temperature correction (γ/mm T)	+9 when temperature is greater than reference level – 7 when temperature is less than reference level		
Vertical intensity Z	Jan. 1 (0000) – May 10 (1557)	53050	
	May 10 (1557) – Nov. 4 (1812)	53038	
	Nov. 4 (1812) – Dec. 31 (2400)	53052	
Temperature correction	– 2 γ/mm T		
			(mm)
Temperature reference levels	Jan. 1 (0000) – May 10 (1557)	5.8	
	May 10 (1557) – Nov. 4 (1812)	12.0	
	Nov. 4 (1812) – Dec. 31 (2400)	5.0	

minute for declination, ± 2 gammas for the horizontal component, and ± 2 gammas for the vertical component.

Magnetic reductions

The methods used were essentially those described by Auld and Holmes (1969). Underlined values in any of the tables have been obtained by interpolation from low-sensitivity records, with an accuracy of about 5 γ.

Magnetic activity and disturbance indices

The procedures followed remain unchanged from those described by Caner and Loomer (1961) and by Auld and Andersen (1966).

Summary of annual mean values

The mean values listed have been corrected to the new (post-1961) location and absolute standards.

For the period 1970.5 – 1971.5, the decrease in declination was 3.0 minutes (the mean rate of decrease over the whole 16-year period being 2.6 minutes per year); the increase in horizontal intensity was 25 gammas (the mean rate of increase over the 16-year period being 19 gammas per year); the decrease in the vertical component was 18 gammas (the mean rate of decrease over the 16-year peri being 22 gammas per year).

Acknowledgments

The help of the Director and staff o the Dominion Astrophysical Observato is greatly appreciated.

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Summary of Annual Mean Values

Year	D East	H	Z	X	Y	I	F
	° ′	γ	γ	γ	γ	° ′	γ
1956.6	23 00.2	18689	53427	17203	7303	70 43.2	56601
1957.75	22 57.1	18705	53408	17224	7294	70 41.9	56589
1958.5	22 55.2	18713	53396	17236	7288	70 41.2	56580
1959.5	22 52.8	18736	53377	17262	7284	70 39.5	56570
1960.5	22 50.3	18748	53362	17278	7277	70 38.5	56560
1961.5	22 47.8	18787	53322	17319	7279	70 35.5	56535
1962.5	22 44.4	18804	53288	17342	7268	70 33.8	56508
1963.5	22 41.4	18814	53264	17358	7257	70 32.7	56489
1964.5	22 38.6	18837	53239	17385	7252	70 30.9	56473
1965.5	22 36.0	18860	53205	17412	7248	70 28.9	56449
1966.5	22 34.2	18873	53179	17428	7244	70 27.6	56429
1967.5	22 31.7	18888	53157	17447	7237	70 26.3	56413
1968.5	22 29.4	18902	53138	17464	7230	70 25.1	56400
1969.5	22 27.4	18923	53127	17488	7228	70 23.7	56396
1970.5	22 24.8	18946	53117	17515	7224	70 22.2	56395
1971.5	22 21.8	18971	53099	17544	7218	70 20.4	56386

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 1 VICTORIA — H = 18,500 GAMMA + — JANUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	470	460	458	469	464	460	461	462	464	464	469	470	471	471	472	467	464	452	439	443	445	443	449	460	460
2	476	466	468	467	455	473	467	462	468	469	463	466	467	469	445	467	472	461	442	437	439	445	451	455	460
3 D	452	455	457	459	444	450	452	458	449	459	463	462	445	460	475	468	464	432	417	420	438	440	431	428	449
4	447	451	460	461	454	465	443	453	445	451	461	461	459	460	468	464	465	451	424	418	418	422	437	453	450
5	456	458	454	456	470	471	465	456	452	457	461	461	467	461	455	466	472	463	449	443	442	443	449	446	457
6	464	468	470	468	469	463	458	459	468	465	462	464	464	465	467	468	472	461	447	439	439	441	453	456	460
7 Q	466	466	468	467	466	467	466	469	466	466	465	469	468	468	473	473	473	466	455	452	448	451	458	461	464
8 Q	466	470	469	471	468	471	471	469	471	471	471	472	473	470	473	476	475	467	460	453	454	457	458	465	468
9 Q	473	472	473	471	471	472	471	468	470	470	473	477	473	475	479	484	482	469	463	458	459	462	466	469	471
10	472	472	476	478	473	476	474	474	475	474	474	477	474	475	480	487	485	476	465	445	457	462	472	476	473
11	469	474	476	475	473	472	462	462	469	473	473	472	472	473	470	466	472	474	467	461	455	456	464	465	469
12 Q	467	469	466	467	468	468	468	470	465	469	468	471	472	468	471	472	469	464	453	442	444	453	468	475	465
13	481	480	477	474	475	475	467	468	467	469	476	480	472	474	486	481	474	464	460	458	464	472	476	483	473
14	473	465	467	465	459	452	453	458	455	446	456	462	465	467	460	463	465	460	453	445	447	454	463	472	459
15	471	466	464	462	460	453	447	440	446	441	439	451	461	462	472	482	483	468	461	451	448	447	461	464	458
16	465	467	464	466	466	464	458	444	450	461	459	464	463	468	473	475	468	455	453	449	452	453	462	468	461
17	473	474	476	470	468	467	465	461	468	468	472	475	474	474	474	480	470	463	454	447	444	449	460	470	467
18	475	473	470	466	466	466	469	471	474	485	476	473	472	477	472	471	468	454	447	438	435	437	453	462	465
19	474	464	471	469	471	471	466	468	465	463	464	467	467	467	462	457	461	451	453	450	433	438	454	442	460
20 D	448	459	467	457	453	441	453	459	460	432	449	458	460	459	448	454	465	460	448	446	440	440	440	440	452
21	454	457	460	465	467	456	475	468	454	458	453	454	461	458	459	457	448	451	442	446	446	452	457	455	456
22	460	461	459	465	464	474	472	472	453	458	465	463	471	471	471	471	464	460	445	444	441	445	450	458	461
23	459	459	465	470	468	470	471	464	467	467	466	468	466	470	467	466	459	454	448	450	442	447	457	454	461
24	459	464	463	470	470	470	466	470	467	468	467	462	473	476	473	472	466	459	456	452	443	451	456	465	464
25	449	455	469	471	466	462	464	463	463	464	459	464	465	464	467	466	466	470	468	455	450	456	462	468	463
26 Q	471	473	474	472	471	474	472	472	472	475	476	476	479	476	479	478	479	472	466	457	452	458	460	470	471
27 D	472	477	478	479	484	488	441	439	418	443	459	456	463	459	403	415	391	419	435	406	382	408	428	431	441
28 D	436	434	418	428	431	427	423	413	422	416	385	432	450	459	452	415	419	407	382	371	376	393	405	403	417
29	398	445	459	452	439	448	446	443	446	446	444	441	464	464	465	469	458	455	448	438	439	444	442	448	448
30 D	453	456	450	456	431	428	460	457	455	443	450	442	451	462	464	460	456	459	447	442	426	444	411	433	447
31	454	460	460	464	460	457	452	470	447	464	460	460	461	455	463	469	465	459	438	438	437	442	446	458	456
MEAN	461	464	465	465	463	463	461	460	458	460	461	464	466	467	466	466	464	457	448	442	440	445	452	457	459

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 2 VICTORIA D = 22 DEG 00.0 MIN EAST + JANUARY 1971

DAY \ HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	22.4	23.4	23.3	23.6	24.0	24.1	23.4	22.8	22.3	22.3	21.6	22.4	22.8	23.3	23.3	24.4	27.1	28.5	26.0	24.0	23.3	21.6	20.9	21.3	23.4
2	20.1	22.7	24.1	24.8	26.2	28.1	22.9	23.2	23.4	16.7	23.9	23.1	22.7	24.1	16.3	22.8	26.1	29.5	28.7	27.2	24.7	22.4	21.0	19.8	23.5
3 D	23.1	22.4	25.6	25.7	30.4	27.8	26.7	23.5	18.8	16.3	24.7	24.6	22.2	17.4	25.7	25.3	26.5	26.4	24.6	24.3	21.7	21.0	21.5	22.8	23.7
4	19.9	21.2	23.2	24.1	25.8	25.5	28.0	28.2	27.7	24.3	23.0	22.2	21.3	18.5	24.0	24.1	28.2	29.9	30.5	28.1	25.5	23.4	21.2	20.6	24.5
5	21.5	22.2	23.3	24.6	24.5	25.1	24.5	24.9	22.4	23.7	23.2	23.3	22.8	22.6	19.3	22.7	26.7	27.3	24.8	25.5	23.6	22.5	21.8	21.5	23.5
6	22.0	22.1	22.6	23.3	23.8	24.3	24.5	24.4	22.6	24.1	23.6	23.1	23.0	23.1	22.4	23.6	25.6	27.3	27.5	26.2	25.6	23.8	23.1	21.9	23.9
7 Q	21.8	22.5	22.7	23.1	23.2	23.3	23.7	23.8	23.3	23.2	22.5	22.7	22.8	22.2	22.8	23.9	25.9	27.8	27.1	25.9	24.3	23.0	22.5	22.4	23.6
8 Q	22.6	22.8	22.9	22.9	23.1	22.8	23.3	23.2	22.7	23.1	22.8	23.1	23.0	22.7	22.6	23.6	25.7	26.6	26.7	26.3	24.9	23.6	23.4	22.4	23.6
9 Q	22.0	22.8	23.2	23.1	23.7	23.4	23.5	23.3	23.3	23.3	22.5	22.7	23.0	22.6	23.2	23.3	25.3	27.3	26.3	25.7	23.3	22.9	22.6	21.9	23.5
10	22.2	22.4	22.9	22.6	23.3	23.4	23.7	23.5	23.2	24.0	23.8	23.8	23.9	23.6	23.2	24.4	25.6	26.0	26.9	25.4	21.0	21.5	22.2	22.5	23.5
11	21.7	22.5	22.9	23.6	23.6	23.2	24.8	25.0	23.2	23.0	23.0	24.4	22.9	24.3	24.7	25.9	23.4	24.6	25.4	24.5	22.8	22.3	22.6	22.3	23.6
12 Q	21.8	22.6	22.8	23.5	23.3	23.6	23.4	23.5	23.2	23.1	22.2	23.3	23.4	23.6	23.9	24.0	25.3	27.1	26.4	24.8	21.7	20.2	20.2	21.1	23.2
13	22.0	22.4	22.8	23.5	23.4	23.1	22.6	23.0	23.9	23.6	22.3	22.8	23.0	23.2	23.9	24.4	26.0	26.2	25.8	24.7	22.9	21.7	22.9	24.0	23.5
14	23.4	23.4	23.9	24.1	23.8	25.5	22.9	23.1	24.0	26.0	25.9	25.6	24.6	25.5	24.2	25.1	26.6	25.6	25.5	24.7	22.8	22.4	24.0	23.5	24.4
15	23.1	23.5	24.0	23.8	23.1	22.9	23.1	24.0	23.3	26.0	27.2	29.6	29.0	29.0	28.2	27.6	25.3	23.7	23.2	22.4	22.0	21.4	20.6	22.5	24.5
16	22.7	23.0	23.7	24.3	23.9	23.7	23.2	27.3	21.1	19.8	24.5	24.2	24.5	26.0	27.7	27.2	25.8	25.8	24.9	24.0	22.2	22.0	21.5	22.2	24.0
17	22.6	23.0	23.4	23.4	23.7	23.3	23.3	23.5	22.8	19.5	21.5	24.7	24.7	24.2	22.5	26.3	27.4	26.3	26.0	23.6	22.0	19.9	19.9	21.2	23.3
18	22.0	22.7	23.8	24.6	24.1	24.4	24.2	23.3	22.5	22.3	25.3	26.3	25.5	24.5	21.3	29.0	29.6	29.2	27.8	26.2	23.4	21.4	21.2	21.1	24.4
19	21.1	22.8	23.1	23.4	23.6	24.0	23.6	23.5	23.9	22.8	23.2	23.6	22.9	23.6	24.2	23.8	26.1	27.9	26.3	24.6	22.3	18.9	18.0	18.3	23.1
20 D	19.1	23.0	22.2	26.0	23.8	24.8	29.3	25.0	23.7	18.3	22.6	23.0	24.7	25.9	25.2	21.2	26.1	26.8	28.6	26.5	24.2	22.5	21.3	20.8	23.9
21	23.4	22.7	24.0	24.6	24.1	23.3	30.0	23.3	24.3	23.8	22.6	22.4	24.1	25.3	24.8	25.2	25.6	26.2	26.0	25.1	23.0	22.6	22.3	21.7	24.2
22	22.2	22.8	22.3	23.6	24.9	23.9	25.8	22.0	24.2	22.9	22.8	24.0	24.2	24.0	24.4	25.6	27.2	27.5	26.4	24.3	22.3	20.9	18.6	20.0	23.6
23	20.1	21.4	22.0	22.5	22.9	22.7	22.4	23.2	23.1	23.3	23.9	23.8	24.0	24.3	24.2	25.0	26.2	26.3	24.9	25.1	23.6	22.0	21.6	21.3	23.3
24	20.2	20.8	20.7	22.1	22.4	22.7	22.6	22.6	22.8	23.2	23.2	21.0	21.8	24.5	24.3	25.0	26.4	26.3	24.4	24.3	22.8	21.8	20.7	19.4	22.7
25	20.3	21.9	22.4	22.9	22.8	24.3	22.7	22.6	22.6	23.1	22.1	22.5	23.7	22.5	22.0	21.8	23.1	24.2	24.0	24.9	24.5	23.2	23.4	22.7	22.9
26 Q	21.8	22.3	22.4	23.0	22.7	22.8	22.4	22.6	22.7	22.6	23.0	22.8	23.1	23.0	22.9	23.9	25.1	26.9	26.7	26.3	25.2	23.6	22.1	21.7	23.4
27 D	21.4	21.9	22.2	22.4	22.2	19.6	25.3	32.5	29.7	18.1	23.1	24.9	25.2	22.8	14.4	16.5	21.2	17.2	22.8	21.6	19.2	19.3	20.0	19.5	21.8
28 D	21.9	23.5	24.8	29.4	25.7	26.8	26.4	24.4	23.9	28.8	21.0	32.4	33.1	30.9	26.3	15.0	16.0	20.5	21.2	14.6	20.0	21.0	19.7	21.7	23.7
29	21.3	22.7	23.5	24.0	25.4	24.2	23.0	23.4	23.4	25.7	24.4	20.3	24.7	26.1	25.9	24.9	23.6	23.3	24.0	23.2	21.1	21.4	21.5	21.5	23.4
30 D	22.2	21.2	23.6	22.4	19.6	24.0	22.5	23.0	23.8	31.7	33.3	36.4	27.1	24.4	23.5	24.3	24.9	24.8	22.9	21.1	21.1	19.1	21.5	20.6	24.1
31	22.7	23.6	24.0	23.8	24.2	25.0	24.1	23.1	17.4	21.0	22.6	24.8	23.3	21.9	22.2	24.8	25.6	25.7	24.2	22.3	22.4	22.5	22.7	22.1	23.2
MEAN	21.8	22.5	23.2	23.8	23.9	24.1	24.3	24.0	23.2	22.9	23.6	24.3	24.1	23.9	23.3	24.0	25.5	26.1	25.7	24.4	22.9	21.8	21.5	21.5	23.6

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 3 VICTORIA Z = 53,000 GAMMA + JANUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	115	111	115	115	112	113	113	111	112	111	110	108	113	110	110	112	113	114	114	113	110	110	113	116	112
2	114	113	116	114	117	119	116	111	106	80	99	110	111	111	97	103	112	113	112	110	110	109	111	112	109
3 D	117	120	125	129	124	126	119	108	88	53	78	95	80	73	91	105	107	107	101	110	110	107	114	118	104
4	124	130	130	125	121	114	113	115	107	111	111	109	103	103	100	114	120	117	117	116	112	113	114	115	115
5	120	118	121	120	121	115	115	112	108	100	108	110	111	110	108	114	119	115	108	108	104	104	109	108	112
6	114	114	115	115	115	116	114	112	110	110	112	111	112	111	112	113	117	113	110	109	110	108	107	108	112
7 Q	113	112	112	113	113	112	112	113	110	109	110	110	110	110	112	116	117	116	113	111	105	106	107	108	111
8 Q	113	112	112	112	112	112	112	110	110	110	109	108	109	109	110	113	115	114	112	112	105	107	108	108	111
9 Q	110	108	108	108	109	109	109	106	109	107	107	106	106	107	107	110	112	111	109	107	104	106	105	104	108
10	105	107	108	108	108	107	109	107	105	106	104	99	98	102	104	108	108	104	101	98	98	98	107	103	104
11	104	106	108	107	109	110	109	115	116	113	111	107	107	105	108	106	110	108	107	104	102	105	106	99	108
12 Q	104	106	108	110	109	109	110	111	110	108	105	106	107	105	107	107	111	111	108	108	101	105	107	105	107
13	107	107	107	109	107	109	109	111	111	111	110	107	107	108	108	106	108	109	109	105	101	105	108	112	108
14	106	105	106	106	106	108	110	110	106	102	106	104	101	99	104	109	103	102	105	109	106	108	117	112	106
15	112	108	109	108	107	106	105	102	108	102	103	100	96	98	100	97	91	93	101	104	109	109	114	113	104
16	115	112	112	110	109	108	106	108	109	92	95	103	104	106	110	105	102	103	105	106	107	106	107	105	106
17	109	107	108	106	105	106	106	107	108	105	96	107	108	104	100	98	101	99	100	99	100	103	109	110	104
18	112	108	107	107	105	103	105	104	105	104	102	101	104	102	79	82	93	98	99	98	100	104	109	110	102
19	116	113	112	114	113	111	110	111	110	110	109	109	106	105	104	107	107	107	106	102	99	100	106	105	108
20 D	121	123	124	140	136	143	133	127	120	77	76	98	106	111	104	84	83	85	94	98	100	105	109	114	109
21	116	118	118	119	116	116	115	107	108	106	106	104	101	107	110	111	111	111	108	108	108	107	109	109	110
22	109	110	112	115	114	114	110	98	101	106	111	112	113	110	111	114	113	115	111	108	106	107	108	110	110
23	115	116	115	117	117	116	116	115	112	111	110	111	110	110	111	114	115	115	114	114	106	104	104	105	112
24	110	111	111	114	113	115	113	114	112	110	109	107	96	105	106	111	108	108	106	103	104	110	107	111	109
25	111	113	116	117	113	118	117	115	114	113	109	107	108	108	108	106	107	107	110	111	110	110	110	109	111
26 Q	109	108	108	108	108	111	108	110	110	109	107	107	108	106	106	108	112	111	108	106	101	96	97	100	107
27 D	101	105	106	105	107	107	107	107	88	72	103	107	80	45	10	-13	51	76	90	100	109	127	132	132	90
28 D	147	140	146	144	133	132	117	119	114	106	55	76	94	97	76	52	69	88	97	104	118	132	157	168	112
29	155	137	129	127	127	129	122	123	118	114	109	88	95	109	111	109	105	105	107	109	111	115	113	113	116
30 D	117	116	116	118	124	135	129	123	121	106	94	72	97	106	111	113	112	110	106	104	104	109	110	120	111
31	124	121	118	118	114	116	120	114	68	88	100	106	108	102	107	106	108	103	99	103	108	112	112	116	108
MEAN	115	114	115	115	114	115	113	111	108	102	102	103	104	103	101	101	105	106	106	106	106	108	111	112	108

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 4 VICTORIA H = 18,500 GAMMA + FEBRUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	454	463	471	462	460	454	449	448	452	458	453	455	464	467	458	444	460	460	454	445	440	443	450	453	455
2	456	453	461	462	467	467	465	465	465	465	466	465	461	466	470	465	466	466	451	448	442	440	452	454	460
3 Q	458	465	472	473	470	469	474	471	470	469	471	471	471	471	472	472	473	472	466	458	451	450	457	461	467
4 Q	469	474	474	474	472	473	473	470	470	472	477	474	471	473	473	471	473	461	464	459	453	456	460	464	469
5 Q	464	478	480	478	477	475	476	476	479	474	478	481	481	479	480	480	477	477	469	468	464	466	469	472	475
6	474	474	476	475	471	476	468	474	463	466	471	472	476	477	474	472	474	473	471	469	457	458	462	470	471
7	472	473	470	471	469	473	471	471	464	464	466	477	475	480	480	479	480	482	479	476	473	471	471	471	473
8	480	477	469	467	471	473	470	468	473	478	479	478	478	480	479	476	473	474	469	468	465	471	472	476	474
9	479	478	479	477	466	476	470	469	466	472	472	477	477	470	478	473	471	471	469	470	467	469	468	466	472
10	468	471	471	472	470	470	469	466	473	469	470	476	476	477	477	460	473	474	471	464	441	450	449	455	467
11	457	457	461	466	463	467	465	465	469	465	472	474	473	475	473	474	464	454	460	465	466	468	470	471	466
12	462	473	476	476	480	471	471	466	468	474	477	480	481	480	486	486	476	474	473	462	445	445	451	459	471
13 Q	470	476	476	472	469	470	473	471	472	472	474	475	477	477	479	467	463	456	453	458	462	472	474	476	470
14 D	476	482	483	482	481	484	483	480	479	473	473	481	478	473	481	470	453	455	452	437	436	433	452	455	468
15 D	456	449	451	457	461	465	461	454	459	460	463	473	462	475	477	470	457	460	435	433	445	447	422	438	455
16 D	417	405	434	454	453	463	453	453	457	455	460	459	459	463	463	443	455	456	452	437	428	429	445	456	448
17	442	459	461	467	464	456	461	470	465	468	463	463	466	460	468	466	459	457	448	443	439	444	434	447	457
18	454	461	454	458	459	465	462	466	470	460	464	461	459	465	463	464	456	442	433	438	438	444	441	433	455
19	440	452	446	456	468	465	464	463	457	461	468	468	469	471	471	470	459	455	446	436	432	440	446	462	457
20	464	471	459	459	469	470	462	467	469	466	470	470	473	471	472	467	461	461	444	437	430	434	446	455	460
21	457	456	464	463	461	458	465	453	449	457	454	461	468	468	461	468	470	466	454	450	446	451	454	459	459
22 Q	462	468	468	467	466	467	467	474	464	467	471	473	473	473	472	472	468	467	458	450	445	450	462	472	466
23	475	474	470	470	466	475	472	468	471	477	476	476	479	484	484	483	467	465	448	424	398	416	439	440	462
24	449	446	451	455	460	461	460	467	466	467	471	471	479	477	475	472	475	462	451	443	444	435	426	431	458
25 D	443	451	450	451	448	455	448	441	469	470	467	464	480	476	429	468	455	425	402	407	402	407	432	440	445
26 D	449	447	419	409	425	448	444	443	449	444	431	458	457	448	442	453	447	435	436	427	421	423	432	441	439
27	441	453	459	460	461	466	461	463	465	463	467	469	466	463	464	465	464	452	437	422	422	436	447	440	454
28	452	451	442	438	438	453	456	464	465	468	472	468	471	477	472	471	466	451	443	437	437	444	457	462	456
MEAN	459	462	462	463	464	467	465	465	466	466	468	470	471	472	470	469	466	461	453	448	442	446	451	456	462

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 5 VICTORIA　　　　D = 22 DEG 00.0 MIN EAST +　　　　FEBRUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	21.4	22.8	22.7	22.7	23.2	24.7	26.3	23.7	21.4	23.8	21.7	19.9	21.8	24.7	24.0	23.5	25.8	27.6	27.4	25.5	24.5	23.1	21.7	22.4	23.6
2	21.3	22.3	23.9	23.9	23.4	23.1	23.5	23.1	23.0	23.7	23.2	23.9	22.0	22.4	23.2	24.0	24.9	26.8	25.7	24.9	23.8	22.8	22.1	20.7	23.4
3 Q	21.4	21.8	22.5	22.9	23.1	23.9	23.4	23.6	23.7	23.7	22.7	22.9	22.9	22.7	23.3	24.1	24.8	25.9	25.7	25.3	24.3	23.3	22.6	22.2	23.4
4 Q	21.7	22.3	22.6	23.0	23.1	23.5	23.2	23.3	23.4	22.7	22.6	23.2	23.3	23.4	23.7	25.0	25.7	25.2	24.9	24.1	22.5	21.5	20.8	21.3	23.2
5 Q	20.3	21.5	22.4	22.5	22.9	23.2	22.7	23.2	23.1	23.7	23.7	23.9	24.6	23.8	23.5	23.5	24.4	25.4	25.3	25.4	24.0	21.9	20.5	20.3	23.2
6	20.5	20.8	21.2	21.4	22.3	23.0	23.0	23.6	23.3	24.2	23.3	23.4	22.9	24.0	24.3	24.6	25.5	26.0	24.0	24.1	23.4	22.2	21.6	21.6	23.1
7	21.2	21.6	21.3	21.8	21.9	23.2	22.4	22.9	24.6	25.8	26.2	25.9	25.0	23.2	23.7	23.8	24.4	24.4	23.4	23.2	22.1	21.6	19.9	20.4	23.1
8	20.2	21.9	22.0	22.2	25.0	22.4	22.8	23.2	23.2	22.7	22.0	24.1	25.0	25.0	23.7	23.7	25.0	24.0	23.7	22.7	21.8	21.0	21.0	21.4	22.9
9	22.3	22.3	22.7	21.8	22.7	22.9	22.8	23.7	27.9	24.8	23.2	23.1	24.6	23.6	22.1	25.8	25.2	25.2	23.2	22.0	20.9	20.5	21.2	23.0	23.2
10	22.6	23.0	23.1	23.4	23.1	23.3	23.0	23.0	24.2	23.5	23.0	23.0	21.9	23.0	22.7	18.3	23.8	25.3	23.7	23.2	23.1	20.8	21.4	22.1	22.8
11	22.3	23.1	23.3	23.4	23.2	23.3	22.4	22.2	21.5	21.8	22.4	23.0	24.0	24.2	24.3	24.6	25.7	23.1	22.4	20.1	20.0	20.1	21.2	22.1	22.7
12	22.1	22.0	21.3	22.1	22.6	23.0	23.0	23.2	22.1	22.0	22.3	22.9	23.1	22.9	21.6	23.0	24.4	23.2	24.8	24.4	20.9	19.4	18.9	19.9	22.3
13 Q	22.9	23.0	23.9	23.7	23.9	23.2	23.2	23.1	23.3	22.8	23.2	22.8	23.4	23.7	24.5	26.1	26.7	25.9	24.0	22.2	21.3	21.1	21.4	20.9	23.3
14 D	21.4	21.9	22.4	23.2	23.3	23.8	22.4	22.4	22.4	19.5	25.2	23.3	25.2	22.4	17.0	28.0	25.2	21.4	22.4	20.7	19.1	18.6	20.0	19.5	22.1
15 D	21.3	21.4	22.1	20.7	22.3	22.6	24.5	25.0	25.9	27.4	24.9	22.7	29.0	26.6	24.1	24.2	14.8	19.9	23.6	19.2	19.4	20.7	19.8	16.6	22.4
16 D	19.0	21.3	23.5	21.9	23.7	25.3	25.0	25.5	21.0	22.8	22.2	22.1	21.6	21.8	24.0	23.2	22.0	25.6	24.3	24.1	22.4	21.2	20.2	20.3	22.7
17	23.5	22.2	22.1	22.8	23.9	23.6	22.5	21.6	23.0	24.8	20.3	22.8	20.0	22.8	24.2	24.5	25.3	23.8	23.1	21.4	20.2	19.1	18.8	18.6	22.3
18	19.4	20.9	21.5	22.5	23.3	23.5	23.5	24.2	23.3	24.4	23.1	24.6	21.3	22.2	25.4	26.8	27.9	27.8	24.3	22.0	21.3	19.4	18.3	18.9	22.9
19	18.4	19.0	19.0	21.2	23.1	22.7	24.4	26.5	23.6	22.8	22.5	23.4	22.7	23.7	23.9	25.0	26.3	27.0	25.8	24.2	22.8	21.3	21.7	21.8	23.0
20	21.2	20.2	20.7	21.9	21.8	22.7	22.6	22.9	23.4	23.0	22.0	22.6	23.4	23.9	23.7	24.4	25.2	25.2	25.0	22.8	21.0	19.5	18.1	20.3	22.4
21	20.0	20.8	21.7	22.1	21.7	20.9	20.0	26.8	25.1	25.5	26.8	23.8	24.8	24.5	22.8	22.4	25.3	25.7	25.1	23.8	21.5	20.3	20.3	20.5	23.0
22 Q	21.1	21.5	21.4	22.2	22.3	23.3	22.2	23.9	24.2	23.5	23.2	23.1	23.0	23.6	23.4	23.4	25.4	26.7	27.0	25.2	22.5	20.9	20.1	19.8	23.0
23	20.4	20.5	21.0	21.4	21.7	21.6	21.6	20.6	23.1	23.5	24.9	25.3	24.5	23.8	23.6	22.2	22.9	27.8	24.3	24.3	18.9	14.5	13.5	18.1	21.8
24	21.4	22.7	22.7	22.9	22.7	22.9	22.8	22.4	23.0	23.1	23.2	23.4	22.1	24.7	25.8	25.7	27.0	28.6	27.8	25.6	22.4	20.0	18.6	14.7	23.2
25 D	15.9	19.2	20.9	22.4	23.4	23.3	24.2	25.8	25.1	24.6	24.5	24.2	22.2	25.0	7.0	11.6	14.3	16.9	15.4	17.2	20.3	21.5	20.8	21.9	20.3
26 D	23.0	21.0	24.0	39.2	21.9	28.2	23.4	24.9	24.0	18.2	17.9	24.7	27.8	25.5	19.6	25.1	27.7	26.9	26.8	26.4	24.1	23.5	23.5	22.8	24.6
27	22.7	23.3	23.2	23.2	24.0	25.5	23.7	23.5	22.9	23.1	23.1	23.1	23.5	20.1	20.8	24.9	28.3	28.1	27.3	22.7	19.2	19.3	18.4	20.2	23.1
28	20.8	21.6	21.5	26.1	28.8	24.0	23.9	23.2	23.1	23.0	23.5	23.1	23.1	22.8	22.2	24.9	26.4	27.7	26.8	24.7	21.8	20.1	19.5	19.2	23.4
MEAN	21.1	21.6	22.2	23.2	23.2	23.4	23.2	23.6	23.5	23.4	23.1	23.4	23.5	23.6	22.6	23.8	24.7	25.3	24.5	23.3	21.8	20.7	20.2	20.4	22.9

minute for declination, ± 2 gammas for the horizontal component, and ± 2 gammas for the vertical component.

Magnetic reductions

The methods used were essentially those described by Auld and Holmes (1969). Underlined values in any of the tables have been obtained by interpolation from low-sensitivity records, with an accuracy of about 5 γ.

Magnetic activity and disturbance indices

The procedures followed remain unchanged from those described by Caner and Loomer (1961) and by Auld and Andersen (1966).

Summary of annual mean values

The mean values listed have been corrected to the new (post-1961) location and absolute standards.

For the period 1970.5 – 1971.5, the decrease in declination was 3.0 minutes (the mean rate of decrease over the whole 16-year period being 2.6 minutes per year); the increase in horizontal intensity was 25 gammas (the mean rate of increase over the 16-year period being 19 gammas per year); the decrease in the vertical component was 18 gammas (the mean rate of decrease over the 16-year period being 22 gammas per year).

Acknowledgments

The help of the Director and staff of the Dominion Astrophysical Observatory is greatly appreciated.

Summary of Annual Mean Values

Year	D East		H	Z	X	Y	I		F
	°	'	γ	γ	γ	γ	°	'	γ
1956.6	23	00.2	18689	53427	17203	7303	70	43.2	56601
1957.75	22	57.1	18705	53408	17224	7294	70	41.9	56589
1958.5	22	55.2	18713	53396	17236	7288	70	41.2	56580
1959.5	22	52.8	18736	53377	17262	7284	70	39.5	56570
1960.5	22	50.3	18748	53362	17278	7277	70	38.5	56560
1961.5	22	47.8	18787	53322	17319	7279	70	35.5	56535
1962.5	22	44.4	18804	53288	17342	7268	70	33.8	56508
1963.5	22	41.4	18814	53264	17358	7257	70	32.7	56489
1964.5	22	38.6	18837	53239	17385	7252	70	30.9	56473
1965.5	22	36.0	18860	53205	17412	7248	70	28.9	56449
1966.5	22	34.2	18873	53179	17428	7244	70	27.6	56429
1967.5	22	31.7	18888	53157	17447	7237	70	26.3	56413
1968.5	22	29.4	18902	53138	17464	7230	70	25.1	56400
1969.5	22	27.4	18923	53127	17488	7228	70	23.7	56396
1970.5	22	24.8	18946	53117	17515	7224	70	22.2	56395
1971.5	22	21.8	18971	53099	17544	7218	70	20.4	56386

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MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 1 VICTORIA H = 18,500 GAMMA + JANUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	470	460	458	469	464	460	461	462	464	464	469	470	471	471	472	467	464	452	439	443	445	443	449	460	460
2	476	466	468	467	455	473	467	462	468	469	463	466	467	469	445	467	472	461	442	437	439	445	451	455	460
3 D	452	455	457	459	444	450	452	458	449	459	463	462	445	460	475	468	464	432	417	420	438	440	431	428	449
4	447	451	460	461	454	465	443	453	445	451	461	461	459	460	468	464	465	451	424	418	418	422	437	453	450
5	456	458	454	456	470	471	465	456	452	457	461	461	467	461	455	466	472	463	449	443	442	443	449	446	457
6	464	468	470	468	469	463	458	459	468	465	462	464	464	465	467	468	472	461	447	439	439	441	453	456	460
7 Q	466	466	468	467	466	467	466	469	466	466	465	469	468	468	473	473	473	466	455	452	448	451	458	461	464
8 Q	466	470	469	471	468	471	471	469	471	471	471	472	473	470	473	476	475	467	460	453	454	457	458	465	468
9 Q	473	472	473	471	471	472	471	468	470	470	473	477	473	475	479	484	482	469	463	458	459	462	466	469	471
10	472	472	476	478	473	476	474	474	475	474	474	477	474	475	480	487	485	476	465	445	457	462	472	476	473
11	469	474	476	475	473	472	462	462	469	473	473	472	472	473	470	466	472	474	467	461	455	456	464	465	469
12 Q	467	469	466	467	468	468	468	470	465	469	468	471	472	468	471	472	469	464	453	442	444	453	468	475	465
13	481	480	477	474	475	475	467	468	467	469	476	480	472	474	486	481	474	464	460	458	464	472	476	483	473
14	473	465	467	465	459	452	453	458	455	446	456	462	465	467	460	463	465	460	453	445	447	454	463	472	459
15	471	466	464	462	460	453	447	440	446	441	439	451	461	462	472	482	483	468	461	451	448	447	461	464	458
16	465	467	464	466	466	464	458	444	450	461	459	464	463	468	473	475	468	455	453	449	452	453	462	468	461
17	473	474	476	470	468	467	465	461	468	468	472	475	474	474	474	480	470	463	454	447	444	449	460	470	467
18	475	473	470	466	466	466	469	471	474	485	476	473	472	477	472	471	468	454	447	438	435	437	453	462	465
19	474	464	471	469	471	471	466	468	465	463	464	467	467	467	462	457	461	451	453	450	433	438	454	442	460
20 D	448	459	467	457	453	441	453	459	460	432	449	458	460	459	448	454	465	460	448	446	440	440	440	440	452
21	454	457	460	465	467	456	475	468	454	458	453	454	461	458	459	457	448	451	442	446	446	452	457	455	456
22	460	461	459	465	464	474	472	472	453	458	465	463	471	471	471	471	464	460	445	444	441	445	450	458	461
23	459	459	465	470	468	470	471	464	467	467	466	468	466	470	467	466	459	454	448	450	442	447	457	454	461
24	459	464	463	470	470	470	466	470	467	468	467	462	473	476	473	472	466	459	456	452	443	451	456	465	464
25	449	455	469	471	466	462	464	463	463	464	459	464	465	464	467	466	466	470	468	455	450	456	462	468	463
26 Q	471	473	474	472	471	474	472	472	472	475	476	476	479	476	479	478	479	472	466	457	452	458	460	470	471
27 D	472	477	478	479	484	488	441	439	418	443	459	456	463	459	403	415	391	419	435	406	382	408	428	431	441
28 D	436	434	418	428	431	427	423	413	422	416	385	432	450	459	452	415	419	407	382	371	376	393	405	403	417
29	398	445	459	452	439	448	446	443	446	446	444	441	464	464	465	469	458	455	448	438	439	444	442	448	448
30 D	453	456	450	456	431	428	460	457	455	443	450	442	451	462	464	460	456	459	447	442	426	444	411	433	447
31	454	460	460	464	460	457	452	470	447	464	460	460	461	455	463	469	465	459	438	438	437	442	446	458	456
MEAN	461	464	465	465	463	463	461	460	458	460	461	464	466	467	466	466	464	457	448	442	440	445	452	457	459

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 2 VICTORIA D = 22 DEG 00.0 MIN EAST + JANUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	22.4	23.4	23.3	23.6	24.0	24.1	23.4	22.8	22.3	22.3	21.6	22.4	22.8	23.3	23.3	24.4	27.1	28.5	26.0	24.0	23.3	21.6	20.9	21.3	23.4
2	20.1	22.7	24.1	24.8	26.2	28.1	22.9	23.2	23.4	16.7	23.9	23.1	22.7	24.1	16.3	22.8	26.1	29.5	28.7	27.2	24.7	22.4	21.0	19.8	23.5
3 D	23.1	22.4	25.6	25.7	30.4	27.8	26.7	23.5	18.8	16.3	24.7	24.6	22.2	17.4	25.7	25.3	26.5	26.4	24.6	24.3	21.7	21.0	21.5	22.8	23.7
4	19.9	21.2	23.2	24.1	25.8	25.5	28.0	28.2	27.7	24.3	23.0	22.2	21.3	18.5	24.0	24.1	28.2	29.9	30.5	28.1	25.5	23.4	21.2	20.6	24.5
5	21.5	22.2	23.3	24.6	24.5	25.1	24.5	24.9	22.4	23.7	23.2	23.3	22.8	22.6	19.3	22.7	26.7	27.3	24.8	25.5	23.6	22.5	21.8	21.5	23.5
6	22.0	22.1	22.6	23.3	23.8	24.3	24.5	24.4	22.6	24.1	23.6	23.1	23.0	23.1	22.4	23.6	25.6	27.3	27.5	26.2	25.6	23.8	23.1	21.9	23.9
7 Q	21.8	22.5	22.7	23.1	23.2	23.3	23.7	23.8	23.3	23.2	22.5	22.7	22.8	22.2	22.8	23.9	25.9	27.8	27.1	25.9	24.3	23.0	22.5	22.4	23.6
8 Q	22.6	22.8	22.9	22.9	23.1	22.8	23.3	23.2	22.7	23.1	22.8	23.1	23.0	22.7	22.6	23.6	25.7	26.6	26.7	26.3	24.9	23.6	23.4	22.4	23.6
9 Q	22.0	22.8	23.2	23.1	23.7	23.4	23.5	23.3	23.3	23.3	22.5	22.7	23.0	22.6	23.2	23.3	25.3	27.3	26.3	25.7	23.3	22.9	22.6	21.9	23.5
10	22.2	22.4	22.9	22.6	23.3	23.4	23.7	23.5	23.2	24.0	23.8	23.8	23.9	23.6	23.2	24.4	25.6	26.0	26.9	25.4	21.0	21.5	22.2	22.5	23.5
11	21.7	22.5	22.9	23.6	23.6	23.2	24.8	25.0	23.2	23.0	23.0	24.4	22.9	24.3	24.7	25.9	23.4	24.6	25.4	24.5	22.8	22.3	22.6	22.3	23.6
12 Q	21.8	22.6	22.8	23.5	23.3	23.6	23.4	23.5	23.2	23.1	22.2	23.3	23.4	23.6	23.9	24.0	25.3	27.1	26.4	24.8	21.7	20.2	20.2	21.1	23.2
13	22.0	22.4	22.8	23.5	23.4	23.1	22.6	23.0	23.9	23.6	22.3	22.8	23.0	23.2	23.9	24.4	26.0	26.2	25.8	24.7	22.9	21.7	22.9	24.0	23.5
14	23.4	23.4	23.9	24.1	23.8	25.5	22.9	23.1	24.0	26.0	25.9	25.6	24.6	25.5	24.2	25.1	26.6	25.6	25.5	24.7	22.8	22.4	24.0	23.5	24.4
15	23.1	23.5	24.0	23.8	23.1	22.9	23.1	24.0	23.3	26.0	27.2	29.6	29.0	29.0	28.2	27.6	25.3	23.7	23.2	22.4	22.0	21.4	20.6	22.5	24.5
16	22.7	23.0	23.7	24.3	23.9	23.7	23.2	27.3	21.1	19.8	24.5	24.2	24.5	26.0	27.7	27.2	25.8	25.8	24.9	24.0	22.2	22.0	21.5	22.2	24.0
17	22.6	23.0	23.4	23.4	23.7	23.3	23.3	23.5	22.8	19.5	21.5	24.7	24.7	24.2	22.5	26.3	27.4	26.3	26.0	23.6	22.0	19.9	19.9	21.2	23.3
18	22.0	22.7	23.8	24.6	24.1	24.4	24.2	23.3	22.5	22.3	25.3	26.3	25.5	24.5	21.3	29.0	29.6	29.2	27.8	26.2	23.4	21.4	21.2	21.1	24.4
19	21.1	22.8	23.1	23.4	23.6	24.0	23.6	23.5	23.9	22.8	23.2	23.6	22.9	23.6	24.2	23.8	26.1	27.9	26.3	24.6	22.3	18.9	18.0	18.3	23.1
20 D	19.1	23.0	22.2	26.0	23.8	24.8	29.3	25.0	23.7	18.3	22.6	23.0	24.7	25.9	25.2	21.2	26.1	26.8	28.6	26.5	24.2	22.5	21.3	20.8	23.9
21	23.4	22.7	24.0	24.6	24.1	23.3	30.0	23.3	24.3	23.8	22.6	22.4	24.1	25.3	24.8	25.2	25.6	26.2	26.0	25.1	23.0	22.6	22.3	21.7	24.2
22	22.2	22.8	22.3	23.6	24.9	23.9	25.8	22.0	24.2	22.9	22.8	24.0	24.2	24.0	24.4	25.6	27.2	27.5	26.4	24.3	22.3	20.9	18.6	20.0	23.6
23	20.1	21.4	22.0	22.5	22.9	22.7	22.4	23.2	23.1	23.3	23.9	23.8	24.0	24.3	24.2	25.0	26.2	26.3	24.9	25.1	23.6	22.0	21.6	21.3	23.3
24	20.2	20.8	20.7	22.1	22.4	22.7	22.6	22.6	22.8	23.2	23.2	21.0	21.8	24.5	24.3	25.0	26.4	26.3	24.4	24.3	22.8	21.8	20.7	19.4	22.7
25	20.3	21.9	22.4	22.9	22.8	24.3	22.7	22.6	22.6	23.1	22.1	22.5	23.7	22.5	22.0	21.8	23.1	24.2	24.0	24.9	24.5	23.2	23.4	22.7	22.9
26 Q	21.8	22.3	22.4	23.0	22.7	22.8	22.4	22.6	22.7	22.6	23.0	22.8	23.1	23.0	22.9	23.9	25.1	26.9	26.7	26.3	25.2	23.6	22.1	21.7	23.4
27 D	21.4	21.9	22.2	22.4	22.2	19.6	25.3	32.5	29.7	18.1	23.1	24.9	25.2	22.8	14.4	16.5	21.2	17.2	22.8	21.6	19.2	19.3	20.0	19.5	21.8
28 D	21.9	23.5	24.8	29.4	25.7	26.8	26.4	24.4	23.9	28.8	21.0	32.4	33.1	30.9	26.3	15.0	16.0	20.5	21.2	14.6	20.0	21.0	19.7	21.7	23.7
29	21.3	22.7	23.5	24.0	25.4	24.2	23.0	23.4	23.4	25.7	24.4	20.3	24.7	26.1	25.9	24.9	23.6	23.3	24.0	23.2	21.1	21.4	21.5	21.5	23.4
30 D	22.2	21.2	23.6	22.4	19.6	24.0	22.5	23.0	23.8	31.7	33.3	36.4	27.1	24.4	23.5	24.3	24.9	24.8	22.9	21.1	21.1	19.1	21.5	20.6	24.1
31	22.7	23.6	24.0	23.8	24.2	25.0	24.1	23.1	17.4	21.0	22.6	24.8	23.3	21.9	22.2	24.8	25.6	25.7	24.2	22.3	22.4	22.5	22.7	22.1	23.2
MEAN	21.8	22.5	23.2	23.8	23.9	24.1	24.3	24.0	23.2	22.9	23.6	24.3	24.1	23.9	23.3	24.0	25.5	26.1	25.7	24.4	22.9	21.8	21.5	21.5	23.6

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 3 VICTORIA   Z = 53,000 GAMMA +   JANUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	115	111	115	115	112	113	113	111	112	111	110	108	113	110	110	112	113	114	114	113	110	110	113	116	112
2	114	113	116	114	117	119	116	111	106	80	99	110	111	111	97	103	112	113	112	110	110	109	111	112	109
3 D	117	120	125	129	124	126	119	108	88	53	78	95	80	73	91	105	107	107	101	110	110	107	114	118	104
4	124	130	130	125	121	114	113	115	107	111	111	109	103	103	100	114	120	117	117	116	112	113	114	115	115
5	120	118	121	120	121	115	115	112	108	100	108	110	111	110	108	114	119	115	108	108	104	104	109	108	112
6	114	114	115	115	115	116	114	112	110	110	112	111	112	111	112	113	117	113	110	109	110	108	107	108	112
7 Q	113	112	112	113	113	112	112	113	110	109	110	110	110	110	112	116	117	116	113	111	105	106	107	108	111
8 Q	113	112	112	112	112	112	112	110	110	110	109	108	109	109	110	113	115	114	112	112	105	107	108	108	111
9 Q	110	108	108	108	109	109	109	106	109	107	107	106	106	107	107	110	112	111	109	107	104	106	105	104	108
10	105	107	108	108	108	107	109	107	105	106	104	99	98	102	104	108	108	104	101	98	98	98	107	103	104
11	104	106	108	107	109	110	109	115	116	113	111	107	107	105	108	106	110	108	107	104	102	105	106	99	108
12 Q	104	106	108	110	109	109	110	111	110	108	105	106	107	105	107	107	111	111	108	108	101	105	107	105	107
13	107	107	107	109	107	109	109	111	111	111	110	107	107	108	108	106	108	109	109	105	101	105	108	112	108
14	106	105	106	106	106	108	110	110	106	107	106	104	101	99	104	109	103	102	105	109	106	108	117	112	106
15	112	108	109	108	107	106	105	102	108	102	103	100	96	98	100	97	91	93	101	104	109	109	114	113	104
16	115	112	112	110	109	108	106	108	109	92	95	103	104	106	110	105	102	103	105	106	107	106	107	105	106
17	109	107	108	106	105	106	106	107	108	105	96	107	108	104	100	98	101	99	100	99	100	103	109	110	104
18	112	108	107	107	105	103	105	104	105	104	102	101	104	102	79	82	93	98	99	98	100	104	109	110	102
19	116	113	112	114	113	111	110	111	110	110	109	109	106	105	104	107	107	107	106	102	99	100	106	105	108
20 D	121	123	124	140	136	143	133	127	120	77	76	98	106	111	104	84	83	85	94	98	100	105	109	114	109
21	116	118	118	119	116	116	115	107	108	106	106	104	101	107	110	111	111	111	108	108	108	107	109	109	110
22	109	110	112	115	114	114	110	98	101	106	111	112	113	110	111	114	113	115	111	108	106	107	108	110	110
23	115	116	115	117	117	116	116	115	112	111	110	111	110	110	111	114	115	115	114	114	106	104	104	105	112
24	110	111	111	114	113	115	113	114	112	110	109	107	96	105	106	111	108	108	106	103	104	110	107	111	109
25	111	113	116	117	113	118	117	115	114	113	109	107	108	108	108	106	107	107	110	111	110	110	110	109	111
26 Q	109	108	108	108	108	111	108	110	110	109	107	107	108	106	106	108	112	111	108	106	101	96	97	100	107
27 D	101	105	106	105	107	107	107	107	88	72	103	107	80	45	10	-13	51	76	90	100	109	127	132	132	90
28 D	147	140	146	144	133	132	117	119	114	106	55	76	94	97	76	52	69	88	97	104	118	132	157	168	112
29	155	137	129	127	127	129	122	123	118	114	109	88	95	109	111	109	105	105	107	109	111	115	113	113	116
30 D	117	116	116	118	124	135	129	123	121	106	94	72	97	106	111	113	112	110	106	104	104	109	110	120	111
31	124	121	118	118	114	116	120	114	68	88	100	106	108	102	107	106	108	103	99	103	108	112	112	116	108
MEAN	115	114	115	115	114	115	113	111	108	102	102	103	104	103	101	101	105	106	106	106	106	108	111	112	108

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 4 VICTORIA — H = 18,500 GAMMA + — FEBRUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	454	463	471	462	460	454	449	448	452	458	453	455	464	467	458	444	460	460	454	445	440	443	450	453	455
2	456	453	461	462	467	467	465	465	465	465	466	465	461	466	470	465	466	466	451	448	442	440	452	454	460
3 Q	458	465	472	473	470	469	474	471	470	469	471	471	471	471	472	472	473	472	466	458	451	450	457	461	467
4 Q	469	474	474	474	472	473	473	470	470	472	477	474	471	473	473	471	473	461	464	459	453	456	460	464	469
5 Q	464	478	480	478	477	475	476	476	479	474	478	481	481	479	480	480	477	477	469	468	464	466	469	472	475
6	474	474	476	475	471	476	468	474	463	466	471	472	476	477	474	472	474	473	471	469	457	458	462	470	471
7	472	473	470	471	469	473	471	471	464	464	466	477	475	480	480	479	480	482	479	476	473	471	471	471	473
8	480	477	469	467	471	473	470	468	473	478	479	478	478	480	479	476	473	474	469	468	465	471	472	476	474
9	479	478	479	477	466	476	470	469	466	472	472	477	477	470	478	473	471	471	469	470	467	469	468	466	472
10	468	471	471	472	470	470	469	466	473	469	470	476	476	477	477	460	473	474	471	464	441	450	449	455	467
11	457	457	461	466	463	467	465	465	469	465	472	474	473	475	473	474	464	454	460	465	466	468	470	471	466
12	462	473	476	476	480	471	471	466	468	474	477	480	481	480	486	486	476	474	473	462	445	445	451	459	471
13 Q	470	476	476	472	469	470	473	471	472	472	474	475	477	477	479	467	463	456	453	458	462	472	474	476	470
14 D	476	482	483	482	481	484	483	480	479	473	473	481	478	473	481	470	453	455	452	437	436	433	452	455	468
15 D	456	449	451	457	461	465	461	454	459	460	463	473	462	475	477	470	457	460	435	433	445	447	422	438	455
16 D	417	405	434	454	453	463	453	453	457	455	460	459	459	463	463	443	455	456	452	437	428	429	445	456	448
17	442	459	461	467	464	456	461	470	465	468	463	463	466	460	468	466	459	457	448	443	439	444	434	447	457
18	454	461	454	458	459	465	462	466	470	460	464	461	459	465	463	464	456	442	433	438	438	444	441	433	455
19	440	452	446	456	468	465	464	463	457	461	468	468	469	471	471	470	459	455	446	436	432	440	446	462	457
20	464	471	459	459	469	470	462	467	469	466	470	470	473	471	472	467	461	461	444	437	430	434	446	455	460
21	457	456	464	463	461	458	465	453	449	457	454	461	468	468	461	468	470	466	454	450	446	451	454	459	459
22 Q	462	468	468	467	466	467	467	474	464	467	471	473	473	473	472	472	468	467	458	450	445	450	462	472	466
23	475	474	470	470	466	475	472	468	471	477	476	476	479	484	484	483	467	465	448	424	398	416	439	440	462
24	449	446	451	455	460	461	460	467	466	467	471	471	479	477	475	472	475	462	451	443	444	435	426	431	458
25 D	443	451	450	451	448	455	448	441	469	470	467	464	480	476	429	468	455	425	402	407	402	407	432	440	445
26 D	449	447	419	409	425	448	444	443	449	444	431	458	457	448	442	453	447	435	436	427	421	423	432	441	439
27	441	453	459	460	461	466	461	463	465	463	467	469	466	463	464	465	464	452	437	422	422	436	447	440	454
28	452	451	442	438	438	453	456	464	465	468	472	468	471	477	472	471	466	451	443	437	437	444	457	462	456
MEAN	459	462	462	463	464	467	465	465	466	466	468	470	471	472	470	469	466	461	453	448	442	446	451	456	462

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 5 VICTORIA D = 22 DEG 00.0 MIN EAST + FEBRUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	21.4	22.8	22.7	22.7	23.2	24.7	26.3	23.7	21.4	23.8	21.7	19.9	21.8	24.7	24.0	23.5	25.8	27.6	27.4	25.5	24.5	23.1	21.7	22.4	23.6
2	21.3	22.3	23.9	23.9	23.4	23.1	23.5	23.1	23.0	23.7	23.2	23.9	22.0	22.4	23.2	24.0	24.9	26.8	25.7	24.9	23.8	22.8	22.1	20.7	23.4
3 Q	21.4	21.8	22.5	22.9	23.1	23.9	23.4	23.6	23.7	23.7	22.7	22.9	22.9	22.7	23.3	24.1	24.8	25.9	25.7	25.3	24.3	23.3	22.6	22.2	23.4
4 Q	21.7	22.3	22.6	23.0	23.1	23.5	23.2	23.3	23.4	22.7	22.6	23.2	23.3	23.4	23.7	25.0	25.7	25.2	24.9	24.1	22.5	21.5	20.8	21.3	23.2
5 Q	20.3	21.5	22.4	22.5	22.9	23.2	22.7	23.2	23.1	23.7	23.7	23.9	24.6	23.8	23.5	23.5	24.4	25.4	25.3	25.4	24.0	21.9	20.5	20.3	23.2
6	20.5	20.8	21.2	21.4	22.3	23.0	23.0	23.6	23.3	24.2	23.3	23.4	22.9	24.0	24.3	24.6	25.5	26.0	24.0	24.1	23.4	22.2	21.6	21.6	23.1
7	21.2	21.6	21.3	21.8	21.9	23.2	22.4	22.9	24.6	25.8	26.2	25.9	25.0	23.2	23.7	23.8	24.4	24.4	23.4	23.2	22.1	21.6	19.9	20.4	23.1
8	20.2	21.9	22.0	22.2	25.0	22.4	22.8	23.2	23.2	22.7	22.0	24.1	25.0	25.0	23.7	23.7	25.0	24.0	23.7	22.7	21.8	21.0	21.0	21.4	22.9
9	22.3	22.3	22.7	21.8	22.7	22.9	22.8	23.7	27.9	24.8	23.2	23.1	24.6	23.6	22.1	25.8	25.2	25.2	23.2	22.0	20.9	20.5	21.2	23.0	23.2
10	22.6	23.0	23.1	23.4	23.1	23.3	23.0	23.0	24.2	23.5	23.0	23.0	21.9	23.0	22.7	18.3	23.8	25.3	23.7	23.2	23.1	20.8	21.4	22.1	22.8
11	22.3	23.1	23.3	23.4	23.2	23.3	22.4	22.2	21.5	21.8	22.4	23.0	24.0	24.2	24.3	24.6	25.7	23.1	22.4	20.1	20.0	20.1	21.2	22.1	22.7
12	22.1	22.0	21.3	22.1	22.6	23.0	23.0	23.2	22.1	22.0	22.3	22.9	23.1	22.9	21.6	23.0	24.4	23.2	24.8	24.4	20.9	19.4	18.9	19.9	22.3
13 Q	22.9	23.0	23.9	23.7	23.9	23.2	23.2	23.1	23.3	22.8	23.2	22.8	23.4	23.7	24.5	26.1	26.7	25.9	24.0	22.2	21.3	21.1	21.4	20.9	23.3
14 D	21.4	21.9	22.4	23.2	23.3	23.8	22.4	22.4	22.4	19.5	25.2	23.3	25.2	22.4	17.0	28.0	25.2	21.4	22.4	20.7	19.1	18.6	20.0	19.5	22.1
15 D	21.3	21.4	22.1	20.7	22.3	22.6	24.5	25.0	25.9	27.4	24.9	22.7	29.0	26.6	24.1	24.2	14.8	19.9	23.6	19.2	19.4	20.7	19.8	16.6	22.4
16 D	19.0	21.3	23.5	21.9	23.7	25.3	25.0	25.5	21.0	22.8	22.2	22.1	21.6	21.8	24.0	23.2	22.0	25.6	24.3	24.1	22.4	21.2	20.2	20.3	22.7
17	23.5	22.2	22.1	22.8	23.9	23.6	22.5	21.6	23.0	24.8	20.3	22.8	20.0	22.8	24.2	24.5	25.3	23.8	23.1	21.4	20.2	19.1	18.8	18.6	22.3
18	19.4	20.9	21.5	22.5	23.3	23.5	23.5	24.2	23.3	24.4	23.1	24.6	21.3	22.2	25.4	26.8	27.9	27.8	24.3	22.0	21.3	19.4	18.3	18.9	22.9
19	18.4	19.0	19.0	21.2	23.1	22.7	24.4	26.5	23.6	22.8	22.5	23.4	22.7	23.7	23.9	25.0	26.3	27.0	25.8	24.2	22.8	21.3	21.7	21.8	23.0
20	21.2	20.2	20.7	21.9	21.8	22.7	22.6	22.9	23.4	23.0	22.0	22.6	23.4	23.9	23.7	24.4	25.2	25.2	25.0	22.8	21.0	19.5	18.1	20.3	22.4
21	20.0	20.8	21.7	22.1	21.7	20.9	20.0	26.8	25.1	25.5	26.8	23.8	24.8	24.5	22.8	22.4	25.3	25.7	25.1	23.8	21.5	20.3	20.3	20.5	23.0
22 Q	21.1	21.5	21.4	22.2	22.3	23.3	22.2	23.9	24.2	23.5	23.2	23.1	23.0	23.6	23.4	23.4	25.4	26.7	27.0	25.2	22.5	20.9	20.1	19.8	23.0
23	20.4	20.5	21.0	21.4	21.7	21.6	21.6	20.6	23.1	23.5	24.9	25.3	24.5	23.8	23.6	22.2	22.9	27.8	24.3	24.3	18.9	14.5	13.5	18.1	21.8
24	21.4	22.7	22.7	22.9	22.7	22.9	22.8	22.4	23.0	23.1	23.2	23.4	22.1	24.7	25.8	25.7	27.0	28.6	27.8	25.6	22.4	20.0	18.6	14.7	23.2
25 D	15.9	19.2	20.9	22.4	23.4	23.3	24.2	25.8	25.1	24.6	24.5	24.2	22.2	25.0	7.0	11.6	14.3	16.9	15.4	17.2	20.3	21.5	20.8	21.9	20.3
26 D	23.0	21.0	24.0	39.2	21.9	28.2	23.4	24.9	24.0	18.2	17.9	24.7	27.8	25.5	19.6	25.1	27.7	26.9	26.8	26.4	24.1	23.5	23.5	22.8	24.6
27	22.7	23.3	23.2	23.2	24.0	25.5	23.7	23.5	22.9	23.1	23.1	23.1	23.5	20.1	20.8	24.9	28.3	28.1	27.3	22.7	19.2	19.3	18.4	20.2	23.1
28	20.8	21.6	21.5	26.1	28.8	24.0	23.9	23.2	23.1	23.0	23.5	23.1	23.1	22.8	22.2	24.9	26.4	27.7	26.8	24.7	21.8	20.1	19.5	19.2	23.4
MEAN	21.1	21.6	22.2	23.2	23.2	23.4	23.2	23.6	23.5	23.4	23.1	23.4	23.5	23.6	22.6	23.8	24.7	25.3	24.5	23.3	21.8	20.7	20.2	20.4	22.9

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 6 VICTORIA Z = 53,000 GAMMA + FEBRUARY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	117	117	114	115	114	114	119	114	95	87	99	97	98	98	98	100	111	110	106	108	105	109	112	114	107
2	111	112	116	118	116	114	113	111	112	111	110	110	106	106	106	109	117	113	106	102	100	105	109	110	110
3 Q	115	117	115	116	113	115	113	114	110	110	110	112	109	110	111	114	114	110	106	103	103	104	105	105	111
4 Q	110	111	111	111	110	111	109	109	108	107	1C7	107	109	111	107	108	107	104	99	95	91	93	98	104	106
5 Q	107	111	111	113	109	109	109	108	110	108	105	101	103	106	107	109	106	107	105	102	99	99	102	106	106
6	105	107	108	110	111	112	111	110	109	111	112	109	104	104	104	108	111	107	102	98	97	97	101	103	106
7	105	107	107	108	110	112	112	110	112	109	105	105	105	108	106	109	109	106	101	98	96	94	93	95	105
8	103	104	105	108	110	109	108	109	106	103	98	100	102	104	101	105	107	106	102	100	101	104	107	101	104
9	105	104	104	104	106	110	110	111	107	107	109	110	107	100	92	92	101	103	101	102	103	106	106	107	104
10	107	106	105	107	106	105	105	107	106	105	105	103	100	100	99	92	102	103	101	100	99	108	107	107	104
11	108	108	108	109	107	108	108	107	107	108	108	107	104	103	102	104	105	104	101	100	98	100	101	105	105
12	104	104	105	105	105	105	104	105	109	108	1C7	106	103	101	93	96	99	98	91	93	98	104	108	110	103
13 Q	114	113	110	108	106	106	106	107	108	107	106	106	104	104	102	104	108	107	106	105	105	106	106	104	107
14 D	106	104	105	103	102	102	103	103	108	99	109	109	104	93	67	69	72	78	82	85	93	100	109	111	97
15 D	113	113	116	122	121	124	124	124	122	117	113	98	92	101	104	97	75	76	83	94	98	102	105	123	107
16 D	176	162	161	136	129	128	124	126	119	102	104	105	102	103	98	92	100	102	98	100	101	110	113	115	117
17	128	127	124	120	121	119	118	116	104	108	111	107	102	101	103	106	111	106	101	100	100	104	106	112	111
18	113	116	116	119	117	119	115	115	106	108	112	109	97	90	96	105	106	106	102	101	104	107	104	109	108
19	116	120	119	125	122	123	117	118	118	120	115	113	115	114	112	115	113	108	103	96	95	100	104	109	113
20	110	110	111	115	113	113	110	110	109	109	107	106	107	111	108	110	108	110	103	94	97	102	101	104	107
21	110	110	113	113	116	118	112	112	118	119	117	112	106	110	108	107	109	103	93	91	93	99	102	106	108
22 Q	108	109	109	110	110	110	112	110	103	112	110	109	109	107	107	108	112	110	110	99	96	100	109	109	108
23	111	110	108	110	109	114	113	115	119	115	114	115	110	110	111	108	105	101	90	84	90	105	112	113	108
24	115	115	115	114	116	115	113	115	113	114	111	107	104	102	106	110	116	111	105	98	102	102	106	118	110
25 D	144	132	140	127	127	123	122	122	121	100	101	104	85	93	37	22	44	55	58	74	95	117	122	125	100
26 D	122	121	130	167	171	157	123	124	107	81	52	79	95	98	82	92	109	106	100	94	92	99	105	112	109
27	116	117	116	115	115	117	113	113	113	114	113	112	110	102	87	100	109	109	105	106	109	112	118	120	111
28	128	125	123	128	127	128	126	123	120	116	112	112	113	111	111	113	113	108	105	103	105	109	110	111	116
MEAN	115	115	115	116	116	116	113	113	111	108	1C7	106	104	104	99	100	104	102	99	97	99	103	106	110	107

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 7 VICTORIA　　H = 18,500 GAMMA +　　MARCH 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	462	465	469	468	459	462	467	467	469	468	470	477	476	478	477	480	472	462	449	439	438	438	453	468	464
2	477	477	477	476	472	470	474	472	472	476	474	476	478	473	477	480	482	471	466	451	444	446	453	458	470
3	474	472	478	477	471	472	466	473	467	478	475	477	479	482	482	480	481	476	459	438	432	436	447	452	468
4	460	459	448	469	475	474	471	473	471	470	474	465	477	487	484	475	469	468	452	451	446	444	448	458	465
5	463	460	464	466	474	476	472	472	479	474	473	476	475	472	481	476	479	476	463	453	449	452	459	463	469
6	467	468	472	467	471	472	473	473	472	479	475	475	477	476	479	477	476	467	461	449	446	445	451	463	468
7	467	466	473	475	473	473	474	471	474	475	477	479	480	479	484	479	475	473	464	452	444	450	458	470	470
8 D	475	478	459	461	475	478	478	482	478	480	487	495	494	491	491	489	487	480	476	461	455	454	458	465	476
9	472	472	477	471	466	468	467	479	466	469	475	473	479	483	483	485	480	470	465	455	448	449	454	471	470
10	472	467	473	479	480	478	469	480	467	474	471	480	479	475	471	479	472	457	460	449	445	442	452	464	468
11	470	473	475	473	456	466	470	475	479	479	481	488	486	484	486	479	482	472	457	451	453	455	458	467	471
12	482	481	484	484	479	479	481	484	483	483	483	486	465	481	485	482	462	443	435	406	412	413	448	450	465
13 D	463	465	465	469	464	455	457	449	456	445	440	451	460	462	445	457	455	413	395	405	416	429	428	435	445
14 D	454	460	458	458	461	462	443	442	447	442	454	445	451	468	464	468	454	451	439	434	430	420	424	456	449
15 D	435	448	454	449	446	453	468	455	451	461	457	468	467	467	462	458	449	435	453	443	438	437	444	460	452
16	445	465	463	469	459	467	466	462	470	457	471	472	468	473	474	465	470	468	447	439	424	420	439	456	459
17	471	483	483	483	481	485	485	497	487	478	483	475	483	475	473	471	467	447	447	441	437	447	451	465	471
18	454	461	471	471	470	466	472	474	473	474	476	479	478	479	477	471	463	455	443	435	431	435	450	466	464
19	470	471	481	470	471	462	473	474	471	474	478	479	479	479	479	480	465	466	466	445	431	430	430	444	465
20	445	450	453	455	446	452	455	460	479	470	470	473	473	472	472	468	457	447	439	437	441	439	443	449	456
21 Q	467	471	473	473	472	471	473	471	469	470	472	471	475	475	473	472	464	448	443	442	442	443	448	458	464
22 Q	467	474	473	476	474	473	474	473	473	481	476	479	478	478	475	478	476	468	465	457	453	456	461	470	471
23 Q	468	479	482	484	482	485	484	485	489	495	493	496	491	488	491	495	491	476	468	458	460	455	467	474	481
24	483	486	480	480	476	474	487	474	463	465	483	484	486	486	487	484	478	463	461	446	451	458	464	458	473
25	469	470	483	482	478	478	459	447	449	477	485	482	477	479	474	472	467	456	455	456	454	451	465	477	468
26	470	472	473	473	470	469	472	458	459	470	477	478	478	470	476	478	467	456	463	470	464	464	472	478	470
27	478	469	469	474	465	472	477	480	481	481	487	488	479	476	491	481	474	462	457	453	458	462	471	476	473
28 Q	477	476	482	475	479	480	477	481	486	484	486	487	486	487	490	488	477	473	458	453	454	461	467	477	477
29 Q	482	481	480	482	480	478	482	484	480	480	483	491	488	487	489	493	487	480	471	458	453	451	459	468	478
30	477	476	484	482	486	479	481	485	486	482	490	487	491	488	495	484	491	476	461	434	431	436	452	464	475
31 D	450	457	465	440	467	459	465	465	445	463	465	470	478	474	468	474	445	440	424	414	437	448	453	451	455
MEAN	467	469	472	471	470	471	471	472	471	473	476	477	478	478	479	477	471	461	454	444	442	444	452	462	467

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 8 VICTORIA D = 22 DEG 00.0 MIN EAST + MARCH 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	20.9	21.4	22.3	22.6	23.8	23.3	23.1	23.6	24.9	24.0	22.1	22.6	22.9	23.1	23.4	24.8	26.4	28.1	27.9	26.6	23.2	20.9	19.4	19.5	23.4
2	19.8	21.1	21.7	22.1	22.6	23.5	22.7	22.8	22.8	23.2	22.8	23.2	23.4	23.5	23.1	24.2	26.3	27.0	27.9	26.6	23.8	21.1	19.5	17.5	23.0
3	19.7	20.7	22.0	22.9	22.8	23.2	22.9	24.8	23.6	23.0	23.0	23.1	24.2	23.4	23.4	24.0	25.6	28.0	29.4	26.1	22.3	19.7	17.7	17.6	23.0
4	18.6	19.8	21.1	21.6	23.0	23.2	24.0	27.0	25.5	24.1	24.2	20.7	25.3	23.7	22.9	23.9	22.9	24.3	25.1	22.6	19.9	19.3	19.8	19.7	22.6
5	20.4	21.2	22.3	22.4	23.6	22.7	23.0	22.7	22.3	24.4	23.8	23.7	24.2	21.1	22.0	22.6	25.3	27.1	26.3	24.1	22.1	21.1	20.4	19.7	22.9
6	20.9	21.3	20.9	22.5	22.5	22.4	22.4	22.5	22.8	22.8	24.4	23.5	24.1	24.4	23.8	24.4	25.6	26.6	26.5	24.7	23.8	20.9	20.0	19.5	23.0
7	20.2	20.4	21.0	22.2	23.0	22.7	22.6	22.8	23.8	24.6	23.9	23.6	24.3	23.3	23.2	25.2	26.0	24.8	25.5	24.4	21.9	19.6	18.8	18.5	22.8
8 D	19.3	20.2	21.5	21.3	21.8	22.6	21.8	22.6	22.9	23.0	22.7	24.0	26.0	25.1	22.0	24.4	25.3	23.1	23.2	24.0	22.1	20.9	20.1	20.8	22.5
9	21.7	21.7	22.4	22.4	22.7	24.7	24.6	25.2	25.2	25.7	23.7	22.8	23.1	23.0	23.7	25.2	27.0	27.5	25.7	25.3	23.1	21.6	20.8	20.3	23.7
10	20.2	21.3	21.2	21.9	22.6	22.2	22.5	29.0	24.4	24.7	25.1	22.8	24.1	22.3	16.8	24.2	25.3	23.5	25.2	23.2	22.6	21.4	20.6	20.7	22.8
11	21.6	21.8	22.2	22.5	26.1	23.5	22.8	22.8	23.2	22.8	22.8	22.7	22.7	23.7	24.4	23.4	23.5	25.8	26.0	23.3	22.0	20.5	20.2	20.0	22.9
12	20.5	21.0	21.3	22.4	22.4	22.2	22.4	22.6	23.0	23.5	25.7	26.0	27.4	20.3	25.4	25.3	24.8	19.0	17.2	19.3	14.9	14.5	15.4	15.7	21.3
13 D	19.8	19.9	21.3	20.3	21.7	22.9	22.8	25.9	34.5	27.0	28.9	20.0	24.7	25.6	27.1	24.7	26.9	30.1	21.4	20.6	21.4	22.4	22.3	20.9	23.9
14 D	22.7	21.6	21.1	23.3	31.1	24.4	25.5	23.1	24.4	32.4	31.1	22.1	18.6	20.1	24.4	25.2	26.6	26.6	25.8	24.6	23.5	21.9	22.8	19.7	24.3
15 D	19.5	19.9	20.9	27.0	22.9	21.7	22.9	22.6	22.0	25.9	23.4	21.9	24.4	24.4	24.7	24.7	28.3	27.0	28.1	27.0	23.9	22.0	20.8	18.6	23.5
16	21.9	21.3	20.9	21.4	22.9	24.7	24.4	24.6	24.4	22.1	23.4	24.1	23.8	23.1	23.5	22.0	25.9	27.8	27.9	25.8	23.9	20.8	18.7	17.5	23.2
17	19.0	19.1	20.0	20.8	22.2	23.0	24.1	24.8	25.2	25.5	25.4	23.3	23.1	25.4	24.8	27.7	30.6	28.8	19.4	23.7	21.3	19.8	19.3	18.6	23.1
18	17.1	19.5	20.9	21.8	21.9	22.6	23.1	23.2	23.2	22.9	21.2	22.2	23.4	23.3	24.2	26.4	27.4	27.2	26.8	24.8	22.9	21.1	20.2	18.4	22.7
19	19.0	20.1	20.9	22.6	24.7	22.2	23.0	22.9	23.2	23.6	23.3	22.8	22.2	18.0	22.5	28.6	26.3	22.9	22.4	24.6	22.4	19.8	18.0	18.1	22.3
20	17.3	18.4	19.3	16.8	18.8	28.4	24.7	23.9	24.1	23.5	23.7	22.8	22.8	23.1	24.3	26.5	28.5	27.9	27.1	25.1	23.2	21.6	19.8	18.8	23.0
21 Q	20.1	20.4	21.5	22.2	22.5	22.5	22.7	23.2	26.2	26.0	24.8	23.4	23.5	23.4	24.3	25.8	27.8	28.1	26.3	22.7	21.5	20.3	19.9	19.9	23.3
22 Q	19.8	19.8	20.4	20.6	21.3	21.5	22.0	22.4	22.8	23.0	23.1	22.8	23.3	24.0	25.4	25.8	27.6	28.1	26.2	24.3	22.9	21.3	20.0	18.7	22.8
23 Q	18.3	19.3	20.0	20.8	21.3	21.2	21.7	22.0	22.3	22.4	23.4	23.6	24.0	24.1	24.7	25.9	27.4	28.0	25.7	22.8	22.6	20.8	20.1	19.1	22.6
24	19.9	20.1	20.9	21.5	22.2	22.7	21.8	24.3	29.2	24.1	22.0	23.8	24.2	24.0	25.3	26.7	29.0	27.3	23.5	20.6	18.7	18.8	18.1	18.0	22.8
25	20.8	20.2	20.8	21.2	21.5	21.4	28.9	37.0	27.4	18.0	23.6	22.4	21.2	23.9	25.8	27.1	27.9	26.7	24.2	22.1	20.6	19.6	19.7	19.1	23.4
26	20.3	22.0	21.0	21.2	20.9	20.5	21.1	18.7	27.9	26.1	27.2	24.5	23.9	22.5	23.4	24.4	26.8	24.6	21.5	20.1	19.8	18.9	19.5	19.8	22.4
27	20.9	21.3	21.9	23.4	22.8	23.8	23.3	22.4	21.3	21.1	22.0	21.0	24.5	19.1	23.3	26.2	27.4	27.3	24.6	22.1	19.3	18.0	18.0	18.9	22.2
28 Q	20.6	21.1	21.6	21.9	22.1	22.4	21.9	22.5	22.3	22.5	22.9	22.9	23.3	23.8	25.0	27.1	28.6	28.7	28.4	25.6	22.0	18.9	17.6	17.5	23.0
29 Q	18.4	19.9	21.1	21.7	22.2	22.1	23.0	22.8	22.8	23.0	22.7	23.1	22.1	23.1	24.6	26.2	28.0	29.2	29.1	27.5	24.2	21.1	18.3	17.0	23.0
30	18.8	19.2	20.7	21.9	21.5	21.3	21.5	21.6	22.5	22.1	23.2	24.7	23.2	23.4	26.2	28.2	29.7	30.9	30.7	25.4	20.2	17.2	15.4	15.5	22.7
31 D	13.7	16.6	16.1	20.1	21.5	22.2	23.6	26.4	29.3	26.7	30.6	25.3	23.8	23.6	21.2	21.5	25.4	25.9	25.3	20.6	17.2	18.1	17.7	16.8	22.0
MEAN	19.3	20.4	21.0	21.8	22.7	22.8	23.1	24.0	24.5	24.0	24.2	23.1	23.6	23.1	23.8	25.2	26.8	26.7	25.5	23.9	21.7	20.1	19.3	18.7	22.9

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 9 VICTORIA Z = 53,000 GAMMA + MARCH 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	115	113	113	112	112	115	114	113	114	111	112	113	111	110	111	112	111	106	99	87	88	99	106	111	109
2	112	108	109	107	108	110	112	112	111	112	112	109	110	107	108	108	108	104	101	94	98	100	103	109	107
3	114	111	110	111	110	112	113	114	113	112	111	109	108	107	108	108	105	106	102	93	91	92	100	105	107
4	114	120	124	125	118	114	113	114	113	112	110	91	77	77	69	74	80	84	89	87	85	96	100	105	100
5	111	112	114	113	114	106	109	110	102	104	107	107	105	105	101	101	104	103	98	89	91	99	102	105	105
6	111	108	111	111	110	111	107	107	107	107	104	104	103	105	106	109	109	109	108	103	97	98	96	98	106
7	105	108	111	112	112	108	111	110	110	109	107	107	104	103	100	102	105	103	98	88	88	92	96	97	104
8 D	64	106	107	113	112	111	109	105	106	104	103	80	70	84	93	97	101	100	95	91	92	98	99	103	98
9	108	106	107	107	106	110	108	102	100	99	101	102	100	103	105	108	107	103	99	97	96	95	98	98	103
10	102	102	106	107	107	104	104	100	92	93	96	96	96	98	88	95	102	98	97	95	93	96	102	98	99
11	105	105	106	105	108	111	109	109	106	106	103	97	89	94	98	102	104	104	100	95	99	100	100	99	102
12	103	102	104	103	104	105	105	104	104	101	93	81	73	76	86	100	100	89	77	80	90	96	118	119	96
13 D	119	113	112	114	122	132	137	141	124	75	87	63	55	64	82	98	92	89	90	93	97	106	116	116	102
14 D	126	120	119	123	130	122	123	121	117	79	40	73	63	75	92	109	110	106	108	111	111	111	124	135	106
15 D	145	136	135	138	145	137	124	100	96	101	101	104	106	110	109	111	110	108	108	100	107	110	111	115	115
16	114	127	124	124	125	122	123	119	118	106	93	87	92	101	102	98	99	101	99	96	96	99	110	115	108
17	116	120	118	118	125	125	114	109	96	100	102	100	94	97	101	102	104	98	93	92	93	100	108	114	106
18	113	118	116	115	116	115	116	111	114	110	110	105	106	108	110	111	110	106	102	101	100	100	102	103	109
19	111	110	113	111	114	113	113	113	112	112	112	112	106	88	82	89	98	98	102	97	103	105	115	124	106
20	127	131	131	137	149	141	125	127	118	104	112	112	113	112	113	114	114	112	108	106	102	101	104	106	117
21 Q	113	113	114	113	111	108	109	109	110	104	104	106	109	108	110	112	110	107	99	97	100	102	107	107	108
22 Q	113	110	113	111	111	110	108	108	109	108	107	107	107	106	107	109	108	103	95	92	87	86	87	93	104
23 Q	105	104	105	107	105	105	105	105	106	103	103	99	101	99	104	106	100	95	90	89	88	87	91	92	100
24	99	102	102	104	106	107	106	102	102	106	106	101	102	105	106	106	103	95	93	83	85	91	95	100	100
25	109	108	110	107	107	106	108	114	93	85	91	98	93	96	102	105	103	95	90	86	86	89	98	103	99
26	111	109	112	109	111	113	117	114	113	112	108	106	105	100	101	102	106	101	97	95	89	94	100	101	105
27	106	108	108	110	110	112	111	102	102	101	101	93	84	83	81	88	95	98	97	94	92	94	100	102	99
28 Q	107	107	107	106	106	106	106	106	107	106	105	104	102	102	103	106	109	104	96	88	87	90	91	94	102
29 Q	101	103	103	103	103	101	104	102	103	102	103	102	101	99	100	100	105	101	97	88	85	83	84	89	98
30	99	101	103	103	102	103	104	103	104	101	92	94	94	92	94	94	93	82	76	69	69	76	87	100	93
31 D	106	112	130	159	140	124	125	113	87	87	84	89	98	99	92	87	79	79	77	82	91	96	95	102	101
MEAN	110	111	113	114	115	114	113	110	107	102	101	98	96	97	99	102	103	100	96	92	93	96	101	105	104

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 10 VICTORIA H = 18,500 GAMMA + APRIL 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	458	464	458	463	456	464	481	440	460	462	467	470	472	471	475	474	473	465	460	448	435	441	452	460	461
2	470	472	472	469	470	472	470	471	475	478	477	480	476	486	480	473	476	471	462	454	459	460	464	474	471
3	467	466	469	470	460	457	455	453	461	464	475	475	478	475	469	465	469	465	457	445	438	455	469	446	463
4 D	476	450	443	462	456	464	483	474	479	482	489	488	484	484	481	476	456	426	451	448	443	452	446	455	465
5	466	465	471	468	470	468	468	467	469	471	477	476	475	475	471	468	470	470	455	444	451	443	447	455	465
6	455	465	468	460	451	465	464	467	460	450	475	478	476	475	478	476	468	461	451	454	455	445	456	475	464
7	475	478	479	476	471	467	474	469	475	470	479	478	479	483	484	477	472	461	453	444	447	447	450	462	469
8 Q	473	480	480	476	477	478	476	476	481	482	488	487	493	486	484	483	476	460	458	461	456	454	454	456	474
9 D	465	471	478	477	484	484	507	448	454	444	421	416	446	454	449	432	410	372	396	416	427	432	442	448	445
10 D	456	454	456	452	426	436	452	459	467	461	458	456	455	458	445	439	459	460	448	458	449	447	456	452	452
11	460	465	463	461	480	454	455	463	459	474	449	447	461	442	455	458	432	444	429	422	432	440	454	465	453
12	476	473	468	472	463	463	467	478	473	471	472	473	478	466	465	469	462	450	443	437	444	446	447	452	463
13	468	466	474	473	476	469	477	473	481	483	477	480	476	474	471	479	466	448	435	442	448	453	462	475	468
14 D	470	465	474	472	475	472	476	478	479	486	485	490	493	485	497	485	497	461	429	407	399	399	412	439	464
15 D	451	466	471	427	435	430	440	435	448	467	440	425	436	452	453	448	442	436	424	429	424	436	445	462	443
16	467	461	451	449	452	453	451	457	456	460	453	449	464	466	454	451	450	444	430	437	447	452	451	447	452
17	458	464	469	461	459	452	475	470	472	470	477	472	475	474	474	472	466	457	451	454	454	456	459	453	464
18	455	469	477	475	470	471	477	478	481	483	490	491	487	484	484	479	460	462	475	480	466	447	428	441	471
19	521	460	466	466	474	467	472	474	478	484	481	481	484	484	482	484	476	466	461	463	462	459	461	469	474
20 Q	585	483	482	483	477	484	487	487	484	485	483	484	484	488	489	490	493	486	479	475	470	467	465	472	486
21	482	484	482	479	478	480	478	477	482	488	469	467	472	478	490	483	465	444	432	434	459	461	477	484	472
22	448	576	426	439	453	452	459	459	464	461	458	460	458	457	452	460	447	446	434	437	431	440	442	448	454
23	456	462	465	465	467	468	461	464	467	465	481	477	480	483	482	470	465	451	444	455	448	455	456	465	465
24 Q	467	470	474	469	469	468	467	471	473	474	481	480	480	483	480	474	467	457	451	457	465	466	464	465	470
25 Q	471	473	477	471	475	472	473	477	478	483	483	483	479.	483	485	482	474	460	448	451	458	461	462	468	472
26 Q	476	470	473	475	478	479	480	477	483	486	493	491	487	491	485	493	478	465	460	456	456	459	456	455	475
27	479	475	479	477	470	467	470	477	476	470	475	486	484	482	482	478	468	460	456	451	454	462	467	470	471
28	479	470	484	487	470	468	482	479	468	466	489	490	483	501	478	505	473	449	450	450	452	460	468	474	474
29	481	489	489	486	489	486	483	482	489	486	486	482	489	491	496	498	493	486	479	477	474	473	471	484	485
30	535	503	498	496	477	468	471	482	485	484	486	490	490	490	494	486	483	479	475	473	472	474	474	476	485
MEAN	475	474	471	469	467	466	471	469	472	473	474	473	476	477	475	474	466	455	449	449	449	451	455	462	466

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 11 VICTORIA — D = 22 DEG 00.0 MIN EAST + — APRIL 1971

DAY	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	19.3	20.2	21.8	22.0	22.9	23.5	31.4	28.2	25.0	23.8	21.9	19.5	22.0	23.7	24.9	25.7	27.3	27.0	28.0	25.9	23.7	21.8	19.5	18.6	23.6
2	19.6	20.7	21.4	22.0	22.2	22.0	22.0	22.2	22.1	22.7	22.8	22.1	17.3	20.1	24.4	25.4	27.6	27.3	26.2	23.6	20.3	19.1	18.0	17.7	22.0
3	20.9	21.2	20.3	21.5	21.4	20.8	21.9	22.3	24.7	21.6	18.9	24.0	23.2	23.9	24.7	23.0	23.3	25.8	26.0	24.6	22.2	19.5	15.5	16.9	22.0
4 D	13.0	19.5	20.7	22.6	22.6	19.7	20.5	21.7	22.0	22.4	22.4	22.4	21.6	19.2	22.7	23.5	22.2	18.0	19.6	22.9	20.8	19.0	18.2	19.5	20.7
5	24.3	22.2	22.5	22.4	22.0	21.9	22.1	22.2	23.2	22.9	22.0	23.4	22.7	24.0	25.3	24.5	26.7	26.7	25.8	24.0	23.8	22.1	20.5	20.0	23.2
6	20.9	19.8	24.5	24.9	27.4	24.5	25.4	26.6	27.4	24.7	20.9	23.9	25.0	24.1	24.9	27.3	28.7	28.8	28.2	24.2	21.8	20.2	19.7	19.7	24.3
7	20.6	20.8	21.7	21.8	22.9	28.2	22.1	22.3	21.7	22.4	23.1	22.8	23.4	23.5	25.3	27.2	28.5	28.6	27.1	25.3	22.5	20.4	19.1	17.7	23.3
8 Q	18.5	19.7	20.8	21.4	21.9	22.1	22.0	23.1	24.6	22.4	22.8	21.7	22.4	25.3	26.6	27.3	26.8	26.7	24.5	23.1	20.9	19.7	17.9	16.4	22.4
9 D	16.7	17.8	19.6	20.9	20.2	23.1	48.3	35.3	32.9	35.0	26.2	35.0	35.4	32.9	32.2	29.6	29.1	28.1	17.2	17.8	18.6	18.2	17.1	19.4	26.1
10 D	17.1	23.4	18.7	21.8	28.0	24.1	24.6	21.8	23.4	21.2	23.0	24.7	22.1	23.8	24.0	20.7	18.3	22.1	23.7	23.1	22.5	23.4	21.3	20.3	22.4
11	20.8	20.6	21.9	23.2	26.3	24.9	28.0	22.1	23.8	16.5	31.3	29.9	25.0	22.0	24.1	28.0	22.3	25.5	24.8	21.8	21.0	20.0	19.0	17.9	23.4
12	21.3	20.8	23.5	21.8	22.5	23.0	22.0	21.1	21.5	22.9	22.1	21.5	23.7	23.7	23.6	25.8	26.9	27.6	26.7	25.0	20.7	18.5	17.9	17.9	22.6
13	17.8	18.8	20.9	22.9	23.8	21.9	22.6	23.0	20.9	23.4	21.6	18.8	20.9	25.5	27.4	27.4	27.9	28.3	24.5	21.1	19.0	17.8	17.6	17.8	22.1
14 D	18.9	21.0	21.2	20.7	21.2	21.1	21.5	23.1	22.1	22.4	23.2	23.3	23.3	24.9	28.7	28.7	26.3	30.6	28.6	24.1	20.1	17.5	13.6	12.8	22.5
15 D	14.2	10.9	19.1	12.0	17.6	21.6	20.2	21.8	22.1	16.4	23.4	29.6	24.5	19.8	23.6	27.2	28.1	26.8	25.0	22.1	19.1	18.1	16.1	17.1	20.7
16	18.6	16.7	19.1	19.9	19.4	21.6	23.3	22.0	22.4	22.6	22.7	18.2	20.9	23.5	24.6	25.3	26.7	26.4	25.3	23.4	21.6	20.3	18.5	19.0	21.7
17	19.0	19.5	19.8	22.1	22.0	22.7	20.0	21.1	20.1	21.8	23.4	24.0	23.8	24.0	24.6	24.4	25.9	25.6	23.3	21.6	20.7	20.3	18.7	18.3	21.9
18	19.1	19.4	20.1	20.6	21.0	23.6	22.7	22.0	21.9	22.6	22.4	22.5	23.7	25.1	25.5	25.9	25.6	22.3	21.5	22.8	23.4	22.0	20.2	19.3	22.3
19	18.0	19.6	20.8	23.5	24.9	23.5	22.5	21.2	20.2	21.0	22.7	22.7	23.1	24.8	25.2	26.5	26.8	26.8	24.2	21.4	20.3	19.7	18.6	17.7	22.3
20 Q	18.6	18.9	20.1	20.9	22.4	22.0	22.0	22.3	23.2	23.6	23.0	23.5	23.1	23.0	23.4	24.1	25.3	26.0	25.4	24.4	23.5	21.8	20.7	18.7	22.5
21	18.2	17.7	19.9	20.7	21.5	21.3	21.9	22.1	22.1	23.9	25.1	28.0	28.5	26.6	24.8	23.8	25.0	21.7	21.2	17.7	15.5	17.4	19.4	20.4	21.8
22	18.8	16.2	15.8	20.2	20.6	23.9	21.4	21.1	22.0	22.9	23.1	22.3	22.5	23.0	23.2	24.8	27.5	26.3	25.2	21.0	19.6	19.9	19.2	19.7	21.7
23	19.8	19.9	20.5	21.3	22.6	22.8	21.1	22.2	24.2	27.2	25.7	25.0	25.1	25.2	25.5	28.0	28.2	27.4	23.1	19.9	17.6	17.5	18.9	19.5	22.8
24 Q	20.3	20.7	21.0	21.8	22.1	22.7	22.0	22.1	21.9	22.3	22.4	22.6	22.3	23.4	24.9	27.5	29.3	29.0	25.6	22.1	20.0	19.4	19.6	19.7	22.7
25 Q	20.8	20.7	21.5	21.8	21.7	22.7	21.4	21.6	22.2	22.5	22.3	23.3	23.6	24.6	25.5	27.2	28.1	27.5	25.0	22.1	20.2	20.5	20.4	20.4	22.8
26 Q	20.1	20.3	20.3	20.6	21.1	21.8	22.0	22.3	22.3	21.9	22.7	22.6	23.3	26.7	28.6	28.6	27.2	27.5	23.9	22.5	21.7	21.0	19.9	16.7	22.7
27	17.6	18.9	19.8	21.3	21.0	22.5	23.3	23.7	29.2	28.0	24.3	20.4	24.3	25.7	26.3	27.2	27.9	27.2	24.7	23.1	20.9	19.5	18.7	17.4	23.0
28	17.0	17.4	19.2	19.5	22.5	19.6	19.9	20.3	25.9	23.9	23.3	23.9	24.5	28.0	29.2	25.5	26.2	26.9	24.5	22.6	19.9	18.2	17.2	17.5	22.2
29	17.9	18.9	19.8	20.9	21.3	21.1	22.1	21.9	21.6	22.0	22.1	22.8	22.7	23.4	24.0	25.2	26.9	26.9	26.1	24.6	22.0	19.1	17.5	16.5	22.0
30	17.5	17.6	19.7	19.9	21.8	22.6	21.7	24.1	23.6	22.7	22.5	19.4	20.3	25.0	24.9	26.4	26.4	25.7	24.9	23.1	21.8	20.7	19.8	19.3	22.1
MEAN	18.8	19.3	20.5	21.2	22.3	22.6	23.4	22.9	23.3	23.0	23.1	23.5	23.5	24.3	25.4	26.1	26.4	26.4	24.7	22.7	20.9	19.8	18.6	18.3	22.5

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 12 VICTORIA Z = 53,000 GAMMA + APRIL 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	111	110	115	116	119	120	104	89	103	104	106	104	99	103	107	107	102	95	95	91	91	90	92	95	103
2	103	105	106	106	107	106	106	108	105	102	104	103	77	63	63	78	84	85	86	86	92	94	96	99	94
3	111	117	113	112	112	115	118	119	117	100	72	94	102	104	104	101	98	93	90	87	90	98	97	98	103
4 D	123	159	162	144	137	128	120	113	112	111	109	107	106	101	86	91	79	59	78	84	91	97	107	114	109
5	118	116	118	115	112	111	112	112	113	113	108	106	108	110	112	111	110	107	97	92	95	94	98	106	108
6	110	113	124	120	123	109	110	102	94	89	75	84	102	109	113	119	118	112	102	99	101	101	101	106	106
7	111	110	111	112	111	114	109	108	105	102	105	107	107	107	111	109	107	104	104	101	100	96	99	102	106
8 Q	104	107	109	107	106	106	106	107	106	105	105	100	86	75	83	89	91	88	86	84	84	86	84	86	95
9 D	95	103	106	110	110	116	104	86	107	114	100	49	62	73	81	93	97	85	90	100	108	111	121	128	98
10 D	136	153	146	162	156	165	139	123	111	87	95	99	102	101	95	86	83	87	94	106	103	112	115	112	115
11	119	120	122	126	125	104	121	124	117	73	45	64	98	85	87	91	80	85	86	94	106	112	117	119	101
12	131	130	130	121	119	117	116	113	105	103	104	98	103	100	104	102	100	97	96	102	103	106	108	110	109
13	117	115	118	119	117	115	115	111	101	102	99	84	71	76	89	92	98	101	95	93	98	102	104	109	102
14 D	116	119	119	116	112	111	112	112	111	105	107	105	102	78	74	72	75	72	72	74	83	100	132	212	104
15 D	215	231	257	181	164	164	143	132	130	88	53	38	46	84	116	128	129	126	121	124	121	122	121	137	132
16	150	140	143	145	141	144	132	129	124	119	113	96	95	109	114	117	120	115	110	106	105	107	111	114	121
17	117	121	124	129	132	137	128	114	113	99	104	110	113	113	115	119	117	113	110	107	107	111	113	115	116
18	119	118	122	120	118	116	117	115	113	113	113	107	101	104	106	104	103	100	103	105	101	101	100	104	109
19	115	116	125	124	121	117	112	114	108	104	107	109	109	110	108	108	105	100	93	92	96	95	100	100	108
20 Q	102	108	111	111	111	109	107	106	101	104	105	105	106	106	103	103	107	102	92	87	85	86	92	96	102
21	102	106	109	108	106	106	108	107	107	96	90	85	81	85	93	99	107	98	88	93	103	119	139	172	104
22	171	177	170	141	132	131	128	123	116	117	116	118	117	117	111	111	115	111	107	105	110	116	120	116	125
23	114	113	114	115	118	117	117	118	115	111	111	114	114	112	113	114	111	103	93	91	95	105	107	112	110
24 Q	116	114	113	114	113	113	111	110	112	109	111	108	106	104	105	107	113	111	104	103	102	100	107	108	109
25 Q	112	110	110	111	112	112	111	112	111	111	107	107	109	108	110	114	111	104	97	96	100	100	104	104	108
26 Q	108	104	110	109	109	111	110	110	110	110	108	107	103	101	102	106	104	101	97	93	92	95	98	99	104
27	104	106	113	111	112	116	118	115	108	104	108	97	92	96	98	97	95	93	87	86	90	94	97	103	102
28	112	114	112	115	121	123	125	129	118	116	105	83	91	90	71	66	69	80	83	87	85	88	91	99	99
29	103	108	105	106	104	102	104	103	105	107	103	106	103	104	100	98	95	93	94	91	87	84	82	91	99
30	98	107	103	110	109	112	111	109	106	106	105	102	89	91	98	99	100	93	86	84	88	90	94	94	99
MEAN	119	122	125	121	120	119	116	112	110	104	100	97	97	97	99	101	101	97	95	95	97	100	105	112	107

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 13 VICTORIA — H = 18,500 GAMMA + — MAY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO C8	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	506	487	485	471	483	483	486	490	494	496	491	495	492	491	495	493	485	471	464	458	467	472	479	480	484
2	472	469	462	442	427	444	431	451	466	479	478	483	479	485	479	477	481	474	471	466	461	458	461	465	465
3	474	473	470	470	473	476	472	481	483	484	482	481	482	479	482	478	468	468	462	454	457	466	467	473	473
4	456	442	448	467	473	478	480	486	489	492	492	489	487	487	484	479	469	465	457	460	466	473	475	478	474
5	474	465	475	480	480	479	485	485	488	491	496	491	495	495	497	494	480	489	464	457	467	487	486	481	483
6 D	513	477	463	468	471	483	492	475	423	423	486	485	480	468	454	467	457	430	425	460	462	470	462	475	465
7 D	469	479	458	455	489	457	475	451	467	461	457	464	463	466	466	461	447	433	426	432	432	447	448	469	457
8	471	475	478	478	474	476	481	493	484	480	478	471	480	478	476	471	461	452	451	456	454	460	459	473	471
9	483	479	475	484	470	492	480	478	477	471	462	462	469	470	473	469	465	453	435	417	426	438	453	462	464
10	467	474	473	472	464	467	460	463	479	485	482	484	478	473	469	469	463	450	437	428	437	446	454	463	464
11	470	472	476	476	471	465	465	475	474	474	476	476	477	477	480	478	470	461	452	447	446	450	453	463	468
12 Q	462	468	478	476	476	476	478	473	477	479	478	479	477	478	477	475	471	468	462	458	459	456	461	468	471
13 Q	468	457	468	471	470	470	475	476	481	481	481	482	479	477	476	472	471	463	452	453	455	454	454	460	469
14	478	479	480	472	467	476	480	478	486	495	478	473	478	485	479	470	438	438	440	449	451	458	457	451	468
15	470	478	464	454	458	456	458	463	470	470	474	477	472	474	466	464	462	458	456	456	458	470	471	478	466
16	478	475	476	476	479	479	483	484	486	486	487	490	489	487	482	472	459	457	453	465	473	475	488	486	478
17 D	481	465	462	457	471	471	515	485	485	492	502	433	475	476	420	448	472	478	443	461	476	469	475	449	469
18 D	475	462	458	468	454	432	449	438	420	423	449	413	454	463	435	444	429	433	453	454	454	460	469	483	449
19	489	471	470	458	460	465	471	466	464	464	473	479	476	485	478	476	468	462	455	448	453	458	455	463	467
20	469	471	471	464	465	465	471	475	476	476	471	472	477	479	477	471	469	467	460	456	464	475	474	476	470
21	483	474	471	471	472	473	474	478	479	485	485	484	480	487	487	479	468	473	469	464	464	465	471	478	476
22	483	475	479	481	478	473	477	478	475	477	480	478	479	481	480	475	458	449	446	451	457	465	476	478	472
23	494	478	460	474	476	475	475	469	475	489	490	486	487	495	490	483	478	467	465	460	451	462	471	475	476
24	486	480	485	473	478	474	477	482	485	484	486	482	487	488	489	474	470	470	456	451	454	467	479	486	477
25	474	476	477	476	480	478	472	480	485	484	488	485	487	487	483	475	465	455	453	453	458	476	477	492	476
26	488	489	485	473	463	468	485	478	476	478	477	475	477	475	472	471	465	459	467	466	464	457	461	467	472
27 Q	474	477	478	473	474	472	473	477	475	478	478	478	478	481	486	481	477	469	465	465	467	469	471	471	474
28 Q	478	481	480	480	480	478	482	485	484	486	484	487	491	491	493	494	486	483	482	480	475	473	481	479	483
29	477	474	473	474	477	484	491	492	491	493	491	490	496	497	497	493	478	467	472	472	478	482	474	482	483
30 D	481	481	484	496	488	485	483	492	511	506	493	494	491	491	498	498	495	483	474	464	456	463	464	472	485
31 Q	468	468	470	474	477	479	478	480	478	479	480	482	482	484	488	492	486	478	473	476	472	465	468	473	477
MEAN	478	473	472	471	472	472	476	476	477	479	481	477	480	482	478	476	468	462	456	456	459	464	468	473	472

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 14 VICTORIA D = 22 DEG 00.0 MIN EAST + MAY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	19.1	19.3	20.6	22.4	21.0	20.9	21.3	20.7	20.4	20.9	21.0	21.6	21.9	22.9	23.3	23.7	25.2	24.8	23.1	21.4	17.5	18.2	18.5	17.0	21.1
2	17.5	20.2	18.1	17.2	21.6	27.8	28.3	30.4	22.8	21.8	21.0	21.9	23.3	23.2	23.8	24.6	24.8	24.4	23.6	22.7	22.3	20.7	19.9	20.0	22.6
3	20.8	21.1	21.4	21.6	23.9	22.0	23.5	21.4	21.6	22.0	22.2	22.9	24.3	24.6	26.0	26.3	26.8	25.4	23.9	23.0	20.4	18.9	18.0	17.3	22.5
4	17.7	18.0	21.0	23.6	20.0	20.4	20.2	21.2	22.1	23.1	22.1	22.4	23.4	24.7	26.2	27.2	27.2	26.2	24.1	19.4	16.9	16.2	16.7	18.3	21.6
5	19.7	19.9	21.4	21.8	22.1	20.8	20.6	21.0	21.5	22.0	21.8	23.2	24.3	25.5	26.8	27.1	27.6	26.9	25.2	21.6	17.8	17.5	17.7	17.9	22.2
6 D	18.8	19.2	23.1	22.4	19.8	22.0	25.2	26.7	34.1	32.9	28.9	26.8	27.3	28.1	27.7	26.7	26.3	20.4	17.8	16.4	16.8	17.1	15.6	17.8	23.2
7 D	16.2	21.4	23.9	23.8	32.2	25.8	21.1	21.3	24.0	23.0	19.3	22.6	20.5	20.4	23.3	24.9	28.7	28.2	25.2	21.8	19.9	19.0	18.4	18.4	22.6
8	18.9	19.4	20.3	21.3	23.4	21.3	24.8	24.6	17.8	17.9	22.7	20.0	21.7	23.9	24.7	27.7	27.9	27.8	25.3	22.4	19.7	18.2	16.8	17.2	21.9
9	18.8	19.0	21.5	23.9	23.1	23.0	22.6	22.3	24.8	23.8	24.9	23.6	22.5	25.6	27.6	28.6	28.5	29.2	26.7	23.7	19.9	17.6	15.6	14.7	23.0
10	14.8	17.3	21.5	25.4	22.5	23.7	26.2	22.7	19.8	19.6	20.4	21.5	22.1	23.6	22.6	24.3	24.1	25.7	25.4	22.7	19.8	18.7	17.5	17.3	21.6
11	17.2	19.9	21.2	21.6	23.6	23.0	22.0	20.9	22.1	21.5	21.6	22.5	21.8	23.1	24.3	25.7	26.0	27.4	27.0	25.3	23.0	19.9	18.8	17.9	22.4
12 Q	18.3	18.3	18.5	19.6	19.8	20.3	21.8	21.7	21.5	21.8	22.5	22.9	23.6	24.3	25.2	26.6	26.1	25.8	25.0	20.9	18.3	17.3	16.0	16.4	21.4
13 Q	17.7	19.7	20.8	21.4	22.3	21.8	21.1	20.7	20.7	21.2	21.9	22.6	22.9	24.1	25.5	28.2	28.3	28.1	25.4	21.5	19.3	18.0	17.2	17.5	22.0
14	16.0	16.1	17.6	23.5	20.1	20.9	20.7	21.8	21.2	22.3	27.0	24.8	23.0	23.5	26.0	29.3	31.8	27.5	23.1	19.2	16.6	15.8	14.5	15.4	21.6
15	14.1	19.3	16.8	17.2	19.3	20.5	22.2	24.7	20.8	20.0	19.9	20.2	23.2	24.2	25.2	25.8	25.0	22.7	20.0	17.3	14.9	13.8	13.4	15.4	19.8
16	18.1	19.1	20.1	20.5	20.6	20.7	21.1	21.9	21.8	22.3	22.3	22.6	23.0	24.3	25.3	27.1	28.0	26.0	23.3	19.6	19.4	18.4	16.1	15.0	21.5
17 D	13.4	14.6	14.2	19.1	19.0	19.1	32.7	24.5	23.5	22.9	14.0	28.3	35.5	27.9	22.1	28.6	30.8	23.3	22.4	18.7	14.8	15.7	17.0	19.6	21.7
18 D	17.4	21.4	21.8	40.1	28.2	28.0	28.6	23.3	29.7	24.1	23.4	24.1	28.1	28.4	21.9	24.4	24.6	22.6	20.5	20.3	21.0	20.5	19.0	19.0	24.2
19	20.3	21.0	21.6	21.6	21.4	21.9	28.8	22.7	23.8	23.9	21.7	22.0	21.8	25.1	26.7	27.7	28.6	27.8	24.4	22.4	21.3	21.2	19.7	19.6	23.2
20	20.7	20.9	21.5	22.0	21.3	21.2	21.2	21.0	21.7	21.9	20.2	18.9	23.2	25.6	27.1	28.0	26.5	23.6	21.3	19.4	18.0	18.0	18.0	18.1	21.6
21	18.9	20.1	20.1	20.2	20.8	20.9	20.9	21.1	21.6	22.3	21.8	22.1	24.1	27.3	27.8	28.5	27.0	23.5	20.8	19.5	19.3	19.7	19.3	18.8	21.9
22	19.5	20.7	21.3	21.5	21.5	20.7	20.3	21.8	22.4	21.6	21.9	22.7	23.9	24.5	25.3	26.3	26.8	25.2	20.8	18.3	16.1	15.8	17.2	18.6	21.4
23	17.6	18.8	20.5	19.7	19.8	21.4	24.7	20.7	20.8	20.9	22.1	23.7	24.2	25.0	26.5	28.2	28.0	26.1	23.7	21.8	19.9	16.9	17.8	17.8	21.9
24	17.6	18.1	18.4	19.2	20.3	19.2	19.1	20.0	21.2	22.0	22.5	23.4	24.2	26.7	27.7	27.4	26.5	25.6	23.3	19.9	19.1	16.3	15.0	14.9	21.1
25	18.3	20.7	21.5	23.4	23.1	21.8	21.7	21.8	21.3	20.9	20.0	21.9	23.4	25.6	27.1	28.3	26.6	23.7	21.5	19.1	18.0	17.2	16.7	16.0	21.6
26	19.0	18.4	19.3	20.5	21.3	21.2	20.0	22.4	21.5	22.2	22.3	22.5	22.3	25.1	25.7	27.6	27.3	24.8	22.1	19.9	18.9	18.6	17.4	17.7	21.6
27 Q	18.4	19.3	20.8	21.3	21.1	21.2	21.4	21.6	21.6	22.3	21.7	22.2	22.8	24.3	26.1	27.5	28.3	28.3	25.7	22.0	20.6	19.7	18.7	18.2	22.3
28 Q	18.4	19.6	20.1	21.1	21.4	21.2	20.9	21.5	21.6	21.5	21.7	22.1	23.1	24.7	26.4	27.0	26.0	26.1	24.8	23.3	20.7	19.9	18.0	16.5	22.0
29	18.2	18.1	19.4	20.1	20.7	20.3	19.7	19.9	20.3	20.9	22.0	22.7	23.8	25.3	26.0	28.0	28.1	27.6	25.5	21.3	19.2	17.4	14.6	14.3	21.4
30 D	16.9	18.9	20.0	22.2	21.1	22.6	24.0	23.2	25.0	27.3	29.9	26.5	23.0	25.4	31.0	31.1	31.3	30.9	27.5	24.1	22.3	19.6	17.4	17.1	24.1
31 Q	18.4	19.9	20.7	21.7	21.8	21.6	22.5	22.6	20.9	21.7	20.9	21.4	22.3	23.4	24.6	25.7	27.2	27.8	25.8	22.7	19.5	17.9	16.4	16.6	21.8
MEAN	18.0	19.3	20.3	22.0	21.9	21.8	22.9	22.3	22.4	22.3	22.1	22.8	23.7	24.8	25.7	27.0	27.3	25.9	23.7	21.0	19.1	18.1	17.2	17.3	22.0

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 15 VICTORIA — Z = 53,000 GAMMA + — MAY 1971

DAY	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	98	99	105	103	106	104	102	103	102	102	103	103	103	103	102	103	105	103	90	87	93	98	103	107	101
2	119	131	139	153	152	135	110	90	76	105	110	111	113	116	116	114	114	114	109	106	103	106	112	115	115
3	117	115	113	113	112	109	112	111	108	109	107	107	107	108	107	109	105	101	92	87	86	85	87	102	105
4	117	126	134	128	118	112	111	109	108	107	107	107	108	108	107	106	102	98	92	84	92	96	94	98	107
5	106	107	114	112	110	109	107	106	106	105	100	100	104	107	104	104	99	96	90	88	90	94	93	99	102
6 D	108	111	124	122	117	115	110	98	53	45	42	94	103	102	86	80	79	66	65	78	97	107	115	135	94
7 D	137	162	165	142	127	122	106	70	97	91	53	71	82	78	88	85	97	105	110	111	113	122	124	127	108
8	122	120	121	121	120	118	115	98	85	71	87	87	97	103	100	102	104	98	93	97	97	100	102	114	103
9	123	124	128	134	125	113	108	105	100	82	75	88	94	98	102	110	113	110	100	98	102	101	103	109	106
10	120	125	132	136	123	120	112	101	105	106	102	103	103	103	100	98	85	99	99	102	112	119	118	118	110
11	118	121	122	123	119	119	118	118	112	112	109	111	110	106	108	106	104	101	98	100	95	96	96	101	109
12 Q	104	108	117	113	110	108	110	111	108	110	109	106	107	105	105	104	104	98	90	85	87	94	101	111	104
13 Q	122	125	123	122	119	117	116	111	110	111	108	108	107	105	107	108	97	98	90	87	89	96	97	100	107
14	107	114	120	130	115	113	109	110	110	108	98	97	100	94	99	102	98	99	90	93	94	105	108	113	105
15	128	153	144	139	140	146	138	133	122	115	110	108	105	104	99	98	91	84	83	86	94	104	108	108	114
16	110	111	109	107	105	105	105	107	105	107	107	106	107	106	102	97	91	91	88	93	96	94	97	111	102
17 D	124	147	155	149	141	132	103	76	110	111	26	-34	43	87	36	-3	45	59	65	80	97	111	127	152	89
18 D	187	207	210	190	125	154	85	76	93	82	74	19	63	60	32	50	79	87	107	117	122	131	138	141	110
19	144	144	146	134	127	123	123	116	114	102	104	119	119	124	122	114	110	113	108	105	109	114	121	129	120
20	134	127	125	122	120	119	118	114	113	111	106	89	101	110	110	109	107	102	103	100	103	109	109	111	111
21	124	118	116	113	112	113	113	112	109	111	111	108	98	107	110	109	106	98	87	88	90	99	104	104	107
22	113	114	115	116	114	114	110	110	110	108	107	109	109	110	111	112	103	93	81	83	86	92	101	112	106
23	126	132	121	116	114	113	113	112	113	115	111	107	111	115	114	113	109	100	94	90	90	97	106	108	110
24	118	115	118	115	114	112	111	113	108	108	108	105	106	105	107	98	100	94	86	85	86	95	101	109	105
25	114	114	113	113	112	110	110	114	111	104	98	95	97	103	101	102	98	91	85	83	84	95	97	105	102
26	117	117	123	119	119	119	101	103	106	109	109	109	107	105	105	104	103	96	88	84	92	98	102	113	106
27 Q	115	115	112	111	107	107	107	109	108	107	107	108	108	109	110	107	98	94	89	87	91	95	102	107	105
28 Q	112	109	107	107	106	104	106	105	105	106	103	106	107	105	101	100	91	80	75	73	73	75	83	95	97
29	111	115	117	113	109	109	108	108	105	107	108	109	110	112	112	108	102	94	83	78	85	87	83	90	103
30 D	98	107	111	112	110	105	109	108	106	84	76	97	104	81	88	94	91	85	81	76	81	90	98	100	96
31 Q	108	113	117	112	110	108	108	105	105	106	109	107	109	113	111	111	109	103	97	92	92	90	94	100	105
MEAN	119	124	126	124	118	116	110	105	104	102	96	95	101	103	100	99	98	95	91	90	94	100	104	111	105

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 16 VICTORIA   H = 18,500 GAMMA +   JUNE 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	479	478	482	484	487	490	493	496	486	449	446	462	471	471	466	461	479	455	448	453	445	427	437	457	467
2 D	477	466	474	469	475	480	478	469	470	452	456	460	468	469	456	447	457	460	450	435	422	438	455	484	461
3 D	481	490	458	477	462	464	464	469	463	467	474	474	462	469	474	465	448	447	436	431	453	454	466	471	463
4	473	479	478	479	480	485	480	465	479	480	476	478	477	475	473	470	454	449	455	465	464	466	464	457	471
5	459	468	471	462	474	477	476	482	479	479	478	477	479	474	470	464	459	460	464	470	471	462	458	473	470
6	474	470	472	476	473	473	482	486	485	480	476	479	478	479	471	458	454	447	446	448	446	448	453	459	467
7 Q	469	473	475	477	477	474	478	481	482	483	484	485	487	491	494	490	482	470	462	462	458	458	457	461	475
8	479	475	478	468	481	473	467	473	473	473	473	477	482	489	491	495	488	466	452	450	452	464	464	472	473
9 Q	471	476	479	477	479	481	479	477	478	479	481	476	482	478	478	485	483	483	472	463	455	459	466	474	475
10	479	482	486	484	486	486	489	489	494	493	488	492	496	499	495	486	491	491	480	464	463	459	468	478	484
11	484	486	490	490	488	493	480	469	474	483	480	477	483	484	482	476	461	456	454	454	449	454	458	470	474
12 Q	478	485	489	484	485	485	478	476	484	489	495	488	491	491	490	494	491	484	471	470	469	466	468	470	482
13	476	482	477	482	483	483	483	485	483	483	489	490	491	492	485	496	506	491	481	468	456	452	448	455	480
14	469	482	488	486	477	460	466	465	470	480	479	476	477	481	474	469	465	462	459	459	463	465	469	472	471
15	473	470	467	475	480	483	482	486	484	485	483	484	490	490	485	481	483	481	475	469	472	478	472	477	479
16	474	480	475	482	481	484	486	487	493	500	500	496	494	497	497	498	494	493	497	494	489	489	480	471	489
17	475	474	483	488	482	474	480	473	478	490	485	483	486	491	483	479	480	479	473	467	462	465	470	480	478
18	490	487	479	477	479	480	474	486	484	486	486	488	495	494	492	482	477	465	457	449	454	469	478	488	479
19 Q	488	479	479	479	482	481	483	484	486	486	486	487	491	490	492	486	480	469	465	465	468	473	481	484	481
20 Q	486	483	484	481	484	484	484	483	481	491	488	491	494	501	498	496	492	489	486	473	476	490	498	501	488
21	496	495	490	491	487	491	492	491	491	492	495	497	498	497	496	487	478	470	458	464	469	473	479	485	486
22	496	489	490	482	484	485	485	486	488	492	494	495	501	500	503	497	480	469	465	467	468	474	477	488	486
23	490	487	498	488	496	489	487	473	487	490	480	473	485	502	508	505	496	487	477	469	465	467	476	488	486
24	491	491	491	486	484	481	489	486	488	492	489	494	497	496	497	497	493	488	478	462	463	474	476	482	486
25 D	480	480	477	464	461	458	451	457	466	458	449	440	448	452	463	438	434	477	487	483	470	476	483	478	464
26	489	484	479	470	466	476	472	461	471	468	471	481	482	479	483	480	476	463	450	447	452	462	470	472	471
27	473	470	476	480	478	482	480	477	477	477	481	482	479	486	492	492	491	481	477	471	463	456	458	463	477
28	475	482	485	488	487	491	493	491	493	492	496	496	497	492	505	500	501	495	480	463	450	457	471	488	486
29 D	482	486	477	488	466	467	487	486	490	489	494	500	486	478	488	471	443	431	440	457	450	445	466	485	473
30	470	456	465	453	467	469	471	474	480	476	479	475	470	462	472	473	459	446	449	447	457	454	456	478	465
MEAN	479	480	480	479	479	479	480	479	481	481	481	482	484	485	485	481	476	470	465	461	460	462	467	475	476

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 17 VICTORIA D = 22 DEG 00.0 MIN EAST + JUNE 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	17.7	19.2	20.2	20.7	21.1	20.6	20.9	21.1	28.2	29.0	30.5	33.6	27.1	26.7	30.1	30.6	27.1	30.9	23.3	21.2	18.8	16.1	15.5	15.4	23.6
2 D	15.1	18.6	19.1	19.9	21.9	21.6	24.2	22.5	22.2	20.4	25.8	19.8	19.4	27.0	26.9	25.7	26.6	27.0	23.6	24.3	23.1	20.2	17.7	18.4	22.1
3 D	16.9	19.0	25.6	25.0	22.9	22.3	22.4	18.7	23.2	22.8	21.4	22.5	20.4	22.0	28.0	30.6	32.3	29.4	26.9	21.0	18.9	18.2	19.0	19.3	22.9
4	19.8	20.2	19.9	19.8	21.9	22.0	23.0	22.8	18.5	21.7	21.6	23.0	23.6	24.1	26.1	28.5	28.7	26.4	22.9	20.7	19.3	18.5	17.2	16.8	22.0
5	18.0	18.1	19.9	20.8	20.1	20.9	20.3	21.0	20.4	20.8	21.4	22.6	23.3	23.7	25.9	28.8	28.1	26.0	22.8	21.0	19.1	17.4	16.3	16.6	21.4
6	17.6	18.5	19.2	22.4	22.4	19.8	19.6	20.0	21.5	20.1	19.7	21.8	22.5	24.0	25.1	28.0	27.7	26.8	23.6	21.5	20.1	17.4	15.3	15.2	21.2
7 Q	17.7	18.9	20.0	20.8	20.7	21.7	21.2	21.1	21.4	21.4	21.9	22.1	23.5	24.7	25.9	27.7	28.1	27.5	25.0	21.9	19.5	16.9	15.4	14.6	21.6
8	16.6	18.5	19.9	19.8	24.2	25.2	22.3	21.4	22.5	23.2	21.8	21.9	22.4	23.4	24.1	26.9	28.4	29.7	26.2	22.1	18.8	17.8	15.6	15.0	22.0
9 Q	16.6	18.8	19.8	20.7	20.8	21.5	22.8	22.1	20.8	21.1	21.5	21.0	21.8	22.6	24.3	25.3	24.2	26.5	26.9	23.7	20.4	17.9	15.9	16.0	21.4
10	16.9	18.2	20.2	20.7	20.6	21.3	21.0	20.7	20.6	20.7	23.3	21.7	22.0	25.4	27.0	28.5	27.4	26.8	26.1	25.0	22.3	19.4	16.8	16.4	22.0
11	17.3	17.6	18.3	19.6	20.0	23.8	22.3	22.6	22.4	21.8	24.5	24.0	24.2	26.0	27.1	27.6	28.7	27.6	24.2	22.2	20.8	20.1	19.0	18.7	22.5
12 Q	18.1	17.9	18.3	19.9	20.3	20.4	20.7	21.6	20.5	21.3	22.5	22.2	23.7	25.0	25.6	27.3	27.5	28.3	26.2	23.7	20.9	18.3	17.3	17.7	21.9
13	17.8	18.5	19.4	20.1	20.2	20.6	20.5	21.5	22.0	21.3	21.1	22.1	23.0	23.4	21.1	21.9	22.6	22.0	21.4	19.6	17.1	16.9	17.1	17.8	20.4
14	18.0	18.3	19.5	20.1	20.7	22.3	21.3	21.5	21.7	22.3	25.3	25.0	24.3	24.0	26.7	26.6	24.8	23.1	22.7	21.9	20.6	20.1	20.2	19.6	22.1
15	19.0	18.4	18.6	19.7	20.3	20.6	20.4	20.4	23.1	23.5	22.6	22.4	23.3	24.4	25.6	26.8	27.0	26.3	23.6	22.0	19.7	18.3	17.6	16.4	21.7
16	16.9	17.4	18.6	20.2	22.1	21.4	21.1	21.4	20.3	21.2	22.7	21.9	21.2	20.2	23.6	25.5	26.2	23.7	23.3	21.1	19.2	18.8	18.9	19.1	21.1
17	19.6	19.9	19.7	20.5	21.8	23.0	24.5	24.5	24.7	20.8	20.8	28.0	26.0	24.8	26.5	27.2	26.2	25.2	21.9	19.9	18.8	19.5	18.7	17.7	22.5
18	17.4	18.2	19.5	21.5	21.9	22.2	22.4	26.1	21.7	21.3	21.2	21.6	22.2	24.7	26.4	27.2	27.2	26.0	23.7	21.1	18.8	18.8	18.9	18.0	22.0
19 Q	19.0	19.8	20.5	20.9	21.1	20.8	21.0	21.6	21.3	21.6	21.7	22.3	22.9	23.5	24.0	24.7	25.8	25.5	23.6	20.3	18.0	16.6	15.6	16.3	21.2
20 Q	18.2	20.1	21.0	21.4	21.0	21.5	22.7	23.9	22.1	22.5	21.9	21.5	22.6	23.6	24.9	26.8	27.6	25.8	23.0	20.6	17.7	17.0	17.3	16.8	21.7
21	18.2	19.4	20.6	21.2	20.4	19.8	19.8	21.9	22.7	21.5	21.2	23.2	23.5	24.7	25.5	26.9	26.9	24.6	21.0	17.7	15.7	15.0	15.3	16.7	21.0
22	17.9	19.5	21.1	22.7	20.8	19.9	20.5	21.3	21.1	21.2	21.5	21.5	23.9	25.0	26.7	27.3	26.4	22.8	20.9	18.0	14.8	13.8	14.7	14.5	20.7
23	15.7	16.9	17.8	20.7	20.4	22.1	23.2	23.8	21.0	22.9	26.5	29.8	25.9	26.4	27.3	27.0	28.1	27.9	26.2	23.6	20.2	17.6	16.9	17.2	22.7
24	18.1	19.4	20.4	20.9	21.1	20.6	20.7	21.1	21.4	21.7	22.2	22.5	23.3	24.2	24.9	25.8	26.3	26.4	25.3	23.2	17.2	15.0	14.7	14.3	21.3
25 D	14.7	14.8	15.8	18.7	20.8	23.4	23.8	22.5	22.3	24.5	25.0	27.8	31.8	31.2	31.6	24.9	21.5	24.0	24.2	22.4	19.6	17.4	15.0	13.4	22.1
26	14.8	17.4	19.7	21.6	28.7	26.3	26.2	26.8	22.5	18.5	19.9	22.8	23.4	23.7	25.1	26.3	27.5	26.2	23.6	19.7	17.2	16.2	15.6	15.2	21.9
27	17.0	18.7	20.1	21.7	22.9	23.3	21.9	21.1	20.5	20.7	21.0	20.7	19.8	23.6	24.9	27.4	27.8	27.6	24.7	21.3	19.8	18.0	17.2	16.8	21.6
28	17.4	18.0	19.2	20.6	20.3	20.3	20.3	20.5	21.0	22.4	21.8	21.1	22.1	21.6	27.1	28.1	29.1	27.6	24.0	21.4	19.9	17.9	16.3	15.2	21.4
29 D	17.6	17.7	18.5	19.3	23.5	20.7	20.8	20.7	19.2	19.8	20.7	22.5	20.5	25.7	28.2	29.1	29.7	28.0	20.4	17.5	17.2	12.9	13.5	15.1	20.8
30	17.2	19.9	19.7	20.7	20.4	20.2	20.4	20.6	19.7	21.5	20.1	21.7	21.8	18.3	19.6	24.1	26.4	27.1	24.3	22.8	19.2	16.3	15.2	14.7	20.5
MEAN	17.4	18.5	19.7	20.8	21.5	21.7	21.7	21.9	21.7	21.8	22.4	23.2	23.2	24.3	25.9	27.0	27.1	26.4	23.8	21.4	19.1	17.5	16.7	16.5	21.7

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 18 VICTORIA | Z = 53,000 GAMMA + | JUNE 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	105	107	114	110	106	105	102	105	79	51	24	45	92	87	92	83	81	78	80	84	84	85	96	103	87
2 D	127	131	141	153	143	133	108	101	108	87	72	52	70	77	79	86	89	84	84	86	101	113	120	142	104
3 D	151	173	169	156	137	122	122	72	86	106	111	113	107	92	106	108	106	98	85	85	91	97	107	114	113
4	153	122	116	115	114	108	108	95	81	96	103	105	106	103	104	105	98	94	85	92	97	94	101	109	104
5	112	121	124	120	117	108	109	108	103	104	107	106	105	108	107	107	104	98	87	93	96	98	96	104	106
6	120	122	123	122	118	114	112	98	95	99	101	103	105	104	99	97	98	96	92	83	86	86	92	100	103
7 Q	112	114	112	110	110	108	108	106	106	104	103	107	104	108	104	98	101	97	92	86	82	84	91	100	102
8	114	118	124	120	114	114	112	111	105	101	104	107	107	113	111	115	113	105	87	85	89	99	98	103	107
9 Q	112	114	113	112	109	110	110	108	107	108	106	104	104	104	101	101	100	99	100	101	101	99	101	102	105
10	104	107	109	108	106	104	105	105	105	104	103	102	96	96	95	93	93	93	93	91	88	82	83	88	98
11	97	97	105	107	106	104	100	106	107	101	86	85	94	99	103	106	100	95	92	87	98	97	98	101	99
12 Q	106	109	110	110	108	107	108	110	111	108	97	96	103	105	104	102	97	95	89	89	88	91	89	99	101
13	105	107	105	106	104	104	103	105	104	103	105	106	107	105	93	74	68	61	64	68	76	84	93	104	94
14	108	111	115	119	123	126	123	120	118	114	105	106	102	99	95	97	94	96	90	83	86	90	98	104	105
15	111	113	113	114	109	109	108	108	99	99	105	108	111	110	110	106	104	101	101	100	97	98	97	103	106
16	108	109	106	109	109	107	108	106	106	107	105	107	102	97	89	90	86	85	86	78	76	80	91	106	98
17	113	112	114	114	111	108	108	106	107	109	101	83	94	103	103	106	101	98	91	92	95	95	97	104	103
18	110	113	113	113	111	110	112	104	98	106	106	107	104	104	108	107	108	102	92	86	87	93	98	103	104
19 Q	110	107	107	106	105	105	104	104	104	102	103	105	103	107	108	108	102	93	83	85	85	86	92	100	101
20 Q	107	109	111	107	106	107	106	106	103	100	99	102	107	110	111	111	103	95	93	89	81	84	85	89	101
21	100	107	105	107	105	101	104	103	103	102	102	104	104	105	104	100	96	95	87	86	82	83	88	91	99
22	104	110	113	111	108	102	102	103	101	101	100	100	96	97	99	100	98	94	89	83	81	85	86	89	98
23	100	106	111	111	112	109	108	111	108	106	90	78	79	95	101	103	103	101	87	80	80	82	83	96	98
24	102	105	109	105	103	101	102	101	102	101	102	101	101	99	100	100	97	91	83	78	74	77	88	98	97
25 D	110	125	137	144	150	148	142	131	125	104	79	34	6	-9	4	3	15	51	84	97	97	102	107	118	88
26	139	142	143	134	134	119	109	112	111	85	63	84	94	97	104	105	107	99	85	81	83	86	94	103	105
27	109	113	114	109	108	108	102	103	102	100	99	99	93	97	101	101	100	95	84	83	79	82	90	95	99
28	104	106	107	103	104	98	100	101	100	92	97	100	103	95	93	92	88	87	85	78	75	83	92	107	95
29 D	113	120	120	118	122	118	110	103	105	105	106	104	87	73	85	94	96	89	82	86	92	109	123	127	104
30	130	135	128	113	112	107	106	105	103	98	97	99	100	92	81	89	92	92	84	86	84	84	92	107	101
MEAN	113	116	118	116	114	111	109	105	103	100	96	95	96	96	96	96	95	92	87	86	87	90	96	104	101

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 19 VICTORIA — H = 18,500 GAMMA + — JULY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO C8	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	501	476	481	495	479	483	479	474	475	479	475	475	475	473	475	483	480	470	459	460	458	459	472	478	476
2 D	479	485	496	465	474	473	481	477	468	477	479	474	466	486	492	480	470	464	456	452	456	466	469	466	473
3	485	468	473	474	478	478	477	482	490	485	485	482	486	485	486	483	477	471	462	467	465	465	471	469	477
4	472	474	468	463	467	469	475	471	476	477	477	480	479	479	475	474	463	453	452	459	463	468	475	484	471
5	487	477	471	472	477	483	485	492	485	485	482	481	483	486	480	475	472	464	451	461	474	478	474	476	477
6	488	477	473	480	486	486	487	488	491	491	494	494	491	490	486	482	483	483	475	467	462	468	480	489	483
7 Q	486	488	486	483	483	486	489	489	494	493	498	496	503	510	513	502	484	471	467	468	474	479	478	483	488
8	493	488	487	484	484	477	474	478	483	477	484	490	488	486	489	484	483	472	469	468	467	476	466	467	480
9	486	463	484	469	475	481	478	478	481	481	483	482	487	489	488	482	476	469	458	455	466	473	484	489	477
10 Q	483	479	482	483	480	479	478	478	477	477	478	482	485	491	491	486	472	461	453	455	460	465	469	476	476
11	480	479	481	478	479	482	485	482	486	487	484	486	488	486	487	486	483	482	472	463	466	474	476	482	481
12	468	476	482	487	488	491	485	487	489	490	492	490	495	505	511	504	495	487	473	471	471	484	491	490	488
13	497	488	491	482	490	493	496	476	473	486	491	492	492	491	490	495	492	490	467	464	475	474	471	476	485
14	482	478	482	479	475	482	479	476	485	494	486	480	490	493	493	488	496	488	478	474	464	462	465	468	481
15	474	473	486	482	486	469	475	479	484	486	477	477	480	491	495	493	487	481	469	459	456	454	464	477	477
16	487	495	485	481	479	481	483	490	493	495	492	488	486	492	497	496	484	469	463	464	456	465	472	477	482
17 Q	484	473	482	481	480	481	483	485	486	486	488	486	486	485	490	487	479	476	472	473	475	473	480	483	481
18	483	482	485	487	481	469	481	489	490	495	495	494	496	499	502	496	480	456	444	452	466	478	486	486	482
19	493	486	491	461	478	482	480	488	487	491	491	494	495	489	487	480	469	468	459	450	451	460	464	475	478
20 Q	483	482	482	483	485	483	484	486	489	486	489	492	494	497	489	475	462	458	449	452	461	470	475	473	478
21 D	475	477	477	484	483	489	494	496	499	499	490	496	487	499	482	451	433	419	425	405	429	445	463	484	470
22	486	489	473	458	458	468	463	466	468	473	470	471	475	477	484	485	479	467	455	457	464	466	473	480	471
23	480	482	479	475	479	479	481	482	489	492	493	492	493	494	512	514	508	484	478	467	462	458	473	479	484
24	465	473	482	481	480	479	481	484	485	486	490	491	497	498	500	493	481	463	454	455	461	469	471	484	479
25 Q	487	486	480	484	484	484	484	488	487	491	489	490	494	489	492	488	483	469	463	462	464	466	467	473	481
26 D	480	483	483	483	484	484	485	484	485	489	488	490	494	501	505	497	489	504	473	481	476	495	476	435	485
27	462	479	472	485	485	484	489	486	488	490	493	493	494	493	494	482	467	455	461	462	462	461	470	473	478
28	481	479	483	474	476	484	481	487	489	488	484	483	483	488	490	491	480	465	457	455	459	461	466	471	477
29	472	478	481	479	482	486	487	487	484	487	486	484	487	493	492	482	475	463	456	459	452	437	450	446	474
30	456	465	470	468	455	459	476	471	478	478	478	478	468	472	483	475	473	465	460	458	463	469	473	477	470
31 D	479	484	481	472	479	482	486	485	484	483	484	484	481	488	485	481	477	467	445	436	445	452	467	476	474
MEAN	481	479	481	478	479	480	482	483	484	486	486	486	487	490	491	486	478	469	460	459	462	467	472	476	479

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 20 VICTORIA — D = 22 DEG 00.0 MIN EAST + — JULY 1971

HOUR = DAY	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1 D	14.3	16.8	18.4	23.5	28.4	23.9	22.3	22.4	21.5	21.5	22.1	22.3	23.4	23.2	24.0	25.7	26.0	26.2	23.8	20.4	17.5	17.9	18.2	17.1	21.7
2 D	17.8	18.7	24.5	20.9	20.6	23.2	28.3	26.8	24.3	21.5	20.6	21.7	20.9	21.2	25.1	29.0	28.4	27.8	24.2	19.4	15.9	14.5	13.5	15.7	21.9
3	17.6	19.3	20.3	20.6	20.8	20.7	21.3	20.8	20.8	20.9	20.5	20.3	19.4	21.2	25.2	28.5	29.1	27.1	24.6	21.1	19.1	17.8	16.8	16.5	21.3
4	17.5	18.9	19.5	19.9	20.7	20.5	21.7	20.7	20.4	20.5	20.6	21.7	22.9	24.8	26.6	27.0	28.2	25.4	22.2	18.3	16.3	14.7	14.7	14.2	20.7
5	15.2	18.3	20.0	20.2	21.2	20.8	21.9	21.6	20.8	22.1	22.1	21.6	23.6	25.2	26.2	27.7	27.0	26.5	24.2	18.3	16.2	17.1	16.7	17.6	21.3
6	17.2	19.0	19.1	19.4	19.1	19.6	20.4	19.7	19.5	20.3	20.9	21.9	22.8	23.9	25.4	26.1	26.8	26.0	20.9	18.4	17.0	16.0	17.4	17.1	20.6
7 Q	18.5	19.0	20.4	21.0	21.0	20.7	20.7	20.8	20.7	21.5	21.8	22.8	23.5	24.5	26.3	28.5	29.8	28.6	24.6	20.8	18.7	17.9	17.8	17.5	22.0
8	18.4	19.2	20.7	21.2	26.5	21.7	22.5	21.5	21.4	22.1	20.4	22.2	24.9	25.4	27.6	27.7	27.6	27.5	24.8	21.4	18.5	16.0	14.2	15.6	22.0
9	16.3	19.3	19.7	20.6	20.4	21.6	24.3	20.1	21.2	20.8	21.1	21.5	22.4	23.7	24.5	25.7	25.0	24.1	22.6	18.9	17.3	17.1	17.8	18.6	21.0
10 Q	19.3	20.4	21.2	21.6	21.5	21.5	21.1	21.4	21.7	21.4	21.6	21.8	22.1	23.0	24.2	26.2	27.1	25.3	22.3	19.0	16.7	16.0	16.3	17.1	21.2
11	18.5	19.1	19.9	20.1	20.6	19.9	21.5	21.0	20.5	20.8	21.1	23.0	24.3	26.3	26.5	26.6	27.0	26.3	24.8	21.9	17.9	15.7	14.7	14.7	21.4
12	17.6	19.0	19.6	20.1	20.3	19.9	20.8	20.1	20.4	20.6	20.9	22.2	22.6	23.8	26.0	28.4	28.5	27.8	25.5	20.4	18.3	14.1	14.0	15.4	21.1
13	17.2	18.2	20.0	20.4	20.5	21.6	24.0	26.0	26.6	21.0	19.6	19.6	23.0	25.4	26.6	27.3	27.2	27.5	26.1	21.5	19.5	19.2	17.6	16.1	22.2
14	17.2	17.9	19.4	20.1	21.7	21.7	22.6	23.8	20.9	21.4	20.9	25.2	25.7	25.6	25.9	27.6	27.7	27.1	25.1	21.7	19.9	20.0	19.9	19.3	22.4
15	18.5	19.0	19.8	22.5	29.4	25.0	21.6	21.9	22.1	22.3	22.5	21.1	23.1	25.2	26.8	28.6	30.0	30.3	26.5	23.1	19.8	19.0	17.6	16.3	23.0
16	17.0	17.8	19.0	20.7	20.4	21.0	20.7	22.2	21.2	21.7	20.8	20.2	22.0	22.1	24.6	27.1	28.4	28.0	23.9	21.2	18.4	16.9	16.2	16.6	21.2
17 Q	17.5	19.5	20.6	20.5	20.3	20.5	22.1	21.4	21.0	20.8	20.8	21.1	21.9	22.7	25.4	26.8	26.6	26.9	24.5	21.4	18.7	17.1	16.7	16.9	21.3
18	18.3	19.4	20.5	22.8	23.8	22.4	20.0	20.0	20.4	20.4	21.2	20.9	24.6	25.5	28.0	28.5	30.4	27.7	23.3	18.9	14.4	13.1	14.1	15.4	21.4
19	15.9	19.3	17.9	18.6	18.5	19.4	19.1	19.3	19.7	19.6	20.5	21.1	22.6	23.4	25.8	27.4	28.3	26.1	22.7	19.1	16.5	14.5	13.3	15.5	20.2
20 Q	18.5	20.9	22.1	21.8	20.6	20.4	20.2	20.5	20.6	20.8	21.1	20.9	21.8	23.4	24.6	27.4	27.6	26.3	21.7	18.6	16.6	15.5	15.5	17.1	21.0
21 D	18.8	20.6	20.7	20.4	20.3	19.8	19.2	19.5	21.1	20.3	17.6	21.1	24.5	23.3	27.1	23.3	26.7	25.3	21.5	18.4	14.7	12.8	12.1	12.2	20.1
22	14.1	18.3	18.4	19.4	17.2	18.0	18.9	19.6	19.9	20.7	21.5	22.3	23.1	24.3	25.6	27.1	27.7	26.9	23.9	20.1	17.5	16.6	16.4	17.3	20.6
23	19.3	20.5	21.3	21.5	21.1	20.9	21.0	21.1	21.5	21.0	21.9	22.4	24.1	25.3	26.5	29.4	31.3	30.1	24.3	19.2	16.7	15.2	15.3	17.1	22.0
24	19.7	20.1	20.7	21.6	21.1	20.2	20.5	20.5	20.7	21.0	21.0	21.4	22.8	23.9	27.6	29.1	30.1	28.5	22.8	18.9	15.9	14.5	15.0	16.4	21.4
25 Q	18.9	19.7	20.0	20.5	20.7	20.5	20.7	20.9	21.2	21.4	21.1	22.1	22.8	23.6	26.1	26.2	26.7	26.7	23.5	20.0	17.5	17.2	18.0	18.1	21.4
26 D	18.7	19.8	20.7	21.2	21.0	21.1	20.7	21.1	20.8	21.2	21.2	21.7	22.9	24.0	26.1	27.8	29.0	26.8	27.0	18.7	15.1	13.9	14.1	16.9	21.3
27	16.1	17.1	20.6	20.8	20.1	20.4	20.5	20.5	20.8	20.7	22.0	22.3	23.5	26.4	28.5	29.8	31.4	29.0	23.8	18.7	14.9	15.1	16.5	17.4	21.5
28	17.6	20.1	19.8	22.0	24.0	21.2	21.2	19.7	20.2	20.5	20.5	21.5	22.7	23.7	25.1	26.4	26.9	26.4	23.9	20.9	18.3	16.6	16.2	17.0	21.3
29	18.2	19.3	20.8	20.6	21.0	20.8	20.6	21.3	21.2	21.3	20.9	22.0	24.0	23.8	24.6	27.5	29.8	29.2	24.7	20.6	19.6	16.8	15.8	16.2	21.7
30	17.0	17.7	19.7	19.0	20.4	21.0	22.9	20.7	20.0	20.0	18.7	18.1	24.7	26.2	27.2	29.5	31.6	29.9	26.4	22.3	18.0	15.4	14.7	16.3	21.6
31 D	18.2	19.2	19.9	19.7	20.4	20.2	20.4	20.7	20.2	20.3	21.6	22.7	22.8	25.9	26.7	28.0	28.1	27.0	24.3	19.1	15.7	15.1	16.0	17.1	21.2
MEAN	17.6	19.1	20.2	20.7	21.4	21.0	21.4	21.2	21.1	21.0	20.9	21.6	23.1	24.2	26.0	27.5	28.3	27.2	24.0	20.0	17.3	16.1	15.9	16.5	21.4

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 21 VICTORIA Z = 53,000 GAMMA + JULY 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO C8	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	125	124	124	129	116	109	105	102	103	107	106	109	111	105	101	104	105	101	98	91	84	83	94	102	106
2 D	110	126	148	135	124	120	114	97	96	99	100	104	100	97	96	97	95	85	83	71	69	77	87	95	101
3	111	108	112	109	105	106	103	104	98	92	99	97	93	89	90	94	93	91	86	83	84	87	95	112	98
4	129	135	136	126	120	117	114	111	108	105	105	105	105	106	105	101	93	87	80	82	79	77	81	98	104
5	112	118	123	117	115	108	105	104	100	99	95	96	103	106	106	107	100	94	89	85	78	87	94	99	102
6	113	115	113	109	105	106	105	106	104	102	100	100	100	101	101	94	82	70	63	74	83	82	85	93	96
7 Q	92	97	101	100	98	100	98	98	97	99	96	99	100	103	105	104	103	94	85	86	92	95	97	99	97
8	115	118	115	116	116	108	111	113	110	104	102	96	98	100	99	99	96	87	81	82	74	78	90	103	100
9	115	109	120	107	105	109	108	106	106	104	102	104	104	105	106	100	96	91	90	86	86	89	95	100	102
10 Q	106	109	105	100	100	99	98	100	99	99	98	98	98	101	102	102	100	95	77	69	74	79	86	96	95
11	102	103	106	102	102	101	101	101	100	99	99	97	100	95	94	92	90	80	73	65	69	75	82	91	92
12	97	99	102	101	100	98	98	97	97	98	99	98	96	99	97	93	85	83	74	75	76	83	90	97	93
13	110	105	108	102	103	100	97	97	102	97	95	90	96	102	102	101	89	84	74	74	84	84	86	95	95
14	102	98	102	104	103	101	101	102	101	94	76	75	83	88	88	90	86	80	75	81	86	85	89	94	91
15	103	106	107	116	110	104	104	105	103	96	90	89	96	99	106	105	102	92	84	82	85	93	96	102	99
16	111	114	108	104	100	100	100	98	94	88	85	85	86	93	94	95	87	86	79	67	72	82	88	90	92
17 Q	104	109	109	103	98	97	98	96	97	97	94	97	97	100	101	100	98	87	80	80	87	87	85	92	96
18	103	108	105	105	105	105	105	102	100	100	97	99	102	99	103	101	97	82	70	61	62	72	87	98	95
19	113	115	121	106	99	103	100	100	97	99	97	98	99	100	101	100	92	92	87	78	75	77	86	96	97
20 Q	105	111	107	103	99	98	98	97	96	96	96	97	98	101	98	96	80	70	67	72	79	82	89	97	93
21 D	110	112	112	108	101	103	103	103	102	99	92	89	92	94	76	60	56	56	68	70	88	112	137	146	95
22	153	165	156	145	136	132	122	117	115	113	112	112	112	115	117	118	117	110	103	99	99	99	108	119	121
23	123	118	112	111	108	106	106	108	107	104	105	103	103	101	106	103	98	88	86	80	74	79	85	100	101
24	111	112	111	107	100	102	102	104	105	103	101	103	105	105	102	103	93	85	81	87	93	92	89	95	100
25 Q	100	98	98	99	98	98	98	101	99	100	100	99	99	100	102	100	98	90	82	78	84	85	87	89	95
26 D	99	101	104	99	97	96	97	95	97	98	97	96	96	99	102	102	98	86	69	63	71	78	79	79	92
27	92	103	107	106	100	98	97	98	97	100	95	97	96	90	96	92	89	83	78	72	67	73	81	88	91
28	104	108	110	111	110	99	102	97	88	89	94	97	99	103	105	106	107	102	94	88	85	90	96	99	99
29	106	106	105	100	101	98	98	97	96	98	95	93	96	100	98	98	90	90	85	78	78	77	93	107	95
30	126	125	126	125	133	130	124	110	109	105	103	79	69	74	90	99	100	94	82	73	77	77	82	92	100
31 D	104	110	112	109	110	108	103	103	101	101	98	87	78	85	93	96	99	93	81	79	89	92	94	103	97
MEAN	110	112	114	110	107	105	104	102	101	99	98	96	97	99	99	98	94	87	81	78	80	84	91	99	98

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 22 VICTORIA H = 18,500 GAMMA + AUGUST 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	477	479	472	480	480	483	484	489	487	485	483	487	486	490	489	494	491	483	477	467	457	469	484	497	482
2 D	488	496	504	467	458	471	472	467	431	471	473	465	464	468	480	482	474	460	456	456	454	459	466	478	469
3 Q	479	483	479	479	475	478	483	483	482	484	486	487	487	488	492	483	465	458	454	456	459	469	470	475	476
4	478	482	476	480	474	467	471	476	483	486	484	486	475	485	488	482	472	458	445	435	460	476	482	499	475
5	561	480	479	462	437	449	472	459	466	466	466	468	471	477	484	481	468	452	443	444	455	466	468	483	469
6 Q	540	476	474	475	479	480	481	481	483	483	485	487	488	489	487	478	468	459	453	450	456	468	472	478	478
7	485	480	482	484	483	485	487	486	490	498	494	495	493	495	492	487	480	471	468	467	474	481	489	493	485
8	487	480	465	457	463	464	463	468	470	468	477	470	481	480	472	477	474	466	457	457	456	449	457	475	468
9	486	479	480	481	479	472	477	484	485	485	482	491	487	495	496	485	464	450	451	469	473	475	482	476	479
10	483	482	477	462	457	456	476	481	484	489	485	485	489	488	489	484	469	466	465	464	464	457	468	470	475
11 D	478	464	466	456	454	457	475	483	487	494	492	470	483	494	487	491	476	463	456	458	456	463	470	472	473
12	475	471	478	487	488	487	495	482	462	477	491	493	476	471	488	484	474	467	463	462	457	458	467	477	476
13	471	479	478	478	483	479	489	486	490	489	490	486	488	488	491	491	492	486	479	483	481	481	480	472	484
14 Q	469	477	481	480	486	487	489	489	491	491	491	489	491	496	498	493	482	462	453	458	465	470	473	480	481
15	486	490	486	485	484	486	486	487	488	492	501	496	499	498	504	496	484	466	467	470	465	466	465	474	484
16	490	498	491	484	472	490	493	494	493	496	497	497	496	492	491	493	487	478	468	460	463	471	474	480	485
17	486	487	489	487	491	492	495	494	501	507	498	499	491	491	492	486	470	461	458	462	466	477	494	466	485
18 D	489	478	481	466	490	490	492	490	491	488	490	490	487	490	488	484	469	451	446	453	456	464	475	476	478
19	479	476	474	483	482	478	477	479	482	486	486	483	486	487	489	479	468	455	452	455	464	473	484	488	477
20 Q	491	488	484	487	488	486	488	490	489	493	495	496	496	501	493	484	470	456	460	463	465	472	481	488	484
21	498	497	487	483	476	465	469	474	475	477	478	479	483	492	492	490	485	473	455	441	440	453	463	466	475
22	471	466	473	483	476	468	468	475	469	484	482	490	487	489	490	486	476	466	453	450	458	465	477	484	474
23 D	475	453	477	481	492	485	488	489	487	480	485	488	482	483	486	477	460	443	431	441	450	457	466	471	472
24	478	480	478	481	485	486	483	484	487	487	488	483	486	488	484	480	471	454	451	460	462	464	463	474	477
25	485	475	485	486	484	486	486	487	490	488	493	493	493	495	488	473	462	453	442	446	459	464	466	473	477
26	461	468	475	477	480	478	463	463	463	470	472	462	476	479	485	476	466	459	451	441	435	444	453	472	465
27 Q	481	481	482	483	483	485	483	481	483	485	485	487	485	491	486	478	464	449	436	434	443	458	476	477	474
28	485	488	488	489	490	488	491	491	501	499	503	503	502	509	494	482	478	477	465	460	462	473	478	480	487
29	480	476	486	486	488	486	488	490	493	492	489	492	492	492	489	474	462	451	449	458	467	468	479	486	480
30	476	481	488	485	484	485	484	483	487	487	488	488	490	485	484	475	471	465	457	465	473	476	484	503	481
31 D	515	486	464	462	467	469	465	469	490	493	486	484	484	486	482	467	467	468	480	467	459	454	477	487	476
MEAN	487	480	480	478	478	478	481	482	483	486	487	486	486	489	489	483	473	462	456	457	460	466	474	480	477

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 23 VICTORIA D = 22 DEG 00.0 MIN EAST + AUGUST 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO C6	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	18.6	19.7	20.6	20.5	21.5	21.2	20.5	21.0	20.9	21.0	20.9	22.1	21.6	24.5	27.2	28.8	27.5	26.9	24.4	21.6	19.4	17.7	15.4	14.7	21.6
2 D	16.4	16.8	19.1	27.0	20.7	20.0	28.3	27.4	23.1	25.6	22.2	23.5	22.2	20.4	26.0	28.9	29.5	27.5	24.2	21.6	19.4	19.6	19.5	18.4	22.8
3 Q	18.9	21.1	20.6	20.5	20.2	20.3	20.6	20.5	20.8	21.3	21.6	22.2	22.8	22.9	24.9	26.9	27.9	26.4	23.0	18.6	16.7	15.9	16.5	17.1	21.2
4	17.9	18.7	20.2	19.5	22.7	21.7	20.5	20.4	20.2	20.4	20.6	22.5	23.2	23.1	25.2	26.8	28.0	26.7	23.1	17.8	15.9	15.1	14.6	14.5	20.8
5	16.1	17.7	18.9	22.0	23.6	24.8	23.3	22.9	19.9	20.6	21.5	23.0	23.5	25.3	26.2	27.1	29.1	27.3	22.8	17.8	15.9	14.6	14.8	16.9	21.5
6 Q	19.6	21.4	21.6	21.4	20.9	20.8	20.8	20.8	21.0	21.3	21.9	22.6	23.3	24.2	26.1	27.7	28.6	28.3	23.8	20.1	17.3	15.0	15.3	17.0	21.7
7	19.3	19.6	20.3	20.2	20.5	20.4	20.3	20.5	20.7	21.1	22.0	23.1	23.2	24.2	25.2	26.8	28.2	27.5	24.3	19.4	15.3	12.6	12.0	13.0	20.8
8	13.9	12.4	13.5	14.8	21.0	27.2	22.3	20.8	25.2	24.0	26.8	24.4	21.9	21.1	19.6	24.3	26.8	25.7	21.4	18.9	18.8	17.8	15.9	17.4	20.7
9	19.5	20.4	21.3	20.5	21.4	21.7	20.3	21.6	23.7	22.2	20.5	21.7	24.1	25.0	26.2	27.0	27.9	24.5	19.3	15.3	14.0	14.7	16.5	16.8	21.1
10	19.0	19.9	21.4	25.4	22.8	23.4	24.7	20.5	20.0	19.7	20.5	20.8	22.0	22.4	23.9	27.5	26.6	25.3	20.3	17.7	18.1	17.2	16.8	17.4	21.4
11 D	20.2	20.4	23.4	31.7	29.4	23.3	22.0	20.6	20.0	23.1	23.1	26.1	23.1	24.7	28.5	28.9	28.8	27.6	23.4	21.9	18.6	17.0	16.3	17.1	23.3
12	18.9	19.7	20.1	19.4	20.7	24.3	27.6	25.7	26.5	21.3	20.1	20.2	19.2	18.2	25.5	28.9	30.4	27.6	24.1	20.4	17.7	14.6	14.6	15.1	21.7
13	17.3	19.0	20.2	22.8	24.5	22.4	22.3	22.1	20.1	19.7	21.8	21.7	22.5	22.6	23.7	24.7	28.0	27.4	23.0	20.4	18.2	18.1	17.2	18.1	21.6
14 Q	18.9	19.5	20.0	21.2	21.9	22.5	20.8	20.6	20.9	20.9	21.0	20.0	21.9	22.9	24.7	26.5	27.9	27.4	24.4	20.9	18.5	17.7	18.0	18.7	21.6
15	19.8	20.3	21.2	21.2	21.5	21.1	20.9	21.1	21.6	19.8	21.7	21.9	22.1	23.9	27.8	28.9	28.1	26.2	21.1	18.2	17.0	16.6	17.4	18.3	21.6
16	19.1	18.5	18.9	20.1	19.9	19.1	19.3	19.3	19.9	19.4	15.4	19.8	21.6	23.6	24.9	26.1	28.0	27.1	24.0	18.6	15.5	15.1	16.2	18.0	20.3
17	20.0	19.9	19.5	19.2	19.6	19.3	20.1	20.3	21.1	20.9	21.5	22.5	22.9	26.0	29.7	31.5	31.0	27.9	22.4	18.9	16.7	17.3	15.8	15.8	21.7
18 D	13.7	16.4	15.2	16.2	18.5	16.3	17.4	18.0	19.4	20.5	21.7	22.8	23.6	24.2	26.5	28.8	29.9	27.8	22.9	17.7	16.3	16.1	16.3	17.5	20.2
19	19.7	22.3	20.3	19.4	19.9	21.2	21.7	20.1	19.4	20.2	20.8	21.8	22.8	24.6	26.0	26.8	27.1	24.9	21.2	18.0	16.1	15.0	15.9	18.4	21.0
20 Q	20.7	21.2	21.2	20.2	20.2	20.3	20.0	20.1	20.1	20.9	21.3	21.8	23.0	23.4	24.9	27.0	28.8	26.2	20.7	16.5	15.8	15.4	15.8	17.9	21.0
21	19.9	20.7	20.6	20.9	20.5	24.3	22.2	22.9	22.1	22.6	25.4	26.2	23.7	25.5	28.9	29.2	30.0	26.2	23.2	19.1	16.9	14.8	14.3	15.5	22.3
22	15.9	18.7	20.8	21.0	21.5	22.8	23.4	22.5	20.9	23.7	22.4	22.2	23.2	22.8	22.1	23.8	26.8	25.6	21.7	18.5	16.1	14.3	14.2	14.7	20.8
23 D	13.8	15.7	18.0	17.7	17.8	20.7	21.6	23.2	23.5	22.9	22.2	22.1	21.2	22.8	26.8	28.1	29.4	27.6	21.6	17.7	16.3	15.3	14.4	15.8	20.7
24	18.6	20.0	21.6	21.7	21.8	20.4	22.1	20.5	20.2	20.5	21.0	23.2	22.9	24.3	26.5	27.6	27.5	26.7	21.4	19.4	17.7	15.8	16.0	16.0	21.4
25	15.5	18.2	19.1	19.9	20.3	19.7	19.7	20.7	21.5	21.2	21.2	20.1	22.0	23.9	26.1	28.5	26.1	27.0	21.8	17.7	15.9	15.0	14.9	15.5	20.5
26	16.9	20.0	20.1	19.4	20.0	20.1	23.9	23.1	19.6	24.0	24.1	27.1	25.7	26.0	27.0	27.1	28.0	27.4	22.9	21.0	18.3	16.4	17.0	17.4	22.2
27 Q	19.0	21.1	21.2	20.8	20.5	20.5	20.3	20.0	21.3	21.3	21.5	21.8	22.4	23.6	26.0	27.9	28.5	27.6	23.7	20.9	18.6	17.7	17.3	17.4	21.7
28	19.5	18.9	18.8	19.0	19.3	19.8	20.1	20.9	20.3	21.0	20.8	22.5	23.3	24.1	26.8	25.0	23.9	24.0	21.8	18.7	17.4	17.7	18.3	16.5	20.8
29	18.4	20.0	19.3	19.7	20.2	20.1	20.2	20.4	20.4	21.5	23.0	22.5	22.6	23.3	25.0	26.0	26.7	24.8	22.7	20.0	18.1	17.2	17.3	16.7	21.1
30	17.6	19.8	19.6	19.4	19.5	20.1	19.8	20.9	20.2	21.7	22.7	22.2	22.9	23.9	25.2	27.2	25.3	23.5	21.9	17.9	15.3	14.5	15.1	15.0	20.5
31 D	14.4	12.5	14.4	13.6	19.8	19.4	27.8	22.4	19.5	20.4	22.6	22.9	23.2	24.3	25.7	28.1	26.7	24.1	21.3	19.0	15.9	15.0	16.7	17.4	20.3
MEAN	18.0	19.0	19.7	20.5	21.1	21.3	21.8	21.3	21.1	21.4	21.7	22.5	22.7	23.6	25.8	27.4	28.0	26.5	22.5	19.0	17.0	16.0	16.0	16.6	21.3

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 24 VICTORIA Z = 53,000 GAMMA + AUGUST 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	109	116	110	110	106	102	101	100	100	102	99	98	97	97	97	97	88	76	75	74	73	79	82	95	95
2 D	97	97	107	126	120	119	113	86	50	86	90	98	98	100	110	108	103	96	85	89	93	101	99	105	99
3 Q	111	113	109	106	100	101	100	99	99	99	99	100	99	102	101	104	95	84	76	75	83	90	96	98	97
4	106	107	106	108	110	110	114	110	110	104	101	92	83	91	104	105	104	100	92	77	72	79	86	97	99
5	111	118	128	143	149	147	91	100	107	106	107	108	107	108	112	110	109	98	83	87	85	83	83	93	107
6 Q	101	103	102	100	100	99	100	101	101	99	101	98	99	100	103	102	97	89	84	82	82	89	91	95	97
7	106	102	100	100	98	100	100	99	100	99	98	95	96	93	95	90	86	82	70	67	66	74	87	99	92
8	105	108	123	130	138	127	119	118	109	100	88	80	90	98	93	98	101	96	92	93	96	98	103	107	105
9	119	114	111	107	108	108	111	110	110	102	94	85	82	94	102	102	97	83	75	78	80	79	90	100	98
10	111	111	126	135	132	131	119	112	112	110	110	108	109	108	107	111	105	89	84	82	85	84	101	109	108
11 D	125	124	127	129	129	124	121	112	108	99	67	64	83	95	106	110	103	93	90	88	84	89	96	102	103
12	109	110	108	107	104	104	96	72	76	86	89	98	96	80	94	97	98	96	93	95	94	92	92	105	95
13	110	111	110	106	104	100	96	90	91	91	90	94	98	99	102	97	97	87	80	79	85	90	95	98	96
14 Q	103	102	104	103	101	99	96	96	97	96	95	94	97	99	101	98	95	84	72	68	71	83	90	97	93
15	102	103	99	99	98	97	97	97	96	93	94	96	98	96	95	90	89	79	68	59	68	76	87	97	91
16	97	96	97	101	104	103	99	100	97	95	73	76	87	93	96	98	99	90	77	73	77	87	91	98	92
17	110	108	103	99	98	98	94	97	95	90	89	92	94	97	96	98	88	74	70	72	78	86	92	91	92
18 D	107	108	121	121	116	112	106	102	101	101	99	99	97	100	102	100	91	80	74	69	75	84	91	95	98
19	105	105	100	101	100	101	99	101	98	98	97	98	97	97	98	99	96	92	88	86	84	89	92	94	96
20 Q	99	96	94	95	94	97	97	95	94	95	95	94	95	94	95	95	90	80	73	75	82	87	93	101	92
21	105	102	96	96	99	103	107	106	103	94	89	91	91	87	93	95	91	82	79	77	84	88	92	101	94
22	111	111	111	104	103	106	109	101	80	83	89	84	89	96	98	84	85	79	80	80	88	100	111	112	96
23 D	119	122	119	113	112	111	110	107	103	100	99	96	89	79	83	91	92	85	76	71	75	80	90	92	96
24	97	100	101	100	97	96	97	95	94	95	94	90	88	90	95	95	91	84	76	75	75	77	84	91	91
25	100	99	98	97	96	95	95	95	95	95	94	87	85	90	91	89	83	78	71	68	73	80	91	101	89
26	115	117	107	100	97	97	99	99	85	70	60	61	70	71	74	80	81	83	83	84	86	92	98	108	88
27 Q	113	108	106	101	96	97	96	97	96	98	97	97	97	98	98	99	98	90	79	75	78	85	91	97	95
28	100	98	96	93	94	93	91	93	92	91	93	92	91	93	91	89	83	73	63	67	73	78	87	92	88
29	102	96	95	93	91	90	89	91	91	91	93	93	93	93	93	92	92	85	75	76	81	87	96	100	91
30	102	98	98	94	95	94	94	94	94	95	93	93	93	92	94	94	86	76	69	70	80	81	88	92	90
31 D	99	101	121	133	136	127	119	118	101	80	99	98	99	99	99	99	95	91	85	76	79	86	93	100	101
MEAN	107	107	108	108	107	106	102	100	96	95	93	92	93	94	97	97	94	86	79	77	80	86	92	99	96

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 25 VICTORIA — H = 18,500 GAMMA + — SEPTEMBER 1971

HOUR = DAY	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	464	459	467	469	474	493	482	483	492	485	481	479	476	477	482	473	455	439	440	446	458	467	467	480	470
2 Q	479	478	476	476	478	480	482	483	482	481	485	484	483	484	478	472	464	455	451	451	458	466	478	487	475
3 Q	487	480	473	479	479	475	471	476	477	477	478	480	480	485	481	471	463	452	444	443	457	471	478	481	472
4	486	485	485	482	484	483	485	486	487	487	491	493	491	491	490	483	472	463	457	467	471	466	487	483	481
5	476	482	475	478	470	466	457	464	473	473	485	485	489	488	473	466	466	464	466	461	452	463	484	496	473
6	489	485	484	479	483	482	480	480	476	489	493	482	492	498	489	485	474	456	444	443	448	462	469	479	477
7 D	463	463	481	476	466	479	482	487	480	487	484	489	490	494	491	473	472	452	448	448	450	450	465	458	472
8	461	459	462	459	470	493	480	476	483	474	487	484	485	491	483	470	457	454	454	453	461	471	480	486	472
9	486	478	481	483	484	481	479	483	488	490	489	490	490	490	492	481	451	454	454	459	461	464	476	473	477
10	470	477	476	472	467	474	496	483	488	484	493	484	490	495	493	482	467	457	453	455	460	467	472	481	477
11	483	483	482	483	480	477	475	475	477	485	501	488	493	494	496	492	477	466	458	455	455	461	469	478	478
12	523	478	477	476	482	480	477	474	469	485	478	488	492	489	489	480	475	469	468	471	470	474	477	476	480
13	484	490	469	479	480	478	480	456	461	469	472	472	480	484	477	475	471	464	461	469	472	472	483	485	474
14	479	474	480	476	480	483	483	492	478	485	484	488	490	491	489	480	468	461	457	451	452	469	471	492	477
15	495	491	481	487	486	492	496	491	493	496	485	482	486	485	485	480	469	460	454	456	467	475	483	480	481
16	476	469	474	480	481	485	489	490	505	496	491	501	491	490	483	477	466	463	466	470	481	489	486	460	482
17	532	476	480	484	484	485	481	483	490	487	490	494	497	489	484	483	481	480	477	479	484	490	496	478	487
18 D	479	465	431	414	427	416	427	431	424	448	463	426	461	476	476	472	455	440	450	454	457	450	467	478	449
19	484	480	477	463	463	464	464	481	481	476	476	480	481	479	476	468	459	456	445	446	462	469	478	479	470
20	475	476	460	456	480	474	474	473	491	476	473	474	462	467	479	471	457	446	430	421	454	459	473	468	465
21 Q	477	475	473	475	476	476	472	475	480	481	484	483	482	483	478	471	461	455	442	438	447	462	473	478	471
22 Q	478	469	468	470	478	477	477	479	479	475	477	480	478	478	475	467	455	446	444	447	453	462	474	484	470
23 Q	488	485	481	478	479	482	479	479	483	480	485	484	485	483	482	476	464	462	459	457	459	467	477	484	477
24	486	486	487	486	485	484	485	486	488	489	489	492	491	492	492	490	480	467	451	445	455	460	474	483	480
25 D	480	476	474	457	453	476	426	444	433	431	432	452	488	482	450	474	461	448	435	442	445	453	471	484	457
26	482	475	470	473	475	476	478	481	483	479	481	487	488	491	488	479	465	466	462	456	454	465	400	419	470
27 D	441	436	451	433	439	451	458	462	459	455	465	452	472	471	455	457	447	427	436	456	463	467	474	479	454
28	473	457	455	466	475	479	488	482	491	485	484	483	482	479	477	471	468	461	461	462	467	474	479	480	474
29	479	475	479	479	480	478	476	485	485	485	486	486	488	485	483	479	476	470	457	460	472	474	481	479	478
30 D	482	490	490	489	491	487	487	490	484	482	474	485	480	489	480	481	467	450	424	434	461	467	444	450	473
MEAN	481	475	473	472	474	477	476	477	479	479	481	481	484	486	482	476	465	457	452	453	460	467	473	477	473

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 26 VICTORIA   D = 22 DEG 00.0 MIN EAST +   SEPTEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	19.5	22.6	22.1	20.9	21.2	22.8	20.7	21.0	19.2	20.3	21.5	22.0	21.6	22.1	24.1	25.6	27.8	25.8	22.1	18.9	17.9	18.1	18.7	20.2	21.5
2 Q	22.1	21.7	20.9	20.5	20.6	20.5	20.9	20.8	21.3	21.6	22.2	22.3	22.6	23.4	24.6	26.2	26.2	25.0	21.4	18.7	16.1	14.7	15.4	17.3	21.1
3 Q	19.3	21.3	21.9	20.7	20.1	20.9	21.5	22.4	23.2	22.6	23.4	22.3	20.7	23.1	25.5	27.4	27.2	24.4	21.4	18.2	16.6	16.0	16.9	18.5	21.5
4	20.4	20.1	20.0	20.4	20.3	20.3	20.3	20.9	21.3	20.9	21.6	22.5	22.6	23.3	24.6	25.8	27.2	25.2	21.1	18.4	16.8	14.5	15.3	14.7	20.8
5	18.7	20.3	20.0	26.0	26.8	27.3	25.2	27.0	21.9	22.0	17.4	17.5	21.9	25.6	24.6	24.2	28.1	25.7	20.9	17.5	15.3	14.1	16.4	19.0	21.8
6	21.7	21.9	20.9	20.5	20.1	19.9	21.8	27.9	22.3	17.6	17.2	22.0	24.9	26.8	26.6	27.2	29.7	27.7	22.5	18.1	17.0	15.9	16.5	17.0	21.8
7 D	18.0	21.3	20.0	19.9	23.6	25.2	20.1	18.2	11.1	18.2	21.2	22.7	22.9	24.4	25.2	22.3	24.4	21.0	17.4	14.9	14.0	13.5	15.4	16.3	19.6
8	18.8	20.3	20.2	24.2	24.7	25.8	21.9	20.2	16.5	10.9	21.4	24.7	23.8	25.0	26.8	27.5	28.0	24.2	20.5	18.4	18.1	17.3	17.7	19.6	21.5
9	21.3	22.8	21.0	20.7	20.6	20.6	21.0	20.7	20.7	20.8	21.2	21.9	20.7	23.6	23.4	26.1	26.2	23.5	18.6	17.0	17.0	17.3	18.0	18.6	21.0
10	20.4	20.4	19.9	20.6	20.2	20.2	18.5	20.5	21.2	21.2	22.0	21.0	21.4	24.1	25.2	27.0	27.9	27.2	23.2	19.7	18.0	17.6	17.9	18.3	21.4
11	19.5	19.5	20.6	20.9	20.8	20.8	21.6	21.6	22.1	21.2	20.5	25.0	24.2	23.9	27.3	27.3	26.3	25.4	24.7	22.6	20.5	20.4	19.6	19.1	22.3
12	19.8	20.2	20.0	22.3	20.1	20.1	20.0	21.4	22.7	28.0	25.6	23.2	23.3	23.3	23.8	23.9	24.5	23.4	22.6	21.0	19.6	18.2	17.5	17.9	21.8
13	18.0	16.8	21.1	22.8	21.5	18.0	30.2	22.3	24.7	22.9	23.5	25.8	24.4	24.8	23.9	24.6	24.5	23.0	21.7	18.1	16.6	16.4	18.3	19.0	21.8
14	20.3	20.4	19.5	19.6	19.9	19.7	19.7	22.9	20.6	22.1	21.6	20.8	24.6	25.1	26.4	26.5	26.1	24.8	20.7	18.6	16.2	16.3	17.8	18.8	21.2
15	17.9	17.1	18.9	19.0	19.6	19.3	19.5	20.5	22.8	24.1	25.5	29.1	24.7	23.4	23.6	24.8	25.9	26.1	23.9	21.2	20.4	19.4	19.4	19.9	21.9
16	20.1	20.6	21.3	21.5	20.0	19.7	19.8	19.5	18.5	22.9	26.4	21.2	24.4	24.2	24.5	24.9	25.2	24.2	21.5	19.8	18.0	17.3	18.2	19.1	21.4
17	21.4	19.4	19.6	21.8	20.9	19.8	20.3	20.4	19.7	19.8	20.3	21.4	21.9	21.2	22.3	24.0	24.6	24.1	19.8	17.4	16.5	15.9	15.3	15.8	20.1
18 D	14.9	25.2	24.9	20.5	23.6	25.0	21.7	25.9	17.8	22.6	24.0	24.1	25.6	24.6	25.2	26.4	26.3	21.9	21.2	20.2	18.4	18.1	18.4	19.7	22.3
19	21.3	21.8	22.3	21.1	21.8	21.2	18.8	18.4	20.6	21.7	22.8	23.3	23.4	23.9	25.4	27.1	27.5	25.6	21.9	17.7	16.5	17.5	18.7	19.0	21.6
20	20.2	19.8	19.7	23.8	25.0	21.1	20.0	20.3	17.4	19.8	25.1	23.7	20.4	19.7	25.5	28.2	27.7	26.4	24.0	20.1	17.2	16.8	17.9	18.4	21.6
21 Q	20.5	20.2	20.5	21.2	21.0	20.6	20.5	20.3	20.8	21.0	21.5	22.4	22.6	22.7	24.2	25.7	26.8	24.4	23.3	19.4	17.4	16.8	17.0	18.5	21.2
22 Q	20.3	20.6	21.4	21.5	21.1	20.3	20.5	20.1	20.6	21.7	21.4	22.4	22.9	24.1	24.9	26.3	27.6	25.6	22.6	20.0	18.3	17.4	17.6	18.8	21.6
23 Q	20.5	20.7	20.7	20.8	21.3	20.9	20.3	20.4	21.6	20.8	21.4	21.8	22.3	22.4	23.5	25.2	25.8	25.4	23.3	20.1	18.2	18.0	18.7	19.5	21.4
24	20.1	20.0	20.0	20.1	20.4	20.2	20.2	20.4	20.2	20.7	21.0	21.2	22.1	22.4	23.6	25.3	26.9	27.0	24.9	19.3	14.9	14.5	15.6	16.9	20.7
25 D	19.2	19.7	19.3	18.2	19.2	33.3	27.9	25.0	27.6	32.4	33.7	31.4	25.6	27.3	22.6	24.2	29.2	27.1	24.9	21.5	17.6	17.0	18.0	18.7	24.2
26	20.1	19.6	19.7	19.4	20.4	20.5	20.6	20.0	22.0	22.9	24.6	23.6	23.1	23.5	25.4	27.1	28.1	25.8	21.6	18.2	15.3	17.0	18.0	17.9	21.4
27 D	13.1	16.2	23.7	18.9	17.5	20.7	21.5	21.4	19.3	19.9	20.5	16.3	23.7	21.7	23.2	23.1	23.5	22.2	20.2	18.3	17.3	17.3	18.5	19.2	19.9
28	19.4	19.4	20.5	20.3	21.6	20.7	23.8	19.7	18.0	18.3	20.6	23.8	23.4	22.6	22.5	23.0	23.9	23.9	22.1	21.4	20.6	19.7	19.9	19.8	21.2
29	20.4	20.3	20.4	20.4	20.2	20.4	21.3	20.0	20.4	21.2	21.7	22.2	21.1	22.5	22.2	24.0	25.1	24.2	23.7	22.1	20.9	20.0	19.0	18.5	21.3
30 D	19.2	19.0	19.4	19.4	19.3	20.5	22.3	21.0	20.8	25.3	26.4	20.0	14.7	20.0	18.4	23.9	19.8	19.6	17.6	13.1	17.9	16.8	17.3	17.9	19.6
MEAN	19.5	20.3	20.7	20.9	21.1	21.5	21.4	21.4	20.6	21.5	22.6	22.7	22.7	23.5	24.3	25.5	26.3	24.7	21.8	19.0	17.5	17.0	17.6	18.4	21.4

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 27 VICTORIA Z = 53,000 GAMMA + SEPTEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	104	110	108	106	103	96	92	94	85	80	88	90	91	93	96	94	91	82	75	72	79	87	92	97	92
2 Q	98	97	94	95	95	96	95	94	94	93	94	94	92	94	96	99	99	91	86	78	77	77	85	92	92
3 Q	102	98	101	101	99	99	102	101	99	94	89	87	87	86	95	94	93	87	76	70	76	87	94	97	92
4	99	96	95	94	95	95	94	95	94	93	93	91	91	90	94	92	87	80	72	74	73	81	90	94	90
5	99	97	95	101	101	99	102	95	95	89	58	57	79	91	93	79	78	71	70	74	86	95	100	103	88
6	103	97	94	90	91	93	93	87	88	86	69	63	82	96	97	88	84	77	69	72	82	87	95	104	87
7 D	108	115	114	107	107	111	102	101	72	71	89	91	97	98	95	78	67	59	63	75	87	97	109	113	93
8	121	111	112	114	111	97	93	97	92	56	73	85	95	96	99	98	93	88	88	92	95	98	100	98	96
9	105	98	96	94	94	94	94	94	96	94	91	96	93	91	95	92	89	80	74	84	90	92	98	102	93
10	104	100	97	98	99	100	87	87	93	95	95	94	94	93	95	97	95	89	80	77	81	87	89	97	93
11	97	96	92	95	94	96	96	97	96	96	78	80	90	93	85	81	79	76	78	78	83	89	95	97	89
12	101	97	96	94	97	95	95	97	91	72	87	95	95	94	98	94	92	90	85	83	87	87	88	87	92
13	92	93	97	102	102	99	88	85	97	98	106	104	106	102	100	98	94	92	88	89	90	93	98	98	96
14	102	95	98	97	98	96	97	93	95	97	97	86	90	94	95	94	84	81	79	79	81	88	93	95	92
15	102	95	94	96	93	95	93	93	93	79	59	68	85	91	94	97	93	91	87	85	86	90	95	98	90
16	99	95	98	99	98	97	93	91	80	80	86	86	83	89	90	89	87	87	86	81	86	86	85	80	89
17	129	94	95	96	96	92	94	93	92	84	84	88	87	87	86	90	87	80	80	74	75	82	88	86	89
18 D	103	141	173	187	158	151	142	107	32	110	89	29	71	97	103	105	100	90	93	94	95	96	101	102	107
19	105	101	98	100	104	103	102	87	81	91	99	98	99	98	99	100	99	92	82	87	91	98	100	105	97
20	104	102	104	110	106	100	100	102	93	68	81	92	83	63	72	85	85	83	80	82	90	89	98	97	90
21 Q	101	100	97	98	99	97	99	100	103	101	101	99	99	99	99	100	99	98	98	96	96	96	100	99	99
22 Q	102	99	101	100	100	100	101	100	101	101	101	99	97	99	101	101	101	95	90	91	98	100	100	97	99
23 Q	96	96	96	95	98	97	96	99	95	97	97	97	96	96	95	97	96	93	88	86	87	89	92	92	94
24	93	92	92	91	90	92	92	93	94	95	93	93	93	92	93	94	92	83	76	76	83	89	93	98	91
25 D	99	100	101	102	115	102	78	95	93	87	62	63	92	92	84	81	90	91	88	88	88	93	100	104	91
26	102	100	99	98	98	97	99	99	100	100	101	103	99	98	99	96	94	88	82	77	80	91	103	127	97
27 D	144	170	199	170	152	128	120	121	104	55	83	46	57	86	82	101	98	92	94	100	98	99	103	103	109
28	106	102	106	108	105	101	98	98	84	82	86	92	94	94	91	89	91	87	93	90	91	90	92	93	94
29	99	98	99	98	98	97	97	96	90	93	96	95	93	92	93	91	91	90	87	85	84	87	88	88	93
30 D	96	96	96	95	96	94	96	99	98	86	79	66	25	34	40	49	60	68	68	78	85	86	89	96	78
MEAN	104	103	105	104	103	100	98	96	91	87	87	84	88	91	92	91	90	85	82	82	86	90	95	98	93

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 28 VICTORIA — H = 18,500 GAMMA + — OCTOBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	C5 TO C6	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	460	455	440	441	450	455	463	483	467	467	472	468	481	485	474	469	476	469	475	477	477	477	471	455	467
2 D	462	466	460	479	472	467	488	464	467	472	463	480	489	481	483	480	465	460	459	465	473	469	451	469	470
3	463	431	436	451	461	479	476	468	473	474	481	484	464	474	479	480	466	456	454	452	461	467	471	472	466
4	469	476	477	481	471	467	479	483	476	476	484	483	484	477	484	479	468	458	452	446	440	444	460	475	470
5	478	456	462	468	466	471	469	463	468	479	478	481	481	472	471	472	471	456	446	444	453	467	481	492	469
6	477	449	474	481	478	479	477	478	482	484	488	491	490	492	486	486	476	460	452	453	461	471	484	473	476
7	483	482	480	480	480	478	477	476	481	479	484	487	484	481	479	474	465	459	435	442	427	406	444	448	467
8 D	465	461	468	468	454	463	476	471	469	473	466	480	469	479	480	470	464	459	454	454	461	473	473	482	468
9 D	485	473	449	447	449	422	424	459	463	473	462	462	467	476	475	459	462	467	446	445	459	473	479	466	460
10	475	475	478	477	482	483	476	472	477	478	482	484	484	485	482	476	474	467	469	468	472	477	480	477	477
11	474	475	480	483	482	480	481	484	486	483	483	483	489	489	480	486	477	472	462	460	471	476	468	468	478
12	472	470	473	470	476	479	480	478	480	479	483	480	483	480	482	485	477	469	476	477	480	485	485	470	478
13	470	477	473	476	480	482	482	471	478	479	482	483	480	484	477	454	448	466	476	477	478	476	477	479	475
14	477	483	483	483	483	482	485	480	483	486	488	492	486	487	492	482	479	470	472	478	482	483	489	479	483
15	469	480	484	481	477	480	482	482	484	484	486	487	488	482	477	479	477	464	454	459	460	469	477	483	477
16	488	486	487	487	485	487	486	487	490	490	490	490	488	482	484	475	462	454	453	464	472	477	485	487	481
17 Q	489	486	487	485	486	486	487	487	487	488	492	492	494	492	487	484	477	470	465	467	470	473	481	484	483
18 Q	486	487	490	489	489	488	490	488	491	491	494	494	494	494	489	486	477	467	469	478	484	489	493	492	487
19 Q	490	490	487	491	490	489	492	488	492	490	492	494	494	495	492	486	481	477	477	480	484	488	489	489	488
20	487	487	490	491	490	490	487	487	490	488	488	492	495	491	493	489	480	475	468	469	471	478	480	478	485
21	481	478	482	487	487	485	481	484	487	489	493	493	492	491	494	489	476	468	461	465	470	472	474	479	482
22	487	483	486	487	482	476	462	453	480	470	477	486	489	488	487	487	477	463	476	483	479	476	481	483	479
23	485	486	487	489	491	488	489	489	490	492	495	500	509	500	504	500	484	470	468	469	477	489	492	494	489
24	493	484	482	487	490	487	486	480	485	487	488	490	479	483	489	483	473	461	450	449	453	467	479	474	478
25	472	472	477	476	479	481	483	483	481	479	480	477	486	483	485	480	472	466	468	461	457	465	474	476	476
26 Q	478	480	483	486	484	483	484	484	488	487	489	487	487	487	486	483	475	465	461	462	462	468	471	475	479
27 Q	483	486	484	486	488	483	484	487	488	491	491	491	497	494	489	480	472	468	460	459	465	470	478	488	482
28	494	490	490	484	482	486	485	488	504	479	486	494	494	492	492	490	488	479	480	472	490	486	474	460	486
29 D	458	452	440	441	455	462	449	456	466	460	473	478	481	481	479	469	453	458	450	421	440	436	461	465	458
30	466	454	470	452	446	460	473	473	466	472	475	475	478	474	472	461	466	463	463	465	466	474	479	480	468
31	482	475	466	471	477	478	478	474	483	480	479	481	482	481	481	477	467	455	457	459	465	470	477	483	474
MEAN	477	474	474	476	476	477	478	477	481	481	483	485	486	485	484	479	472	465	462	462	466	471	476	477	476

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 29 VICTORIA — D = 22 DEG 00.0 MIN EAST + — OCTOBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	19.6	21.2	35.0	25.5	22.4	21.5	21.2	19.5	17.3	22.1	19.3	18.0	20.5	21.2	20.9	19.0	20.9	20.3	20.1	19.7	19.1	19.2	18.9	20.3	20.9
2 D	21.3	20.7	22.9	23.0	22.1	24.1	24.9	21.9	22.7	23.3	16.4	18.4	23.8	22.7	22.5	22.2	21.0	20.0	21.2	19.6	18.5	18.8	19.1	19.3	21.3
3	18.9	24.5	25.4	19.6	23.6	23.9	20.5	21.5	21.5	18.2	19.7	21.4	18.1	20.1	22.8	23.3	24.0	23.3	22.3	20.7	19.7	19.6	19.7	20.3	21.4
4	20.6	21.8	21.5	22.8	22.0	21.5	21.6	17.5	19.9	17.2	21.9	23.4	21.6	18.6	20.8	23.9	24.9	24.6	22.4	18.9	16.0	14.8	18.1	18.9	20.6
5	18.8	20.0	25.3	24.0	21.1	20.7	23.7	19.6	19.7	20.7	21.9	21.7	22.6	21.2	19.5	20.7	24.6	25.3	24.0	20.8	18.5	18.4	18.6	16.6	21.2
6	18.6	25.6	17.5	17.8	19.1	19.7	20.3	20.5	20.6	21.7	22.0	23.4	23.7	23.6	25.0	25.8	27.0	22.9	22.8	20.2	18.5	17.6	17.6	19.6	21.3
7	20.6	20.7	20.7	20.9	20.8	21.1	21.0	20.6	20.4	20.6	20.8	21.1	21.5	22.3	23.7	25.8	26.9	25.9	23.6	18.9	18.8	15.4	15.4	16.6	21.0
8 D	20.8	19.9	20.0	24.9	22.2	21.4	20.2	17.4	19.4	21.6	22.1	23.1	27.2	19.3	23.4	24.3	25.2	25.0	21.8	19.1	17.2	17.2	17.5	18.4	21.2
9 D	19.4	19.5	21.1	20.0	23.7	26.9	28.2	22.6	22.9	19.7	13.6	19.4	25.1	24.0	24.3	22.7	22.5	23.7	22.8	19.4	19.7	20.5	20.3	20.3	21.8
10	22.3	21.4	21.0	21.8	27.1	23.5	22.0	18.4	18.1	18.2	18.4	21.8	22.3	22.9	23.5	24.3	24.5	23.8	22.5	20.2	19.3	19.2	19.4	20.0	21.5
11	19.8	19.8	19.9	20.2	20.2	20.4	20.2	20.0	18.1	21.2	22.4	22.7	17.4	18.0	15.3	17.1	15.5	17.3	15.4	15.3	16.6	19.2	19.7	20.6	18.8
12	20.7	20.3	20.2	20.6	21.7	20.3	20.1	20.3	20.2	20.6	20.7	20.8	20.8	21.1	22.2	22.9	22.9	18.7	17.6	16.5	17.5	18.5	18.8	17.5	20.1
13	17.7	16.9	17.9	17.9	18.7	20.1	20.5	22.2	24.0	23.9	22.9	24.5	23.2	21.9	23.1	23.2	20.7	18.8	18.5	17.9	19.1	19.2	19.7	19.2	20.5
14	20.6	20.0	20.5	20.6	20.9	20.6	19.8	20.5	22.1	20.9	21.5	21.5	19.8	17.1	22.2	24.4	25.0	23.2	20.1	17.2	17.5	18.0	16.7	18.5	20.4
15	18.8	19.9	20.0	20.2	21.2	20.5	19.8	20.2	20.4	20.3	21.0	21.4	21.1	21.5	21.3	21.8	23.9	23.4	21.5	19.5	18.5	18.3	18.6	18.8	20.5
16	19.8	19.8	20.0	20.7	20.4	20.3	20.2	20.1	20.3	20.8	20.6	21.9	22.7	21.4	22.5	24.6	25.7	23.4	21.0	18.3	16.6	16.8	17.5	18.4	20.6
17 Q	20.2	19.6	20.0	20.2	20.2	20.3	20.0	20.8	19.3	19.8	20.9	21.1	20.2	20.8	21.2	23.3	24.5	23.7	22.4	19.9	18.2	17.9	18.1	19.2	20.5
18 Q	19.7	19.7	19.6	20.0	20.1	20.2	20.5	19.6	20.2	20.1	20.7	21.1	21.1	22.0	22.5	22.9	24.0	23.8	21.4	18.6	16.7	17.3	18.2	19.1	20.4
19 Q	20.1	19.6	20.1	20.1	20.1	19.6	19.8	19.8	20.2	20.4	20.8	20.9	21.4	21.5	22.7	23.3	24.1	23.9	22.5	20.1	18.1	17.3	18.1	18.9	20.6
20	19.8	19.7	19.7	20.1	19.9	20.0	20.3	20.2	21.1	21.9	22.2	21.6	22.5	20.9	21.0	24.2	25.9	25.3	21.9	18.5	17.8	17.4	17.9	18.5	20.8
21	19.1	18.9	19.8	19.9	20.1	20.3	21.0	20.5	19.8	19.9	20.6	21.2	21.5	21.4	21.1	23.0	23.9	22.8	21.4	17.9	16.8	17.3	18.1	18.6	20.2
22	19.4	19.7	20.2	20.2	20.2	20.0	22.7	22.9	21.6	25.3	24.6	23.7	22.4	21.9	22.5	23.6	22.7	17.5	13.7	13.3	15.2	16.8	18.8	19.9	20.4
23	20.9	20.3	20.6	20.4	20.2	20.3	20.2	19.8	19.8	19.9	20.0	20.6	21.3	22.0	22.2	24.9	25.1	24.9	21.6	19.1	17.1	15.2	15.7	17.9	20.4
24	19.1	20.4	20.5	21.0	20.9	22.5	21.1	20.6	22.4	20.5	22.3	23.1	20.0	13.8	21.9	23.3	24.2	23.7	22.4	19.0	16.5	16.1	16.4	18.7	20.4
25	20.4	20.3	21.2	20.9	21.5	21.2	19.8	21.2	20.8	20.6	21.6	20.5	19.2	20.9	22.4	23.9	24.4	23.0	20.4	18.2	16.8	15.8	18.5	19.2	20.5
26 Q	20.6	20.1	20.2	20.4	20.5	20.1	20.4	20.3	20.3	20.1	20.3	20.2	20.4	19.9	21.1	22.4	24.1	24.9	23.3	21.2	20.0	18.6	18.3	17.6	20.6
27 Q	19.0	19.4	20.0	20.1	20.5	20.6	20.7	20.4	20.2	20.1	20.3	20.4	20.7	21.2	21.7	22.9	24.4	24.5	23.3	21.0	20.1	19.2	18.8	18.8	20.8
28	19.6	19.5	19.9	21.2	21.8	20.5	20.4	20.1	25.7	24.0	22.4	22.7	23.9	22.0	23.7	24.3	25.4	24.4	19.0	14.7	14.7	15.7	17.3	17.0	20.8
29 D	18.6	16.5	23.5	26.3	24.3	23.7	27.9	23.6	21.4	17.0	15.8	20.4	20.3	18.7	20.0	19.5	22.5	22.5	21.1	19.0	16.5	16.9	17.2	18.7	20.5
30	23.3	20.5	27.2	26.1	26.2	26.0	24.0	22.2	23.2	20.6	19.5	19.6	20.4	22.1	20.6	20.0	21.8	22.8	20.9	19.5	19.5	19.6	19.9	20.2	21.9
31	20.7	19.9	20.5	20.9	20.7	20.1	20.6	20.8	20.4	19.6	20.0	21.0	21.3	21.2	21.3	23.0	24.0	23.2	20.6	20.0	19.5	18.5	19.7	19.0	20.7
MEAN	20.0	20.2	21.4	21.2	21.4	21.4	21.4	20.5	20.8	20.7	20.6	21.4	21.5	20.9	21.9	22.9	23.7	22.9	21.1	18.8	17.9	17.8	18.3	18.9	20.7

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 30 VICTORIA Z = 53,000 GAMMA + OCTOBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	105	110	126	125	132	132	121	101	65	80	80	77	80	85	86	82	85	83	83	81	82	86	92	99	95
2 D	107	109	112	108	107	105	90	87	84	71	48	41	63	83	94	93	92	90	92	86	86	89	93	99	89
3	105	111	128	126	123	111	96	100	101	88	78	85	69	71	89	99	100	102	104	97	94	96	100	99	99
4	100	102	104	102	102	104	101	91	85	76	76	88	92	83	82	87	90	91	88	85	86	94	102	103	92
5	108	104	112	107	108	96	101	94	91	90	96	95	95	91	91	87	93	88	86	81	84	90	97	102	95
6	108	122	117	108	104	102	105	102	100	100	95	92	95	96	94	93	89	85	85	86	88	92	94	95	98
7	99	96	95	96	96	95	96	97	97	97	97	97	94	94	97	98	97	92	86	84	78	88	105	108	95
8 D	118	114	113	108	108	114	107	94	91	92	85	55	47	79	92	101	104	99	92	90	91	97	98	101	95
9 D	104	102	103	111	103	84	102	115	111	103	68	53	33	57	85	89	97	102	98	95	95	99	102	100	92
10	105	102	103	100	101	94	97	95	88	88	87	94	96	95	98	97	97	95	90	89	90	95	96	96	95
11	99	96	98	97	97	96	97	95	89	84	93	95	88	70	70	65	70	72	72	75	83	88	95	97	87
12	100	97	99	99	101	97	95	95	96	95	96	95	95	91	92	94	94	86	83	81	84	88	91	92	93
13	98	101	106	106	106	101	99	98	88	82	88	87	87	88	92	91	87	84	81	80	82	89	95	95	92
14	99	98	98	98	97	97	95	94	96	97	96	94	90	74	73	83	86	83	82	82	84	86	90	90	90
15	93	95	99	97	98	95	98	95	95	93	92	93	91	90	87	91	90	87	84	85	88	89	94	94	92
16	94	93	94	93	94	93	92	92	92	89	89	90	89	90	92	97	92	89	88	87	85	86	87	89	91
17 Q	92	89	92	93	93	93	93	91	91	91	92	90	90	89	88	95	95	93	88	84	87	89	88	88	91
18 Q	92	91	92	91	91	91	91	90	91	90	91	88	89	88	90	92	95	90	84	83	84	86	88	87	89
19 Q	90	89	90	89	90	90	90	90	91	90	90	87	88	87	89	90	92	90	83	78	77	82	83	86	88
20	88	88	89	88	90	89	91	92	91	90	90	90	89	86	87	88	90	84	77	77	84	88	92	92	88
21	92	93	93	94	93	93	94	93	94	93	92	90	89	88	89	90	93	83	75	78	84	91	91	91	90
22	91	89	90	89	89	90	92	95	83	80	86	88	87	86	90	90	89	81	77	78	79	85	88	90	87
23	91	87	87	88	88	87	88	89	89	90	88	89	89	85	88	89	87	84	81	80	83	89	89	88	87
24	90	89	88	90	89	91	90	86	91	90	83	86	79	55	68	78	82	83	77	77	81	86	93	94	84
25	95	94	94	93	94	94	90	90	88	91	89	87	81	82	89	93	92	92	86	85	90	88	94	96	90
26 Q	96	93	93	90	89	89	87	88	88	88	89	89	88	88	89	91	91	87	82	80	84	87	89	90	89
27 Q	96	93	94	93	92	90	89	91	89	89	90	89	89	89	90	90	88	83	79	79	82	84	91	90	89
28	90	87	89	88	88	88	87	85	74	68	66	62	72	82	87	85	82	74	71	73	72	74	78	85	79
29 D	96	110	123	127	119	109	107	103	101	89	80	85	89	90	89	90	95	97	90	86	94	96	101	101	99
30	109	105	115	107	115	109	94	94	94	85	85	86	89	91	92	96	99	94	88	87	89	93	95	93	96
31	92	92	93	95	97	96	95	91	90	86	87	90	91	90	95	96	98	90	87	90	92	87	89	86	91
MEAN	98	98	101	100	100	97	96	94	91	88	86	85	84	84	88	90	91	88	84	83	85	89	93	94	91

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 31 VICTORIA H = 18,500 GAMMA + NOVEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO C6	06 TO 07	07 TO C8	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	480	474	473	476	478	474	476	479	477	482	483	486	485	485	482	474	468	464	463	465	468	472	478	479	476
2	485	487	486	486	487	484	487	483	486	489	489	488	489	489	483	476	471	468	468	466	470	471	477	479	481
3 Q	482	481	483	483	483	476	478	479	479	484	484	486	490	489	488	488	480	479	476	478	472	472	481	485	482
4	491	486	498	495	492	485	487	494	491	493	495	495	497	496	496	493	485	479	423	441	453	465	477	482	483
5	487	485	488	484	486	484	481	481	483	483	484	481	480	486	482	486	482	473	481	475	473	473	474	480	481
6	487	486	484	486	486	483	486	485	484	481	491	488	490	490	485	481	481	477	470	472	473	472	477	487	483
7	489	481	478	474	472	473	470	476	478	484	485	489	494	488	489	493	482	471	464	457	459	466	474	480	478
8	489	490	483	486	488	487	489	494	492	484	497	500	503	504	500	494	483	466	458	457	456	460	465	463	483
9	479	481	481	483	481	487	482	479	482	482	482	484	482	480	479	480	468	463	454	447	454	460	471	475	475
10	481	483	484	486	487	487	486	489	489	490	489	491	496	495	495	494	497	496	488	483	477	480	490	485	488
11	488	481	476	460	471	467	472	471	474	474	478	478	481	482	480	473	469	459	459	437	436	456	463	466	469
12	474	479	482	482	483	478	498	484	481	483	482	482	485	483	484	478	475	469	464	452	440	447	466	475	475
13	481	481	482	483	481	478	481	484	481	479	479	484	486	486	486	480	478	472	464	456	454	458	469	478	477
14 Q	484	488	488	488	486	486	487	485	490	485	490	488	489	489	489	486	487	486	478	467	462	462	470	474	483
15 Q	484	485	488	488	487	486	487	487	495	488	488	489	491	490	490	490	482	484	475	466	460	464	476	480	483
16 Q	483	489	489	489	488	489	492	486	486	486	486	488	488	485	485	492	486	477	472	461	462	466	475	488	483
17 Q	491	489	491	490	490	487	488	487	486	490	489	491	493	492	491	491	489	480	475	467	466	469	481	486	485
18	494	494	481	469	476	488	482	486	488	485	493	489	493	490	488	485	487	486	484	474	473	475	483	484	484
19	491	495	497	498	497	496	497	495	498	499	502	503	504	503	490	494	484	477	474	466	467	470	480	486	490
20	490	486	488	488	487	485	484	482	476	472	480	485	486	492	488	482	474	462	460	463	473	474	478	487	480
21	490	490	489	484	485	481	474	474	467	477	479	475	479	471	484	479	477	468	453	450	459	467	474	477	475
22 D	466	483	483	479	480	470	466	466	454	447	477	479	476	483	487	490	490	488	473	453	438	420	443	445	468
23 D	437	451	449	458	478	458	448	471	447	466	470	467	459	472	484	455	465	471	433	430	447	428	416	428	454
24 D	451	448	462	454	440	483	447	476	464	459	467	467	451	457	463	456	459	462	447	441	436	431	440	438	454
25 D	443	445	464	460	439	466	443	443	448	412	430	445	437	476	477	428	441	445	456	452	450	450	448	457	448
26 D	468	474	467	472	464	476	472	466	461	457	464	456	471	477	477	474	472	466	455	451	455	461	467	474	467
27	482	479	480	473	474	476	476	477	483	481	480	474	477	481	484	480	472	473	466	458	455	456	467	473	474
28	476	480	481	480	484	477	476	485	483	481	483	480	484	481	480	481	481	475	465	448	446	459	468	475	475
29	476	473	480	477	480	479	480	479	480	479	481	480	483	481	486	485	488	479	465	459	461	465	471	477	477
30	477	479	478	477	473	474	475	478	483	485	481	485	487	487	483	487	483	480	472	464	463	461	465	474	477
MEAN	479	480	481	480	479	480	478	480	479	478	482	482	484	485	485	481	478	473	465	459	459	461	469	474	476

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 32 VICTORIA D = 22 DEG 00.0 MIN EAST + NOVEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	19.4	19.4	19.8	20.2	20.5	22.0	21.0	20.6	20.3	19.3	20.4	20.7	20.6	20.2	21.2	22.7	22.9	21.6	20.4	19.5	19.2	19.5	19.7	20.0	20.5
2	20.4	19.7	20.0	20.0	20.0	20.3	20.0	20.2	20.2	20.1	20.4	20.5	20.8	21.2	21.3	21.9	22.7	22.3	19.9	19.2	18.6	18.5	18.9	19.3	20.3
3 Q	20.2	20.2	20.3	20.5	20.4	20.8	20.5	19.7	20.4	20.1	20.2	20.0	20.1	21.3	21.5	22.6	23.1	21.9	20.7	19.0	18.6	18.8	19.1	18.7	20.4
4	19.1	19.8	20.4	20.3	20.6	20.2	20.1	20.1	20.3	20.6	20.8	20.7	21.3	21.4	21.8	22.8	24.8	23.5	23.0	19.8	19.0	18.2	18.8	19.7	20.7
5	19.1	19.7	19.9	20.3	20.7	20.1	21.0	19.9	19.9	20.0	20.9	22.2	21.5	23.5	23.8	24.6	25.4	24.1	20.9	17.7	15.6	15.3	16.6	18.5	20.5
6	19.5	19.6	20.3	20.4	20.5	21.0	20.9	21.0	20.8	20.6	20.3	20.3	20.9	21.3	21.8	22.7	23.4	23.1	21.2	20.0	19.0	19.0	19.2	19.4	20.7
7	19.4	20.1	20.2	22.0	22.5	22.3	22.9	22.7	22.4	21.4	18.7	20.9	20.5	21.2	18.4	23.1	23.7	24.3	23.6	21.2	19.6	18.0	17.9	18.3	21.1
8	19.8	19.0	20.0	19.8	20.6	20.8	20.8	20.7	20.4	20.5	20.3	20.4	20.5	21.0	21.7	22.8	22.9	22.8	21.9	19.7	19.2	18.3	18.6	18.5	20.5
9	19.7	19.8	20.5	21.0	21.4	21.0	20.4	20.4	20.4	19.9	20.1	20.0	21.0	21.7	21.7	23.4	24.7	25.6	23.8	21.1	19.6	18.6	18.5	18.8	21.0
10	19.5	19.7	20.4	20.6	20.4	20.6	20.6	20.5	20.1	20.1	20.1	20.2	20.2	20.5	20.8	22.7	24.2	24.3	23.3	21.0	19.4	18.1	17.6	17.3	20.5
11	17.7	17.5	14.4	17.6	20.1	20.9	20.9	21.4	22.7	21.7	20.8	21.5	21.8	22.0	21.8	22.8	24.6	23.2	23.1	20.8	19.5	19.0	17.7	17.7	20.5
12	18.6	20.5	20.2	21.1	21.1	21.8	21.5	20.3	20.6	20.0	20.0	20.6	20.7	21.1	21.1	21.4	22.7	23.1	22.8	22.5	19.7	16.1	17.2	18.0	20.5
13	19.0	19.8	20.4	20.9	20.7	20.7	20.4	20.2	20.7	20.5	20.6	20.9	21.2	21.3	21.1	21.1	22.0	23.3	23.6	22.8	21.9	20.4	19.2	18.8	20.9
14 Q	19.5	19.4	20.0	20.4	20.3	20.3	20.4	20.4	20.2	20.3	20.6	20.7	21.0	21.4	21.2	21.7	22.2	22.9	23.4	22.2	21.0	19.5	18.6	18.5	20.7
15 Q	19.0	19.6	20.1	20.1	20.5	20.3	20.3	20.5	20.6	20.5	20.8	20.7	20.9	20.9	20.9	21.8	23.2	23.9	23.3	21.6	20.1	18.8	18.5	18.4	20.6
16 Q	19.0	19.6	20.0	20.5	20.6	20.6	20.3	20.5	20.3	21.3	20.4	20.4	20.7	20.7	21.3	21.8	22.6	23.4	23.1	21.9	20.5	19.3	18.5	18.5	20.7
17 Q	19.3	19.7	20.2	20.1	20.1	20.1	20.1	20.0	20.1	20.0	20.1	20.0	20.3	20.6	20.8	21.6	22.5	23.5	22.9	21.7	20.0	18.5	18.4	18.5	20.4
18	19.3	19.8	20.0	19.3	20.5	19.6	19.7	19.9	20.5	21.5	22.8	21.4	20.9	21.1	20.8	20.8	22.7	22.6	22.0	20.9	19.8	19.1	19.6	19.5	20.6
19	20.2	20.1	20.5	20.4	20.2	20.2	20.1	19.7	19.7	19.5	19.7	19.7	20.2	20.7	18.4	19.5	22.5	23.6	22.2	20.6	18.6	17.9	17.6	18.5	20.0
20	20.1	19.7	20.4	20.4	20.8	20.5	20.5	20.8	21.7	23.5	20.2	20.7	20.6	21.1	21.7	22.3	24.0	24.4	19.4	18.5	17.3	15.6	16.8	17.9	20.4
21	18.9	20.0	20.4	20.7	20.6	20.5	20.3	20.8	22.0	21.2	16.6	22.6	23.8	22.1	21.7	23.3	24.9	24.4	22.2	19.9	17.8	17.4	16.9	16.5	20.6
22 D	16.6	18.8	20.6	20.2	21.4	22.6	19.8	20.4	20.7	22.9	24.5	21.4	22.5	24.3	22.4	16.7	22.0	24.2	21.5	18.7	18.9	16.4	17.2	17.3	20.5
23 D	18.0	19.8	20.9	25.6	21.8	22.7	28.6	28.2	25.4	21.1	19.4	19.9	13.7	17.1	21.9	20.4	19.8	23.8	23.2	19.2	16.4	16.6	16.5	17.2	20.7
24 D	19.0	24.2	26.7	23.6	26.2	24.9	27.0	21.1	22.1	25.8	18.7	21.0	18.8	16.6	17.0	17.7	17.0	23.6	22.3	20.0	18.7	18.1	19.5	17.4	21.1
25 D	18.1	20.7	25.0	26.3	35.4	33.3	22.6	14.7	28.8	27.6	16.2	21.4	9.5	14.0	14.1	11.0	13.8	17.4	23.5	22.8	20.3	18.9	18.8	19.1	20.6
26 D	19.9	21.1	24.0	23.3	23.2	19.9	21.7	23.9	21.1	25.3	22.4	16.4	19.5	22.3	22.6	22.4	22.6	21.8	22.1	22.2	20.3	19.1	19.1	18.8	21.5
27	20.1	20.2	20.7	21.3	22.5	20.9	21.0	20.7	20.7	20.9	21.7	20.5	19.6	22.0	22.0	21.7	21.0	23.0	23.1	21.8	21.0	19.3	18.5	18.7	21.0
28	20.4	20.0	20.7	21.2	21.6	21.0	22.8	20.3	19.9	20.4	19.5	15.3	21.7	21.6	21.6	22.2	24.0	24.6	24.1	22.5	19.7	18.4	18.2	18.9	20.9
29	20.0	20.4	20.9	20.6	21.7	20.8	20.3	20.1	20.6	19.9	19.5	20.7	20.7	19.7	21.2	21.3	21.9	21.2	19.8	19.3	18.3	18.9	19.5	19.6	20.3
30	20.5	20.5	20.8	20.3	20.8	20.7	20.7	20.2	18.9	19.9	19.8	20.4	19.7	18.2	21.1	21.5	22.2	22.7	22.7	21.9	20.0	18.7	18.3	18.1	20.4
MEAN	19.3	19.9	20.6	21.0	21.6	21.4	21.2	20.7	21.1	21.2	20.2	20.4	20.2	20.7	21.0	21.4	22.5	23.1	22.3	20.7	19.3	18.3	18.3	18.5	20.6

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 33 VICTORIA Z = 53,000 GAMMA + NOVEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	90	91	95	96	94	96	95	91	91	91	91	90	92	90	91	93	93	89	87	86	86	89	87	89	91
2	88	89	99	89	89	90	90	89	87	87	86	87	87	87	88	91	91	87	86	84	87	86	86	83	88
3 Q	89	87	88	89	90	90	90	92	90	90	87	88	84	85	87	89	89	90	85	86	87	86	87	86	88
4	87	82	86	85	87	87	87	87	88	86	87	85	86	84	84	88	91	87	89	81	82	86	87	86	86
5	87	86	87	87	89	88	89	91	90	90	85	86	86	81	82	86	87	79	73	71	76	83	82	89	85
6	92	91	91	89	89	89	89	90	90	90	91	90	90	89	89	91	92	88	81	80	87	89	91	91	89
7	95	93	94	94	96	99	98	98	93	93	92	90	90	88	88	94	96	96	92	92	93	93	96	97	94
8	96	94	94	94	93	92	91	91	91	91	91	90	91	89	89	92	91	85	81	83	86	87	91	93	90
9	100	99	99	96	95	94	94	91	92	90	91	90	89	91	94	97	98	96	93	90	91	92	95	96	94
10	98	97	97	96	95	93	92	91	90	90	91	90	90	91	90	93	92	87	82	76	77	78	85	84	89
11	89	90	100	110	106	102	100	98	98	99	96	96	95	96	94	96	96	93	89	86	92	99	100	101	97
12	102	101	101	101	98	98	89	81	89	91	93	92	92	92	92	94	96	93	89	84	85	89	94	95	93
13	98	99	97	97	97	95	94	93	90	90	91	94	92	93	94	93	94	94	92	89	89	89	93	93	93
14 Q	95	94	95	95	93	92	93	91	91	90	90	90	90	91	90	92	93	92	89	85	85	84	88	89	91
15 Q	94	93	94	94	93	92	91	91	90	90	89	88	90	89	89	91	93	93	91	87	86	88	90	91	91
16 Q	93	93	93	94	96	93	95	92	92	90	91	89	91	89	91	93	94	91	90	89	89	91	92	92	92
17 Q	96	93	93	91	90	92	92	91	91	89	90	90	89	90	89	90	93	92	89	86	82	85	87	90	90
18	90	88	89	94	100	98	95	94	94	92	91	90	89	86	89	87	89	89	88	86	87	89	90	89	91
19	91	92	90	89	89	89	88	89	88	88	87	87	86	84	78	72	72	78	79	81	81	87	89	89	85
20	94	92	92	92	91	92	92	94	93	93	93	93	94	94	91	91	90	89	88	86	86	87	89	91	91
21	93	91	91	91	90	94	94	93	91	84	69	66	73	72	78	85	89	89	90	92	93	93	94	92	87
22 D	96	101	101	100	98	100	98	85	78	40	63	64	73	74	71	67	65	71	70	74	76	88	100	105	82
23 D	112	114	117	131	117	107	115	68	88	93	93	85	75	61	74	74	86	91	84	95	99	98	119	115	96
24 D	123	126	128	117	118	100	94	76	75	79	88	93	85	76	76	81	91	97	95	97	101	105	112	117	98
25 D	122	121	124	116	118	116	100	39	57	51	30	32	28	31	33	45	66	86	103	102	98	98	100	106	80
26 D	110	108	111	110	110	101	90	94	69	80	91	78	78	93	98	100	102	102	101	99	98	98	100	100	97
27	103	102	102	101	102	100	99	98	97	94	94	94	94	94	95	97	100	99	94	91	91	93	97	100	97
28	105	106	103	103	102	101	100	93	93	95	93	77	79	69	94	100	102	102	97	90	91	94	97	98	96
29	100	100	103	102	102	100	99	98	97	95	94	96	95	94	94	96	98	95	90	86	90	91	95	94	96
30	93	94	95	95	96	96	98	95	93	90	91	91	92	88	88	92	94	94	94	90	89	88	90	93	92
MEAN	97	97	98	98	97	96	94	89	89	87	87	86	86	85	86	88	91	90	88	87	88	90	93	94	91

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 34 VICTORIA H = 18,500 GAMMA + DECEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	478	478	481	480	478	474	471	473	477	477	474	484	484	484	484	486	492	486	478	471	467	468	478	483	479
2	490	493	492	491	489	484	484	485	485	487	486	483	487	491	486	480	486	484	474	470	469	468	478	486	484
3	487	485	486	485	482	482	479	477	475	463	472	474	477	478	484	482	481	463	463	455	461	468	474	482	476
4	487	484	488	486	482	479	485	478	479	481	478	479	482	482	485	484	486	482	478	474	470	467	476	482	481
5	491	494	494	489	488	484	484	477	479	481	479	482	484	486	486	487	488	486	476	466	464	469	477	486	482
6 Q	487	489	488	485	488	488	489	487	489	487	491	491	493	493	493	492	487	483	476	469	467	473	482	487	486
7 Q	491	490	490	490	489	490	488	485	484	483	487	487	488	490	489	487	485	482	474	470	469	471	480	486	484
8 Q	493	488	492	493	491	489	493	490	492	492	496	495	493	497	497	498	497	491	484	475	476	482	494	504	491
9	511	504	499	506	502	501	495	493	491	498	499	494	492	495	494	496	492	486	477	472	464	466	475	475	491
10 Q	488	492	493	491	489	487	488	489	487	488	491	489	489	488	486	490	493	491	481	476	472	477	482	488	487
11	495	496	496	494	493	491	492	488	490	489	491	495	495	497	496	492	503	505	490	483	482	474	475	481	491
12	490	492	490	492	492	491	489	485	487	488	489	490	489	493	492	493	482	483	476	471	464	469	450	456	483
13	469	474	468	470	479	481	480	476	488	467	475	477	486	483	488	481	491	483	469	455	453	458	463	479	475
14 Q	482	486	487	488	484	480	480	479	480	483	485	487	488	484	482	482	482	478	473	471	469	474	479	488	481
15	488	485	488	486	489	489	488	489	483	482	483	487	489	486	485	488	484	477	472	468	468	475	482	489	483
16	491	491	492	489	487	487	486	487	485	484	488	491	490	488	487	485	483	483	480	484	475	479	470	472	485
17 D	486	446	451	463	450	464	450	445	431	465	451	470	477	479	492	485	394	306	322	319	388	410	427	444	434
18 D	448	453	458	461	455	459	461	461	452	456	454	448	461	462	452	459	466	462	454	450	452	454	453	455	456
19	459	461	460	456	455	450	447	432	425	437	456	474	463	470	467	470	474	461	457	456	448	449	456	460	456
20	462	468	468	466	466	465	466	465	466	468	468	472	473	474	474	474	470	465	455	449	445	442	454	468	464
21	473	478	476	474	474	473	471	473	473	475	474	476	477	481	481	480	480	480	473	452	429	444	459	469	471
22 D	477	476	463	459	473	471	469	467	469	467	470	475	462	470	473	487	476	474	453	454	446	456	461	468	467
23	475	469	470	471	468	478	474	469	463	474	475	475	468	475	480	488	477	464	459	443	444	453	463	474	469
24	479	483	473	470	476	474	479	479	475	477	480	479	481	481	493	492	490	487	476	465	453	455	470	476	477
25	474	480	477	474	469	476	474	475	476	476	477	480	483	485	482	484	488	493	483	470	461	464	471	471	477
26	459	467	462	468	459	474	470	474	481	477	475	480	479	482	483	485	488	490	474	459	446	446	454	459	470
27	470	465	464	468	472	469	472	467	474	472	471	475	476	478	479	486	484	484	477	469	464	465	468	476	473
28	483	483	483	484	480	481	478	478	480	482	483	482	485	486	489	490	490	492	481	472	460	458	464	478	480
29 D	488	485	482	474	467	455	452	457	455	457	461	465	462	469	485	483	487	489	486	480	478	479	479	474	473
30 D	460	463	472	472	476	465	468	461	454	486	472	470	476	471	475	480	473	481	476	464	456	462	464	469	469
31	476	482	481	471	477	471	468	472	475	477	475	480	481	481	481	483	483	481	469	461	468	471	470	476	475
MEAN	480	480	479	479	478	477	476	475	474	477	478	480	481	483	484	485	482	476	468	461	459	463	469	476	476

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 35 VICTORIA D = 22 DEG 00.0 MIN EAST + DECEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO C8	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	19.2	19.6	19.8	20.2	20.3	20.5	20.4	20.3	20.9	21.1	19.5	21.1	22.7	22.6	22.9	22.1	22.7	22.1	20.2	20.2	19.0	19.4	19.4	19.2	20.6
2	19.8	20.2	20.8	20.9	21.0	20.7	20.4	20.4	20.2	20.2	20.7	20.9	21.1	22.4	21.7	19.6	21.7	22.1	22.0	21.2	20.2	18.9	17.7	17.8	20.5
3	19.5	20.0	20.4	19.8	19.9	20.5	20.2	18.3	23.0	23.9	23.8	21.6	21.1	19.8	20.8	21.8	22.9	21.2	20.1	20.1	19.6	18.1	19.0	18.7	20.6
4	18.7	20.0	20.4	20.5	20.3	20.4	20.7	20.6	20.1	20.5	21.0	20.6	21.9	21.4	20.7	21.9	22.3	21.9	21.4	20.3	19.6	19.2	19.1	18.6	20.5
5	19.7	19.6	20.7	20.3	20.8	20.4	22.0	20.9	20.1	19.4	18.6	18.4	20.9	20.5	21.0	20.6	21.6	21.4	21.2	20.4	19.7	18.6	18.6	18.8	20.2
6 Q	19.5	19.8	20.2	20.7	21.7	21.3	19.9	19.6	19.6	19.8	19.6	19.7	19.7	20.0	20.7	20.9	22.4	23.3	22.7	21.2	19.5	18.7	18.3	18.1	20.3
7 Q	19.4	19.9	20.5	21.2	21.4	21.3	20.6	20.4	20.2	20.0	20.2	19.9	20.2	20.5	20.7	20.9	22.3	22.7	22.2	20.8	19.5	19.1	18.5	17.9	20.4
8 Q	18.8	19.2	20.0	20.7	20.9	21.1	20.3	20.4	20.2	20.2	19.9	20.6	20.6	19.3	20.7	21.7	23.1	23.4	22.9	22.1	20.8	18.7	17.7	17.5	20.4
9	18.3	19.4	19.7	19.7	21.3	20.0	20.1	20.6	20.8	19.5	17.7	21.8	20.8	21.2	21.0	21.3	22.6	24.3	22.7	22.2	21.0	20.3	19.0	18.5	20.6
10 Q	19.1	19.9	20.3	20.6	20.9	21.1	21.1	20.8	20.7	20.5	19.7	20.2	20.4	20.9	18.8	19.7	22.0	23.7	22.9	21.4	20.2	19.5	18.4	18.1	20.5
11	19.0	19.0	19.6	20.3	20.4	20.7	20.8	20.5	20.5	20.5	20.8	20.8	20.5	20.3	20.8	20.9	20.5	22.6	22.5	20.0	19.5	17.7	18.2	18.2	20.2
12	19.0	20.0	20.2	20.4	20.8	20.4	20.8	20.4	20.2	20.2	19.7	20.0	19.8	19.9	20.2	20.5	19.5	19.2	20.8	19.0	20.2	18.3	17.3	16.2	19.7
13	17.7	18.6	19.8	20.1	21.3	21.0	21.1	21.0	25.9	25.2	23.1	21.0	21.0	21.3	20.1	19.1	21.0	22.1	20.6	19.8	19.2	17.3	17.6	17.8	20.5
14 Q	19.5	20.1	20.2	20.6	20.5	20.3	20.2	21.1	19.9	19.8	19.7	20.6	19.6	21.5	21.7	22.0	22.3	21.7	21.0	20.3	19.9	19.2	19.0	18.4	20.4
15	18.5	19.4	19.5	20.0	20.5	20.1	20.3	19.9	20.4	20.3	20.8	20.4	20.7	21.2	20.8	22.2	22.6	24.0	22.0	20.8	19.5	18.6	18.6	19.1	20.4
16	19.0	20.2	20.1	20.4	20.3	20.3	19.7	20.1	20.4	20.1	19.6	19.9	19.8	20.6	20.3	21.1	22.0	21.7	22.0	21.2	19.7	18.2	16.6	14.4	19.9
17 D	16.6	18.8	23.7	23.3	31.5	26.5	22.4	26.6	25.8	19.3	22.5	15.9	19.9	21.1	21.6	23.7	24.3	1.1	20.7	13.0	15.6	15.3	16.2	18.4	20.2
18 D	19.7	20.7	21.3	22.0	22.7	21.8	20.9	20.0	19.8	18.6	16.6	15.1	21.6	19.8	20.5	21.4	22.5	22.6	22.1	22.0	21.5	20.7	20.8	20.6	20.6
19	20.9	21.3	21.7	21.9	21.3	20.5	22.0	25.6	27.1	23.4	27.2	29.0	20.4	19.5	20.0	22.2	22.7	20.5	19.1	21.5	21.7	20.9	20.2	19.9	22.1
20	20.7	20.7	21.0	21.1	20.8	20.7	20.4	20.3	19.9	19.8	19.9	19.9	19.6	20.3	20.5	21.5	21.8	23.2	21.5	21.7	20.4	18.4	18.0	18.2	20.4
21	19.7	20.3	21.1	21.2	21.1	20.9	20.2	20.0	19.9	19.7	18.7	19.1	20.1	19.8	17.8	20.9	21.5	23.2	22.8	21.9	16.7	14.1	17.1	18.3	19.8
22 D	19.9	20.6	20.7	23.5	22.6	22.2	24.8	22.6	14.7	18.6	19.9	20.5	19.4	15.8	19.5	18.7	19.5	21.8	20.9	20.3	19.9	18.3	17.6	18.4	20.0
23	19.5	20.0	20.9	21.9	22.8	22.8	23.0	21.5	20.7	18.5	20.0	19.6	15.5	15.0	18.8	21.3	21.6	21.9	22.6	23.1	21.1	19.9	18.6	19.3	20.4
24	19.3	19.7	20.9	21.5	21.2	21.8	23.0	20.9	21.1	20.3	18.0	21.4	19.5	16.6	18.2	20.9	22.6	23.7	23.9	23.0	21.7	19.5	18.8	17.9	20.6
25	19.3	19.9	20.4	21.0	23.6	21.9	21.2	21.1	20.3	20.2	19.2	19.6	19.8	19.6	17.0	18.2	20.2	22.1	22.5	22.1	21.2	19.2	18.0	18.7	20.3
26	18.9	19.7	20.4	20.9	22.8	24.3	21.8	21.1	19.8	20.4	19.9	18.4	18.8	20.2	20.3	20.3	19.6	19.1	19.7	19.4	20.0	18.8	18.5	19.1	20.1
27	19.5	20.8	21.6	21.9	22.2	23.1	23.1	22.5	19.4	23.6	22.6	21.3	20.5	19.9	20.1	20.5	21.4	22.5	23.0	22.2	20.9	19.8	18.8	18.5	21.2
28	19.4	20.0	20.4	21.1	20.8	20.2	21.2	20.6	20.1	20.3	20.1	20.4	20.0	20.3	20.6	20.9	21.8	22.9	23.0	22.3	20.7	19.4	17.8	17.8	20.5
29 D	18.7	19.4	20.0	20.2	20.3	21.8	23.3	25.8	26.2	26.5	17.0	22.6	22.7	13.6	14.3	19.5	21.2	22.1	23.2	23.0	21.6	20.0	17.8	18.3	20.8
30 D	16.9	16.8	18.0	19.6	19.0	19.1	20.6	21.9	20.6	20.9	22.3	19.2	20.7	21.3	20.8	20.2	20.3	22.1	22.0	21.7	20.6	18.6	18.0	18.0	20.0
31	19.3	20.7	20.8	23.2	22.5	21.2	20.8	20.9	20.0	19.5	19.6	19.9	20.0	19.9	20.0	19.8	20.6	21.4	21.3	20.2	19.0	17.8	17.5	18.6	20.2
MEAN	19.1	19.8	20.5	21.0	21.5	21.3	21.2	21.2	20.9	20.7	20.3	20.3	20.3	19.9	20.1	20.8	21.7	21.5	21.8	20.9	20.0	18.7	18.3	18.3	20.4

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 36 VICTORIA   Z = 53,000 GAMMA +   DECEMBER 1971

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	97	97	98	99	100	100	100	101	99	98	93	91	90	93	92	96	99	94	91	91	89	91	92	95	95
2	96	96	96	95	95	95	94	94	96	95	94	94	95	95	93	93	93	96	93	93	93	91	92	94	94
3	95	95	95	97	98	97	98	87	72	83	82	89	93	88	90	95	97	89	85	80	86	90	92	93	90
4	97	95	95	95	95	97	100	99	101	98	96	95	94	93	95	96	95	93	92	90	91	90	95	94	95
5	98	96	96	93	94	93	93	93	94	93	90	86	91	92	93	94	96	93	90	88	90	91	93	95	93
6 Q	96	96	95	94	95	94	94	93	94	94	95	94	92	91	92	93	93	95	92	91	91	92	94	95	94
7 Q	97	95	96	94	93	93	92	93	93	93	93	94	94	93	92	95	97	96	93	94	95	97	98	95	94
8 Q	98	95	96	96	94	94	93	93	94	92	93	91	91	89	87	89	91	89	88	87	87	88	88	88	91
9	91	89	88	90	90	87	88	87	89	87	70	77	85	87	89	89	90	90	86	86	86	90	91	90	87
10 Q	96	96	95	93	93	92	92	91	90	90	90	90	90	91	90	90	94	94	89	88	90	90	92	92	92
11	95	95	94	94	93	93	92	92	92	92	90	92	91	91	89	90	87	82	79	79	82	81	84	88	89
12	93	93	95	97	97	97	96	95	94	94	93	93	91	93	93	93	91	85	85	88	90	90	83	93	92
13	103	103	104	105	105	103	100	97	91	73	81	83	81	86	89	81	82	77	77	81	86	91	94	96	90
14 Q	97	97	95	97	95	93	93	93	93	91	91	92	88	86	91	93	92	87	87	89	90	90	90	90	92
15	91	93	94	96	97	95	96	95	93	94	93	93	93	92	92	92	93	93	89	87	87	91	94	91	93
16	93	93	91	94	92	93	93	93	91	93	92	92	92	92	91	93	95	94	92	91	85	86	83	89	91
17 D	98	98	116	114	119	115	108	97	53	54	68	72	81	93	98	87	52	-16	18	61	96	98	109	114	83
18 D	114	114	114	116	117	117	115	112	109	107	105	70	62	92	96	98	106	105	106	107	109	110	107	107	105
19	107	105	104	103	103	103	103	92	80	72	38	34	65	83	94	98	99	97	97	98	96	98	100	101	90
20	102	100	100	100	100	100	100	100	100	100	99	99	98	97	97	98	98	100	99	99	99	98	101	102	99
21	104	103	100	99	99	98	97	99	97	98	95	94	96	95	92	90	92	95	94	94	94	103	103	101	97
22 D	102	103	102	104	105	103	100	100	85	68	72	79	73	67	76	89	87	90	91	96	93	97	100	102	91
23	106	105	104	104	106	104	101	100	96	93	93	96	90	80	87	96	94	98	96	95	96	99	104	105	98
24	106	106	103	104	104	105	103	99	99	97	92	88	94	91	92	97	100	100	101	98	99	100	103	102	99
25	108	107	106	105	104	105	103	102	101	100	100	101	101	101	97	96	99	100	99	99	96	96	97	99	101
26	104	107	109	110	110	108	105	102	92	96	99	97	98	100	102	103	102	99	95	97	98	100	104	109	102
27	113	109	110	112	108	107	103	102	93	90	96	97	98	100	101	105	106	105	102	99	95	94	95	97	102
28	102	101	101	102	101	102	101	100	99	99	99	99	99	99	99	100	102	105	99	96	95	94	94	97	99
29 D	101	101	101	104	104	107	114	113	89	68	52	28	36	62	77	91	99	102	100	97	91	90	89	89	88
30 D	96	105	113	113	118	119	123	113	96	77	82	70	72	90	96	100	100	105	103	99	95	97	98	99	99
31	103	103	104	105	103	103	103	103	102	99	101	100	100	99	100	101	104	104	102	101	101	100	96	98	101
MEAN	100	100	100	101	101	100	100	98	92	90	88	86	88	90	92	94	94	91	91	92	93	94	95	97	94

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY (GAMMAS) (ALL DAYS)

TABLE 37 VICTORIA H = 18,500 GAMMA + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	461	459	467	475	478	479	481	487	481	477	479	480	475	481	475	470
1- 2	464	462	469	474	473	480	479	480	475	474	480	480	474	478	473	472
2- 3	465	462	472	471	472	480	481	480	473	474	481	479	474	478	473	472
3- 4	465	463	471	469	471	479	478	478	472	476	480	479	473	477	472	472
4- 5	463	464	470	467	472	479	479	478	474	476	479	478	473	477	472	471
5- 6	463	467	471	466	472	479	480	478	477	477	480	477	474	477	473	472
6- 7	461	465	471	471	476	480	482	481	476	478	478	476	475	480	474	470
7- 8	460	465	472	469	476	479	483	482	477	477	480	475	474	480	474	470
8- 9	458	466	471	472	477	481	484	483	479	481	479	474	475	481	476	469
9-10	460	466	473	473	479	481	486	486	479	481	478	477	477	483	477	470
10-11	461	468	476	474	481	481	486	487	481	483	482	478	478	484	479	472
11-12	464	470	477	473	477	482	486	486	481	485	482	480	479	483	479	474
12-13	466	471	478	476	480	484	487	486	484	486	484	481	480	484	481	476
13-14	467	472	478	477	482	485	490	489	486	485	485	483	481	487	482	477
14-15	466	470	479	475	478	485	491	489	482	484	485	484	481	486	480	476
15-16	466	469	477	474	476	481	486	483	476	479	481	485	478	482	477	475
16-17	464	466	471	466	468	476	478	473	465	472	478	482	472	474	469	473
17-18	457	461	461	455	462	470	469	462	457	465	473	476	464	466	460	467
18-19	448	453	454	449	456	465	460	456	452	462	465	468	457	459	454	459
19-20	442	448	444	449	456	461	459	457	453	462	459	461	454	458	452	453
20-21	440	442	442	449	459	460	462	460	460	466	459	459	455	460	454	450
21-22	445	446	444	451	464	462	467	466	467	471	461	463	459	465	458	454
22-23	452	451	452	455	468	467	472	474	473	476	469	469	465	470	464	460
23-24	457	456	462	462	473	475	476	480	477	477	474	476	470	476	470	466
MEAN	459	462	467	466	472	476	479	477	473	476	476	476	472	476	471	468

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION (MINUTES) (ALL DAYS)

TABLE 38 VICTORIA D = 22 DEG 00.0 MIN EAST + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	21.8	21.1	19.8	18.8	18.0	17.4	17.6	18.0	19.5	20.0	19.3	19.1	19.2	17.7	19.5	20.3
1- 2	22.5	21.6	20.4	19.3	19.3	18.5	19.1	19.0	20.3	20.2	19.9	19.8	20.0	19.0	20.1	21.0
2- 3	23.2	22.2	21.0	20.5	20.3	19.7	20.2	19.7	20.7	21.4	20.6	20.5	20.8	20.0	20.9	21.6
3- 4	23.8	23.2	21.8	21.2	22.0	20.8	20.7	20.5	20.9	21.2	21.0	21.0	21.5	21.0	21.3	22.2
4- 5	23.9	23.2	22.7	22.3	21.9	21.5	21.4	21.1	21.1	21.4	21.6	21.5	22.0	21.5	21.9	22.5
5- 6	24.1	23.4	22.8	22.6	21.8	21.7	21.0	21.3	21.5	21.4	21.4	21.3	22.0	21.4	22.1	22.5
6- 7	24.3	23.2	23.1	23.4	22.9	21.7	21.4	21.8	21.4	21.4	21.2	21.2	22.2	21.9	22.3	22.5
7- 8	24.0	23.6	24.0	22.9	22.3	21.9	21.2	21.3	21.4	20.5	20.7	21.2	22.1	21.7	22.2	22.4
8- 9	23.2	23.5	24.5	23.3	22.4	21.7	21.1	21.1	20.6	20.8	21.1	20.9	22.0	21.6	22.3	22.2
9-10	22.9	23.4	24.0	23.0	22.3	21.8	21.0	21.4	21.5	20.7	21.2	20.7	22.0	21.6	22.3	22.0
10-11	23.6	23.1	24.2	23.1	22.1	22.4	20.9	21.7	22.6	20.6	20.2	20.3	22.1	21.8	22.6	21.8
11-12	24.3	23.4	23.1	23.5	22.8	23.2	21.6	22.5	22.7	21.4	20.4	20.3	22.4	22.5	22.7	22.1
12-13	24.1	23.5	23.6	23.5	23.7	23.2	23.1	22.7	22.7	21.5	20.2	20.3	22.7	23.2	22.8	22.0
13-14	23.9	23.6	23.1	24.3	24.8	24.3	24.2	23.6	23.5	20.9	20.7	19.9	23.1	24.2	22.9	22.0
14-15	23.3	22.6	23.8	25.4	25.7	25.9	26.0	25.8	24.3	21.9	21.0	20.1	23.8	25.8	23.9	21.7
15-16	24.0	23.8	25.2	26.1	27.0	27.0	27.5	27.4	25.5	22.9	21.4	20.8	24.9	27.2	24.9	22.5
16-17	25.5	24.7	26.8	26.4	27.3	27.1	28.3	28.0	26.3	23.7	22.5	21.7	25.7	27.6	25.8	23.6
17-18	26.1	25.3	26.7	26.4	25.9	26.4	27.2	26.5	24.7	22.9	23.1	21.5	25.2	26.5	25.2	24.0
18-19	25.7	24.5	25.5	24.7	23.7	23.8	24.0	22.5	21.8	21.1	22.3	21.8	23.5	23.5	23.3	23.6
19-20	24.4	23.3	23.9	22.7	21.0	21.4	20.0	19.0	19.0	18.8	20.7	20.9	21.3	20.4	21.1	22.3
20-21	22.9	21.8	21.7	20.9	19.1	19.1	17.3	17.0	17.5	17.9	19.3	20.0	19.5	18.1	19.5	21.0
21-22	21.8	20.7	20.1	19.8	18.1	17.5	16.1	16.0	17.0	17.8	18.3	18.7	18.5	16.9	18.7	19.9
22-23	21.5	20.2	19.3	18.6	17.2	16.7	15.9	16.0	17.6	18.3	18.3	18.3	18.2	16.4	18.5	19.6
23-24	21.5	20.4	18.7	18.3	17.3	16.5	16.5	16.6	18.4	18.9	18.5	18.3	18.3	16.7	18.6	19.7
MEAN	23.6	22.9	22.9	22.5	22.0	21.7	21.4	21.3	21.4	20.7	20.6	20.4	21.8	21.6	21.9	21.9

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY (GAMMAS) (ALL DAYS)

TABLE 39 VICTORIA Z = 53,000 GAMMA + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	115	115	110	119	119	113	110	107	104	98	97	100	109	112	108	107
1- 2	114	115	111	122	124	116	112	107	103	98	97	100	110	115	109	107
2- 3	115	115	113	125	126	118	114	108	105	101	98	100	111	117	111	107
3- 4	115	116	114	121	124	116	110	108	104	100	98	101	111	115	110	108
4- 5	114	116	115	120	118	114	107	107	103	100	97	101	109	112	110	107
5- 6	115	116	114	119	116	111	105	106	100	97	96	100	108	110	108	107
6- 7	113	113	113	116	110	109	104	102	98	96	94	100	106	106	106	105
7- 8	111	113	110	112	105	105	102	100	96	94	89	98	103	103	103	103
8- 9	108	111	107	110	104	103	101	96	91	91	89	92	100	101	100	100
9-10	102	108	102	104	102	100	99	95	87	88	87	90	97	99	95	97
10-11	102	107	101	100	96	96	98	93	87	86	87	88	95	96	94	96
11-12	103	106	98	97	95	95	96	92	84	85	86	86	94	95	91	95
12-13	104	104	96	97	101	96	97	93	88	84	86	88	94	97	91	96
13-14	103	104	97	97	103	96	99	94	91	84	85	90	95	98	92	96
14-15	101	99	99	99	100	96	99	97	92	88	86	92	96	98	95	95
15-16	101	100	102	101	99	96	98	97	91	90	88	94	97	98	96	96
16-17	105	104	103	101	98	95	94	94	90	91	91	94	97	95	96	99
17-18	106	102	100	97	95	92	87	86	85	88	90	91	93	90	93	97
18-19	106	99	96	95	91	87	81	79	82	84	88	91	90	85	89	96
19-20	106	97	92	95	90	86	78	77	82	83	87	92	89	83	88	96
20-21	106	99	93	97	94	87	80	80	86	85	88	93	91	85	90	97
21-22	108	103	96	100	100	90	84	86	90	89	90	94	94	90	94	99
22-23	111	106	101	105	104	96	91	92	95	93	93	95	99	96	99	101
23-24	112	110	105	112	111	104	99	99	98	94	94	97	103	103	102	103
MEAN	108	107	104	107	105	101	98	96	93	91	91	94	100	100	99	100

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY (GAMMAS) (QUIET DAYS)

TABLE 40 VICTORIA H = 18,500 GAMMA + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	469	465	472	494	470	478	485	492	482	485	485	488	480	481	483	477
1- 2	470	472	476	475	470	479	482	481	477	486	486	489	479	478	479	479
2- 3	470	474	478	477	475	481	482	480	474	486	488	490	480	480	479	481
3- 4	470	473	478	475	475	480	483	481	476	487	488	489	479	480	479	480
4- 5	469	471	477	475	475	481	482	482	478	487	487	488	479	480	479	479
5- 6	470	471	477	476	475	481	483	483	478	486	485	487	479	481	479	478
6- 7	470	473	478	477	477	480	484	485	476	487	486	488	480	482	480	479
7- 8	470	472	479	478	478	480	485	485	478	487	485	486	480	482	481	478
8- 9	469	471	479	480	479	482	487	486	480	489	487	486	481	484	482	478
9-10	470	471	482	482	481	486	487	487	479	489	487	487	482	485	483	479
10-11	471	474	482	486	480	487	488	488	482	492	487	490	484	486	486	481
11-12	473	475	485	485	482	485	489	489	482	492	488	490	485	486	486	482
12-13	473	475	484	485	481	489	492	489	482	493	490	490	485	488	486	482
13-14	471	475	483	486	482	490	494	493	483	492	489	490	486	490	486	481
14-15	475	475	484	485	484	490	495	491	479	489	489	489	485	490	484	482
15-16	477	472	485	484	483	490	488	483	471	484	489	490	483	486	481	482
16-17	476	471	479	478	478	486	476	470	461	476	485	489	477	478	474	480
17-18	468	467	469	466	472	479	467	457	454	469	481	485	469	469	465	475
18-19	459	462	461	459	467	471	461	451	448	466	475	478	463	463	459	469
19-20	452	459	454	460	466	467	462	452	447	469	468	472	461	462	458	463
20-21	451	455	452	461	466	465	467	458	455	473	464	471	461	464	460	460
21-22	456	459	453	461	463	469	471	467	466	478	467	475	465	468	465	464
22-23	462	464	460	460	467	474	474	474	476	482	477	483	471	472	470	472
23-24	468	469	469	463	470	478	478	480	483	486	483	491	476	477	475	478
MEAN	468	469	474	475	475	480	481	479	473	484	483	486	477	479	477	477

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION (MINUTES) (QUIET DAYS)

TABLE 41 VICTORIA — D = 22 DEG 00.0 MIN EAST + — 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	22.0	21.5	19.4	19.7	18.2	17.9	18.5	19.4	20.5	19.9	19.4	19.3	19.7	18.5	19.9	20.5
1- 2	22.6	22.0	20.1	20.1	19.4	19.1	19.9	20.9	20.9	19.7	19.7	19.8	20.3	19.8	20.2	21.0
2- 3	22.8	22.6	20.9	20.7	20.2	19.9	20.9	20.9	21.1	20.0	20.1	20.2	20.9	20.5	20.7	21.4
3- 4	23.1	22.9	21.4	21.3	21.0	20.7	21.1	20.8	20.9	20.2	20.3	20.8	21.2	20.9	21.0	21.8
4- 5	23.2	23.1	21.9	21.8	21.3	20.8	20.8	20.7	20.8	20.3	20.4	21.1	21.3	20.9	21.2	21.9
5- 6	23.2	23.4	21.9	22.3	21.2	21.2	20.7	20.9	20.6	20.2	20.4	21.0	21.4	21.0	21.2	22.0
6- 7	23.3	22.9	22.3	21.9	21.5	21.7	21.0	20.5	20.7	20.3	20.3	20.4	21.4	21.2	21.3	21.7
7- 8	23.3	23.4	22.6	22.3	21.6	22.1	21.0	20.4	20.8	20.2	20.2	20.5	21.5	21.3	21.5	21.8
8- 9	23.0	23.5	23.3	22.8	21.3	21.2	21.0	20.8	21.5	20.0	20.3	20.1	21.6	21.1	21.9	21.8
9-10	23.1	23.3	23.4	22.5	21.7	21.6	21.2	21.1	21.5	20.1	20.4	20.1	21.7	21.4	21.9	21.7
10-11	22.6	23.1	23.4	22.6	21.7	21.9	21.3	21.5	22.0	20.6	20.4	19.8	21.7	21.6	22.1	21.5
11-12	22.9	23.2	23.2	22.7	22.2	21.8	21.7	21.7	22.2	20.7	20.4	20.2	21.9	21.9	22.2	21.7
12-13	23.1	23.4	23.2	22.9	22.9	22.9	22.4	22.7	22.2	20.8	20.6	20.1	22.3	22.7	22.3	21.8
13-14	22.8	23.4	23.7	24.6	24.2	23.9	23.4	23.4	23.1	21.1	21.0	20.4	22.9	23.7	23.1	21.9
14-15	23.1	23.7	24.8	25.8	25.6	24.9	25.3	25.3	24.5	21.8	21.1	20.5	23.9	25.3	24.2	22.1
15-16	23.7	24.4	26.2	26.9	27.0	26.4	27.0	27.2	26.2	23.0	21.9	21.0	25.1	26.9	25.6	22.8
16-17	25.5	25.4	27.9	27.3	27.2	26.6	27.6	28.3	26.7	24.2	22.7	22.4	26.0	27.4	26.5	24.0
17-18	27.1	25.8	28.4	27.3	27.2	26.7	26.8	27.2	25.0	24.2	23.1	23.0	26.0	27.0	26.2	24.8
18-19	26.6	25.4	27.1	24.9	25.3	24.9	23.3	23.1	22.4	22.6	22.7	22.3	24.2	24.2	24.2	24.3
19-20	25.8	24.4	24.6	22.8	22.1	22.0	20.0	19.4	19.3	20.2	21.3	21.2	21.9	20.9	21.7	23.2
20-21	23.9	22.9	22.6	21.3	19.7	19.3	17.6	17.4	17.3	18.6	20.0	20.0	20.1	18.5	20.0	21.7
21-22	22.7	21.7	20.5	20.5	18.6	17.3	16.7	16.3	16.6	18.1	19.0	19.0	18.9	17.2	18.9	20.6
22-23	22.2	21.1	19.2	19.7	17.3	16.3	16.9	16.6	17.1	18.3	18.6	18.4	18.5	16.7	18.6	20.1
23-24	21.9	20.9	18.4	19.4	17.0	16.3	17.3	17.6	18.5	18.7	18.5	18.0	18.5	17.1	18.5	19.8
MEAN	23.5	23.2	22.9	22.6	21.9	21.6	21.4	21.4	21.4	20.6	20.5	20.4	21.8	21.6	21.9	21.9

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY (GAMMAS) (QUIET DAYS)

TABLE 42 VICTORIA Z = 53,000 GAMMA + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	110	111	108	108	112	109	101	105	100	93	93	97	104	107	102	103
1- 2	109	112	107	109	114	111	105	104	98	91	92	96	104	109	101	102
2- 3	110	111	108	111	115	111	104	103	98	92	93	95	104	108	102	102
3- 4	110	112	108	110	113	109	101	101	98	91	93	95	103	106	102	103
4- 5	110	110	107	110	110	108	99	98	98	91	92	94	102	104	102	102
5- 6	111	110	106	110	109	107	98	99	98	91	92	93	102	103	101	102
6- 7	110	110	106	109	109	107	98	98	99	90	92	93	102	103	101	101
7- 8	110	110	106	109	108	107	98	98	99	90	91	93	102	103	101	101
8- 9	110	108	107	108	107	106	98	97	98	90	91	93	101	102	101	101
9-10	109	109	105	108	108	104	98	97	97	90	90	92	101	102	100	100
10-11	108	108	104	107	107	102	97	97	96	90	89	92	100	101	99	99
11-12	107	107	104	105	107	103	98	97	95	89	89	92	99	101	98	99
12-13	108	107	104	102	108	104	98	97	94	89	89	91	99	102	97	99
13-14	107	108	103	99	107	107	101	99	95	88	89	90	99	104	96	99
14-15	108	107	105	101	107	106	102	100	97	89	89	90	100	104	98	99
15-16	111	109	107	104	106	104	100	100	98	92	91	92	101	103	100	101
16-17	113	109	105	105	100	101	96	95	98	92	92	93	100	98	100	102
17-18	113	108	102	101	95	96	87	85	93	89	92	92	96	91	96	101
18-19	110	105	95	95	88	91	78	77	88	83	89	90	91	84	90	99
19-20	109	101	91	93	85	90	77	75	84	81	87	90	88	82	87	97
20-21	103	99	89	93	86	87	83	79	87	83	86	91	89	84	88	95
21-22	104	100	90	93	90	89	86	87	90	86	87	91	91	88	90	96
22-23	105	104	92	97	95	92	89	92	94	88	89	92	94	92	93	98
23-24	105	106	95	99	103	98	95	98	95	88	90	92	97	99	94	98
MEAN	109	107	102	104	104	102	95	95	95	89	90	92	99	99	98	100

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY (GAMMAS) (DISTURBED DAYS)

TABLE 43 VICTORIA H = 18,500 GAMMA + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	452	448	455	464	484	480	483	489	469	466	453	472	468	484	464	456
1- 2	456	447	462	461	473	480	481	475	466	461	460	465	466	477	463	457
2- 3	454	447	460	464	465	474	484	478	465	451	465	465	464	475	460	458
3- 4	456	451	455	458	469	476	480	466	454	455	465	466	463	473	456	460
4- 5	449	454	463	455	475	470	480	472	455	456	460	464	463	474	457	457
5- 6	447	463	461	457	466	472	482	474	462	454	471	463	464	474	459	461
6- 7	446	458	462	472	483	475	485	478	456	460	455	460	466	480	463	455
7- 8	445	454	459	459	468	475	483	480	463	467	464	458	465	477	462	455
8- 9	441	463	455	465	461	475	482	477	456	466	455	452	462	474	461	453
9-10	439	460	458	468	461	463	485	485	461	469	448	466	464	474	464	453
10-11	441	459	461	459	477	464	483	485	464	467	462	462	465	477	463	456
11-12	450	467	466	455	458	467	484	479	461	474	463	466	466	472	464	462
12-13	454	467	470	463	473	467	481	480	478	477	459	468	470	475	472	462
13-14	460	467	472	467	473	468	489	484	482	480	473	470	474	479	475	468
14-15	448	458	466	465	455	469	488	485	470	478	478	475	470	474	470	465
15-16	442	461	469	456	464	456	478	480	471	469	461	479	466	470	466	461
16-17	439	453	458	453	460	452	470	469	460	464	465	459	459	463	459	454
17-18	435	446	444	431	451	454	465	457	443	463	466	442	450	457	445	447
18-19	426	435	437	430	444	452	452	454	439	457	453	438	443	451	441	438
19-20	417	428	431	432	454	452	447	455	447	452	445	433	441	452	441	431
20-21	412	426	435	428	456	448	453	455	455	462	445	444	443	453	445	432
21-22	425	428	438	433	462	448	463	459	457	466	438	452	447	458	449	436
22-23	423	437	441	440	464	461	469	471	464	467	443	457	453	466	453	440
23-24	427	446	453	451	470	475	468	477	470	467	448	462	460	473	460	446
MEAN	441	451	456	454	465	466	476	474	461	465	458	460	460	470	459	453

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION (MINUTES) (DISTURBED DAYS)

TABLE 44 VICTORIA D = 22 DEG 00.0 MIN EAST + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	21.5	20.1	19.1	16.0	16.5	16.4	17.6	15.7	16.9	19.9	18.3	18.4	18.0	16.5	18.0	19.6
1- 2	22.4	21.0	19.6	18.5	19.1	17.9	19.0	16.4	20.3	19.6	20.9	19.3	19.5	18.1	19.5	20.9
2- 3	23.7	22.6	20.2	19.9	20.6	19.8	20.8	18.0	21.5	24.5	23.4	20.7	21.3	19.8	21.5	22.6
3- 4	25.2	25.5	22.4	19.6	25.5	20.7	21.1	21.2	19.4	23.9	23.8	21.7	22.5	22.2	21.3	24.0
4- 5	24.3	22.9	23.8	21.9	24.1	22.0	22.1	21.2	20.6	22.9	25.6	23.2	22.9	22.4	22.3	24.0
5- 6	24.6	24.6	22.8	21.9	23.5	21.7	21.6	19.9	24.9	23.5	24.7	22.3	23.0	21.7	23.3	24.0
6- 7	26.0	23.9	23.3	27.0	26.3	22.4	22.2	23.4	22.7	24.5	23.9	22.4	24.0	23.6	24.4	24.1
7- 8	25.7	24.7	24.1	24.7	23.8	21.1	22.1	22.3	22.3	21.0	21.7	23.4	23.1	22.3	23.0	23.9
8- 9	24.0	23.7	26.6	24.5	27.3	23.0	21.6	21.1	19.3	20.7	23.6	21.4	23.1	23.2	22.8	23.2
9-10	22.6	22.5	27.0	23.5	26.0	23.3	21.0	22.5	23.7	20.7	24.5	20.8	23.2	23.2	23.7	22.6
10-11	24.9	22.9	27.3	23.6	23.1	24.7	20.6	22.4	25.2	17.4	20.2	19.7	22.7	22.7	23.4	21.9
11-12	28.3	23.4	22.7	27.0	25.7	25.2	21.9	23.5	22.9	19.9	20.0	18.7	23.3	24.1	23.1	22.6
12-13	26.5	25.2	23.5	25.4	26.9	23.8	22.9	22.7	22.5	23.4	16.8	20.9	23.4	24.1	23.7	22.3
13-14	24.3	24.3	23.8	24.1	26.0	26.5	23.5	23.3	23.6	21.2	18.9	18.3	23.1	24.8	23.2	21.4
14-15	23.0	18.3	23.9	26.2	25.2	29.0	25.8	26.7	22.9	22.2	19.6	19.3	23.5	26.7	23.8	20.1
15-16	20.5	22.4	24.1	25.9	27.1	28.2	26.8	28.6	24.0	21.5	17.6	20.7	24.0	27.7	23.9	20.3
16-17	22.9	20.8	26.5	24.8	28.3	27.4	27.6	28.9	24.6	22.4	19.0	21.6	24.6	28.1	24.6	21.1
17-18	23.1	22.1	26.5	25.1	25.1	27.9	26.6	26.9	22.4	22.3	22.2	17.9	24.0	26.6	24.1	21.3
18-19	24.0	22.5	24.8	22.8	22.7	23.7	24.2	22.7	20.3	21.4	22.5	21.8	22.8	23.3	22.3	22.7
19-20	21.6	21.5	23.4	22.0	20.3	21.3	19.2	19.6	17.6	19.4	20.6	20.0	20.5	20.1	20.6	20.9
20-21	21.2	21.1	21.6	20.2	19.0	19.5	15.8	17.3	17.0	18.2	18.9	19.8	19.1	17.9	19.3	20.3
21-22	20.6	21.1	21.1	19.2	18.4	17.0	14.8	16.6	16.5	18.5	17.8	18.6	18.4	16.7	18.8	19.5
22-23	20.8	20.9	20.7	17.3	17.5	16.1	14.9	16.6	17.5	18.6	18.2	18.1	18.1	16.3	18.5	19.5
23-24	21.1	20.2	19.4	17.8	18.4	16.3	15.8	17.2	18.4	19.4	18.0	18.7	18.4	16.9	18.7	19.5
MEAN	23.5	22.4	23.3	22.5	23.2	22.3	21.2	21.4	21.1	21.1	20.9	20.3	21.9	22.0	22.0	21.8

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY (GAMMAS) (DISTURBED DAYS)

TABLE 45 VICTORIA Z = 53,000 GAMMA + 1971

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	121	132	112	137	131	121	110	109	110	106	113	102	117	118	116	117
1- 2	121	126	117	153	147	131	115	110	124	109	114	104	123	126	126	116
2- 3	123	130	121	158	153	136	120	119	137	115	116	109	128	132	133	120
3- 4	127	131	129	143	143	136	116	124	132	116	115	110	127	130	130	121
4- 5	125	130	130	136	124	132	110	123	126	114	112	113	123	122	127	120
5- 6	129	127	125	137	126	125	107	119	117	109	105	112	120	119	122	118
6- 7	121	119	124	124	103	117	104	114	108	105	99	112	112	110	115	113
7- 8	117	120	116	113	86	102	100	105	105	100	72	107	104	98	109	104
8- 9	106	115	106	114	92	101	100	93	80	90	73	86	96	97	98	95
9-10	83	100	89	101	83	91	101	93	82	87	69	75	88	92	90	82
10-11	81	96	83	93	54	78	99	91	80	72	73	76	81	81	82	82
11-12	90	99	82	80	49	70	97	91	59	62	70	64	76	77	71	81
12-13	91	96	78	84	79	72	95	93	68	62	68	65	79	85	73	80
13-14	86	98	86	87	82	64	96	95	81	79	67	81	83	84	83	83
14-15	78	78	94	90	66	73	94	100	81	89	70	89	83	83	89	79
15-16	68	74	100	94	61	75	92	102	83	91	73	93	84	83	92	77
16-17	84	80	98	93	78	77	91	97	83	95	82	89	87	86	92	84
17-18	93	83	96	86	80	80	84	89	80	94	89	77	86	83	89	86
18-19	98	84	96	91	86	83	80	82	81	91	91	84	87	83	90	89
19-20	103	89	95	98	92	88	75	79	87	88	93	92	90	84	92	94
20-21	108	96	100	101	102	93	80	81	91	90	94	97	94	89	96	99
21-22	116	106	104	108	112	101	88	88	94	93	97	98	101	97	100	104
22-23	124	111	109	119	120	111	98	94	100	97	106	101	108	106	106	111
23-24	130	117	114	141	131	121	105	99	104	100	109	102	114	114	115	115
MEAN	105	106	104	112	99	99	98	100	96	94	91	93	100	99	102	99

THREE-HOUR RANGE INDICES

VICTORIA 1971

TABLE 46

JANUARY

DAY	D	H	Z	K
1	1112 1210	3102 0010	1001 0000	3112 1210
2	3555 4422	3332 3322	1233 2211	3555 4422
3	3455 5333	2344 4444	2244 3232	3455 5444
4	3443 3321	3333 2321	1321 2120	3443 3321
5	1343 3222	2332 2212	0122 1001	2343 3222
6	0020 2200	0020 1000	0010 0000	0020 2200
7	0010 1000	0000 0000	0000 0000	0010 1000
8	0000 0000	0000 0000	0000 0000	0000 0000
9	0000 0000	0000 0000	0000 0000	0000 0000
10	0011 1231	0002 1021	0001 0001	0012 1231
11	1131 2211	0131 1301	0010 0101	1131 2311
12	0002 1000	0000 0100	0000 0010	0002 1100
13	0123 3101	0122 2102	0001 1000	0123 3102
14	0223 3302	2223 1211	0011 1001	2223 3312
15	0134 2111	1122 2101	0021 0000	1134 2111
16	1054 1111	2032 2001	0022 0000	2054 2111
17	0114 3311	0111 1100	0002 0000	0114 3311
18	0023 4433	0013 2222	0001 3311	0023 4433
19	2011 2342	2110 2233	0000 0121	2111 2343
20	3444 4423	3334 3313	2335 2211	3444 4423
21	2353 2231	2243 1222	0121 1110	2353 2232
22	2331 0122	2342 0001	0120 0000	2342 0122
23	1111 0121	1120 0111	0000 0000	1121 0121
24	0004 4122	1112 2012	0000 2111	1114 4122
25	2323 2220	3221 1220	1011 0010	3323 2220
26	0000 0000	0000 0000	0000 0000	0000 0000
27	0355 5532	0354 5443	0145 5521	0355 5543
28	3555 5443	4535 3423	1335 4423	4555 5443
29	3414 3221	5323 1101	3113 2000	5424 3221
30	3415 4323	3424 3224	2224 3112	3425 4324
31	1263 3332	2252 3222	0052 2111	2263 3332

FEBRUARY

DAY	D	H	Z	K
1	1143 3322	2232 2432	0043 1311	2243 3432
2	3101 3122	3101 2223	1000 0001	3101 3223
3	0102 0010	2001 0010	0000 0000	2102 0010
4	0003 1211	0002 0102	0000 0000	0003 1212
5	1001 1000	0102 1000	0001 0000	1102 1000
6	1032 2210	1031 0001	0010 0000	1032 2211
7	0121 2222	0132 0112	0010 0000	0132 2222
8	1313 2222	2211 1122	0101 0011	2313 2222
9	2243 3212	2231 2201	1021 2100	2243 3212
10	0021 3432	1011 2322	0000 1101	1021 3432
11	0011 0321	0001 0112	0000 0101	0011 0322
12	1030 3321	0021 1111	0020 2100	1031 3321
13	0000 0000	0000 0000	0000 0000	0000 0000
14	0034 5422	0123 3332	0013 4211	0134 5432
15	2234 3543	2233 3434	1023 2332	2234 3544
16	5454 2422	5332 2322	5231 1212	5454 2422
17	3134 3112	3232 2213	1022 0000	3234 3213
18	1233 3221	1231 1113	0021 2001	1233 3223
19	1342 0211	2232 0001	0110 0000	2342 0211
20	2202 1111	3201 0011	0000 0000	3202 1111
21	1243 3200	2232 1100	0022 0000	2243 3200
22	0130 0000	0132 0000	0020 0000	0132 0000
23	0031 2433	0231 1333	0010 0222	0231 2433
24	0001 3223	1011 2223	0001 1212	1011 3223
25	5233 7543	3243 5443	4122 5432	5243 7543
26	4744 4322	5534 3211	2434 3300	5744 4322
27	2320 3222	2210 2213	1000 3200	2320 3223
28	1411 2100	2321 0000	0000 0000	2421 2100

THREE-HOUR RANGE INDICES

VICTORIA 1971

TABLE 47

MARCH

DAY	D	H	Z	K
1	1223 0100	1122 0000	0000 0000	1223 0100
2	0120 1111	0210 1001	0000 0000	0220 1111
3	2141 2122	1131 0023	0020 0001	2141 2123
4	3244 4220	3322 3211	2213 2000	3344 4221
5	1332 2101	2331 1000	0120 0000	2332 2101
6	0201 1000	0101 0000	0000 0000	0201 1000
7	0011 1200	0111 1101	0000 0000	0111 1201
8	1114 4321	3313 2212	1103 3100	3314 4322
9	0333 1111	1122 1011	0020 0000	1333 1111
10	1053 4330	2142 3311	0021 2210	2153 4331
11	0313 3100	0322 1101	0002 1000	0323 3101
12	0003 4343	0112 3233	0003 3012	0113 4343
13	2355 4433	2334 4433	2344 4322	2355 4433
14	3555 4333	3344 3334	2235 4112	3555 4334
15	3553 2322	3343 2322	3241 1210	3553 2322
16	3324 3221	3323 2212	2113 2100	3324 3222
17	1134 2111	2232 1211	1021 1000	2234 2211
18	1112 0111	2211 0011	1000 0000	2212 0111
19	1323 4322	1212 2233	0100 3102	1323 4333
20	2553 1101	2442 0001	1231 0000	2553 1101
21	0022 0000	1011 0001	0001 0000	1022 0001
22	0000 0000	0000 0000	0000 0000	0000 0000
23	0001 1221	0011 1221	0000 0000	0011 1221
24	0233 2233	2233 1223	0010 0011	2233 2233
25	2154 1321	2143 1111	1032 0000	2154 1321
26	2163 3220	3243 2221	1032 1000	3263 3221
27	2233 4100	2232 2002	0022 1000	2233 4102
28	0000 0000	0000 0000	0000 0000	0000 0000
29	0021 1000	0020 0000	0000 0000	0021 1000
30	1102 1232	0002 1222	0002 0011	1102 1232
31	3464 3432	3443 2332	3442 2211	3464 3432

APRIL

DAY	D	H	Z	K
1	2253 2211	3252 1111	1141 0000	3253 2211
2	0023 2111	0021 3202	0012 3200	0023 3212
3	3335 1223	2223 1214	2124 0002	3335 1224
4	4413 3443	4332 1424	4321 3322	4433 3444
5	0013 2222	1112 1222	0001 0001	1113 2222
6	3444 1321	3334 1222	2333 2000	3444 1322
7	1421 0001	1321 0012	0110 0000	1421 0012
8	0032 1110	0121 2112	0001 2000	0132 2112
9	0566 5454	1354 4444	0246 5332	1566 5454
10	4633 3423	3532 3323	3542 2222	4633 3423
11	2446 3422	3544 3423	1425 3212	3546 3423
12	3233 2221	3222 2112	2222 1000	3233 2222
13	0334 4200	2223 2111	0023 2000	2334 4211
14	2031 4444	2021 3334	0020 4126	2031 4444
15	6525 4222	5434 3223	5435 5112	6535 4223
16	3434 3111	3223 2211	2233 2001	3434 3211
17	1243 0001	2233 1002	1132 0000	2243 1002
18	1332 1221	2212 1322	0002 0000	2332 1322
19	2332 0110	3321 0111	1211 0000	3332 0111
20	1232 1120	0221 1010	0010 0000	1232 1120
21	0014 3344	0124 3334	0003 2223	0124 3344
22	4442 2121	4322 2121	3320 0001	4442 2121
23	0343 2221	1223 1132	0011 0011	1343 2232
24	0000 0000	1100 0000	0000 0000	1100 0000
25	0000 0000	0000 0000	0000 0000	0000 0000
26	0010 2211	1010 2112	0000 1000	1010 2212
27	1345 1221	2222 0011	1123 0000	2345 1221
28	1443 4410	2333 4422	1123 3210	2443 4422
29	2111 2213	4222 2223	2110 0102	4222 2223
30	3233 3100	4332 2111	2112 1000	4333 3111

THREE-HOUR RANGE INDICES

VICTORIA 1971

TABLE 48

MAY

DAY	D	H	Z	K
1	1220 2122	1321 1121	0100 0010	1321 2122
2	3562 2110	3441 1211	2442 0000	3562 2211
3	0320 1222	0210 0011	0000 0002	0320 1222
4	3312 1110	4311 1011	2200 0010	4312 1111
5	1101 1211	2012 1212	0001 0100	2112 1212
6	3456 4433	3346 4334	2277 3323	3456 4434
7	4674 4333	4553 3233	3455 2212	4674 4333
8	0353 3222	2333 2222	1143 2111	2353 3222
9	3423 2210	3422 2112	2323 0001	3423 2212
10	4342 2110	2231 1011	1221 0110	4342 2111
11	2320 1000	2320 1011	0100 0000	2320 1011
12	0000 0001	2110 0012	1000 0000	2110 0012
13	0100 0110	3110 1201	0000 0000	3110 1211
14	3313 3322	3223 2332	1202 1111	3323 3332
15	3242 2211	3221 1211	3120 0001	3242 2211
16	0000 0111	2210 0122	0000 0001	2210 0122
17	3466 6543	3356 5544	3356 5533	3466 6544
18	4674 5320	4555 4332	4555 4421	4675 5332
19	2243 3220	4232 2112	2113 0001	4243 3222
20	0023 1000	2112 0102	0003 2000	2123 1102
21	1002 2100	3002 2311	0001 2001	3002 2311
22	1232 1101	3220 0002	1000 0000	3232 1102
23	2442 1120	4132 2122	2111 0010	4442 2122
24	1211 2321	2221 1222	1100 0100	2221 2322
25	2322 1221	3121 1123	0002 0001	3322 1223
26	3332 1100	2331 1122	1230 0000	3332 1122
27	0011 0000	0011 0000	0000 0000	0011 0000
28	0000 1120	0000 1011	0000 0000	0000 1121
29	0100 1121	2200 1123	0000 0002	2200 1123
30	2334 4222	3234 3222	1123 4111	3334 4222
31	0221 0100	2111 1021	0000 0000	2221 1121

JUNE

DAY	D	H	Z	K
1	0044 3433	1143 2434	0044 2221	1144 3434
2	3555 4433	4444 3333	3445 2233	4555 4433
3	6552 4322	5543 3223	4552 3111	6553 4323
4	1341 1211	2242 1222	1132 0010	2342 1222
5	3221 1010	3310 1012	2100 0000	3321 1012
6	1322 1200	2322 1111	1120 0100	2322 1211
7	0100 0110	1101 1012	0000 0000	1101 1112
8	2322 1100	2321 1101	1210 0000	2322 1101
9	0031 1211	0111 0211	0000 0000	0131 1211
10	0003 2100	0002 1111	0000 0000	0003 2111
11	1322 0000	2222 0001	0212 0000	2322 0001
12	0021 0100	1122 0012	0002 0000	1122 0112
13	0021 3321	1111 3322	0000 3101	1121 3322
14	1223 2100	2322 1102	1001 2000	2323 2102
15	1022 0100	2231 0123	0021 0001	2232 0123
16	0222 2111	2122 1213	1000 1002	2222 2213
17	1234 2200	2232 3111	0003 2000	2234 3211
18	0141 1110	3231 1022	1020 0000	3241 1122
19	0100 0000	2210 0001	0000 0000	2210 0001
20	0022 0000	1112 0010	0000 0000	1122 0010
21	0032 2010	1122 0112	0000 0000	1132 2112
22	0301 2121	2301 0002	0100 0010	2301 2122
23	1333 3200	2233 3101	1113 3000	2333 3201
24	0000 0020	1110 0011	0000 0000	1110 0021
25	2344 4523	2334 4535	1035 3523	2344 4535
26	2445 2110	4333 1012	3334 1000	4445 2112
27	0322 2001	2221 2111	0000 1000	2322 2111
28	0021 3221	1111 2113	0002 1011	1121 3223
29	0322 4343	3333 3343	2222 3222	3333 4343
30	2222 3221	4322 2223	2211 2112	4322 3223

VICTORIA 1971

TABLE 49

JULY

DAY	D	H	Z	K
1	2432 2112	4422 1122	2300 1000	4432 2122
2	4343 3112	3332 3114	3331 1011	4343 3114
3	0022 1110	3221 1112	1110 1001	3222 1112
4	2220 1221	2211 0113	2200 0001	2221 1223
5	0233 2121	3212 1113	1100 0001	3233 2123
6	2120 0121	4221 0223	2100 0011	4221 0223
7	0001 0000	1211 1011	0000 0000	1211 1011
8	0413 1211	2322 0113	0201 0011	2423 1213
9	2150 0010	4320 0011	2010 0000	4350 0011
10	2000 0100	3100 0001	1000 0000	3100 0101
11	0111 1310	2211 1211	0000 0100	2211 1311
12	2121 2121	3112 2123	1000 0012	3122 2123
13	2233 2231	3242 1122	2012 1110	3243 2232
14	1243 3211	3223 2212	1103 2010	3243 3212
15	1413 3100	3322 2122	1211 1000	3423 3122
16	0033 2210	2221 2122	1011 1000	2233 2222
17	2110 2000	3110 0001	1000 0000	3110 2001
18	0222 3211	1222 2202	0001 1101	1222 3212
19	3110 1110	3321 1212	2200 0000	3321 1212
20	0000 2000	1001 2101	1000 0000	1001 2101
21	0123 4532	1222 3433	0102 3223	1223 4533
22	4310 1010	4310 0011	3210 0000	4310 1011
23	1011 2121	2232 3223	1001 2111	2232 3223
24	1100 1000	3110 0012	2100 0001	3110 1012
25	1001 2100	2001 1010	0000 0000	2001 2110
26	0001 2343	0000 1335	0000 0122	0001 2345
27	2212 2311	4122 1222	2101 1101	4222 2322
28	3431 0100	3321 0000	1220 0000	3431 0100
29	0011 1221	0011 1223	0000 0101	0011 1223
30	1234 2110	2223 2111	1123 3001	2234 2111
31	1122 2120	3222 1122	1002 2010	3222 2122

AUGUST

DAY	D	H	Z	K
1	1211 2111	3211 1112	2100 0001	3211 2112
2	3564 3111	4452 2012	2252 1001	4564 3112
3	2100 1100	1110 2001	0000 0000	2110 2101
4	1313 2221	3222 2112	1002 2000	3323 2222
5	2451 1000	4441 0003	3240 0001	4451 1003
6	0000 0100	1000 0011	0000 0000	1000 0111
7	0011 0111	1021 0013	0000 0000	1021 0113
8	3533 3211	3323 2113	1323 2001	3533 3213
9	1133 2212	2123 2114	1002 2002	2133 2214
10	1441 2231	2331 1222	2230 0000	2441 2232
11	3533 2210	3334 2122	1224 3010	3534 2222
12	1343 4100	2343 3111	1131 3000	2343 4111
13	1333 1201	2232 0012	1030 0100	2333 1212
14	0202 0110	1100 0101	0000 0000	1202 0111
15	0112 2110	1112 0012	0000 0000	1112 2112
16	1314 1200	2312 1111	1203 1000	2314 1211
17	0002 2103	1122 1015	0001 0003	1122 2115
18	4312 2311	4422 2112	3200 1000	4422 2312
19	3131 0000	2220 0001	1000 0000	3231 0001
20	0000 0110	1100 0111	0000 0000	1100 0111
21	0324 3210	2223 1102	1112 1000	2324 3212
22	1243 3311	2232 1103	2032 2102	2243 3313
23	3332 3210	3322 1112	1220 2000	3332 3212
24	0232 3212	2211 1123	0000 0011	2232 3223
25	2212 2211	2211 1223	0001 1000	2212 2223
26	3245 2210	3133 2111	3033 0000	3245 2211
27	0000 1100	1010 0001	0000 0000	1010 1101
28	0000 1321	0011 2212	0000 0100	0011 2322
29	2002 3200	2121 2111	0000 1000	2122 3211
30	2021 0203	3121 0213	0000 0002	3121 0213
31	3455 2332	5343 1333	3343 0021	5455 2333

THREE-HOUR RANGE INDICES

VICTORIA 1971

TABLE 50

SEPTEMBER

DAY	D	H	Z	K
1	3332 1111	4421 1012	2321 0000	4432 1112
2	0000 0000	0000 0000	0000 0000	0000 0000
3	1112 3000	2112 2000	0001 1000	2112 3000
4	0010 0233	0010 0124	0000 0002	0010 0234
5	2444 3311	2333 3222	1124 2100	2444 3322
6	1044 3212	2222 2213	0023 3002	2244 3213
7	3353 1312	3332 2323	2243 0211	3353 2323
8	2455 1110	2433 1101	1324 0000	2455 1111
9	2002 3201	2122 1302	0001 0000	2122 3302
10	1132 1000	2331 1000	0020 0000	2332 1000
11	1224 2110	1123 1010	0003 0000	1224 2110
12	1324 1212	1224 0122	0013 0000	1324 1222
13	3452 2221	3342 2122	2221 0000	3452 2222
14	1143 0122	2231 0112	1022 0000	2243 0122
15	2124 2221	3223 1113	1013 1001	3224 2223
16	3334 1222	3132 1124	1032 1012	3334 1224
17	2332 2124	2122 2025	1011 0003	2332 2125
18	6674 3321	5554 3322	6565 4000	6674 3322
19	0342 1212	2241 1222	0132 0101	2342 1222
20	2444 3332	3433 3222	1333 3111	3444 3332
21	1101 1220	2120 1011	0000 0000	2121 1221
22	1201 0000	1201 0001	0000 0001	1201 0001
23	0111 0100	0120 0100	0000 0000	0121 0100
24	0000 1221	0000 0122	0000 0001	0000 1222
25	3644 4422	2444 4222	2555 5323	3644 4422
26	2012 1223	2012 1225	0000 0113	2012 1225
27	6665 3321	4444 3222	5454 4110	6665 3322
28	1353 2211	3342 1112	0132 0000	3353 2212
29	1031 1111	2121 1022	0020 0000	2131 1122
30	0334 5442	1233 3324	0013 3322	1334 5444

OCTOBER

DAY	D	H	Z	K
1	5544 3212	4342 2213	3241 1002	5544 3213
2	5545 3311	3344 2123	2234 3001	5545 3323
3	4433 3321	4432 3211	3323 3101	4433 3321
4	2344 3212	2232 2012	0032 2002	2344 3212
5	4442 3213	4331 2113	2331 1012	4442 3213
6	5203 2512	4213 2303	3202 1201	5213 2513
7	1000 1233	2201 0134	1000 0023	2201 1234
8	5644 4420	3533 3211	2334 4200	5644 4421
9	2445 4332	4443 2333	2435 4212	4445 4333
10	1433 1211	2322 0111	0221 0000	2433 1211
11	1032 3331	1121 3222	0021 3210	1132 3332
12	0200 2322	1200 1323	0000 0101	1200 2323
13	2142 2222	3232 2322	1131 1101	3242 2322
14	1121 4222	1121 2113	0010 2101	1121 4223
15	2200 2211	2211 1212	0000 1001	2211 2212
16	0111 2100	1110 1000	0000 0000	1111 2100
17	0031 2011	0010 1011	0000 0000	0031 2011
18	0120 0200	1010 0000	0000 0000	1120 0200
19	0000 0100	1010 0000	0000 0000	1010 0100
20	0012 3120	0012 1011	0000 0000	0012 3121
21	0021 2100	0111 0002	0000 0000	0121 2102
22	0132 1120	0243 0220	0032 0110	0243 1220
23	0000 2222	0012 3112	0000 1011	0012 3222
24	2232 5322	2232 3122	0022 3101	2232 5322
25	1122 2111	2221 2010	0011 1000	2222 2111
26	0000 0111	0000 1011	0000 0000	0000 1111
27	0010 0110	0110 0000	0000 0000	0110 0110
28	1234 3343	1133 2234	0022 2121	1234 3344
29	4444 3332	4333 2343	3322 1121	4444 3343
30	5333 2300	4422 1110	2222 0000	5433 2310
31	0012 0211	3220 0101	0010 0000	3222 0211

THREE-HOUR RANGE INDICES

VICTORIA 1971

TABLE 51

NOVEMBER

DAY	D	H	Z	K
1	1331 1101	2211 0002	0000 0000	2331 1102
2	0011 0000	0011 0000	0000 0000	0011 0000
3	0022 2000	0010 0000	0000 0000	0022 2000
4	1001 1220	2111 0110	0000 0000	2111 1220
5	0223 3000	1111 2100	0000 0000	1223 3100
6	1021 0110	0010 0000	0000 0000	1021 0110
7	1223 4100	2211 2100	0001 0000	2223 4100
8	0001 1322	1012 2121	0000 0100	1012 2322
9	0101 1000	0000 0000	0000 0000	0101 1000
10	1000 0121	0011 1022	0000 0010	1011 1122
11	4423 2231	2322 1131	1100 0010	4423 2231
12	2240 1101	1130 0101	0030 0000	2240 1101
13	0011 0100	1011 1100	0000 0000	1011 1100
14	0000 0000	0000 0010	0000 0000	0000 0010
15	0000 0100	0000 0000	0000 0000	0000 0100
16	0011 0000	0010 0000	0000 0000	0011 0000
17	0000 0010	0100 0001	0000 0000	0100 0011
18	1212 2101	3321 1101	0100 0000	3322 2101
19	0000 3321	0000 2211	0000 0100	0000 3321
20	0023 1211	0022 1002	0000 0000	0023 1212
21	2134 4112	0123 3002	0013 2100	2134 4112
22	3255 4332	3344 2233	1144 1122	3355 4333
23	3463 5433	3463 4444	2352 3323	3463 5444
24	5664 4324	4542 4323	3432 3202	5664 4324
25	4666 4323	4554 5332	2353 2420	4666 5333
26	4545 3220	3433 3221	1333 3110	4545 3221
27	1212 3322	1112 2211	0000 0100	1212 3322
28	2134 3111	1121 1111	0013 2000	2134 3111
29	2202 2110	2101 2000	0000 0000	2202 2110
30	0121 3000	0010 2000	0000 0000	0121 3000

DECEMBER

DAY	D	H	Z	K
1	0012 1111	0012 1112	0000 0000	0012 1112
2	0000 2302	0000 2201	0000 0000	0000 2302
3	1143 2322	0133 2221	0032 1000	1143 2322
4	2122 2221	1222 0111	0000 0000	2222 2221
5	0133 1001	1121 1001	0000 0000	1133 1001
6	0300 0000	0200 0000	0000 0000	0300 0000
7	0100 0000	0100 0000	0000 0000	0100 0000
8	0010 2100	1000 1001	0000 0000	1010 2101
9	0203 1221	2212 0111	0003 0000	2213 1221
10	0000 2200	0000 1000	0000 0000	0000 2200
11	0000 1222	0000 0222	0000 0000	0000 1222
12	0010 0322	1000 0223	0000 0002	1010 0323
13	1044 3311	2132 2222	0032 1000	2144 3322
14	0010 2000	0000 1000	0000 0000	0010 2000
15	0011 0100	0010 0000	0000 0000	0011 0100
16	0001 0132	0001 0033	0000 0011	0001 0133
17	4654 5753	4544 4764	2343 4652	4654 5764
18	2225 6421	0004 3000	0015 4100	2225 6421
19	0134 4321	0134 2121	0034 3000	0134 4321
20	0000 0102	0000 0012	0000 0000	0000 0112
21	1003 3232	0011 1222	0000 0101	1013 3232
22	1254 4333	2333 3223	0032 3111	2354 4333
23	1433 3331	2332 2221	0121 2110	2433 3331
24	0023 3010	2222 2000	0001 0000	2223 3010
25	0222 2211	1100 1111	0000 0000	1222 2211
26	2433 2211	2321 1111	1220 0000	2433 2211
27	0143 0000	1121 0000	0020 0000	1143 0000
28	0000 0010	0000 0010	0000 0000	0000 0010
29	0245 5322	0233 3313	0034 4201	0245 5323
30	3334 2201	2233 1201	0043 3100	3334 2201
31	2420 1211	1321 0122	0100 0000	2421 1222

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telephone verification system for automatic magnetic observatories

F. ANDERSEN

DEPARTMENT OF ENERGY, MINES AND RESOURCES

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telephone verification system for automatic magnetic observatories

F. ANDERSEN

Abstract. Automatic magnetic observatories at many locations across Canada sample the various components of the geomagnetic field once per minute and record the measurements in digital form on magnetic tape. The magnetic tapes are mailed once a month to Ottawa for processing by computer. This paper describes a system which permits the operation of a remote automatic magnetic observatory to be monitored in Ottawa at any time, by means of commercial telephone circuits.

Résumé. Les observatoires magnétiques automatiques installés en nombre d'endroits au Canada prélèvent une fois par minute les composantes du champ magnétique et enregistrent les mesures sous forme numérique sur bande magnétique. Les bandes magnétiques sont transmises chaque mois à Ottawa aux fins de traitement par ordinateur. L'auteur décrit un système qui permet de télécommander en tout temps d'Ottawa, par circuits téléphoniques commerciaux, un observatoire magnétique automatique éloigné.

Introduction

Eight Canadian stations are now equipped with the Automatic Magnetic Observatory System (abbreviated AMOS) developed by the Division of Geomagnetism, Earth Physics Branch (Andersen, 1969, 1970). The system employs a combination of fluxgates and a proton magnetometer. Once per minute, three voltages proportional to the magnetic north, magnetic east, and vertical geomagnetic components are sampled in quick succession by a digital voltmeter. Then follows a measurement of total intensity by the proton magnetometer. The four readings are recorded on digital magnetic tape; the date, time, and station identification are recorded every tenth minute. The magnetic tapes are mailed to Ottawa once a month for processing by computer.

The AMOS equipment is electronically complex, and although a number of checking procedures are provided, it is difficult for a local operator to ensure that the complete system is functioning properly, and to diagnose faults when they occur. Furthermore, an aim of the AMOS program is to eliminate the need for highly skilled permanent staff at the more remote magnetic observatories.

These problems present a need for some means whereby the proper operation of the AMOS can be verified by personnel and equipment located in Ottawa. For those locations equipped with conventional telephone service the system described here fulfills these requirements.

General description of telephone verification system

Figure 1 shows a block diagram of the system. In use, the operator at the receiving station, Ottawa, makes a phone call to the distant magnetic observatory. At the observatory the equipment automatically answers the phone, and commences to transmit the data currently being produced by the AMOS.

The data is received in Ottawa and printed on a small strip-printer. Upon completion of transmission, the equipment at the observatory disconnects the phone.

At the input to the system the data is in BCD parallel format. For transmission by a single telephone channel the data must be converted into bit-serial format. At the receiving station, Ottawa, conversion back to parallel format is required for use with the printer.

The information being transmitted includes the current geomagnetic data, the time indicated by the observatory clock, the identity of the observatory, and an indication of the performance of the recording equipment. Thus an extensive check on the operation of the AMOS is accomplished by making a phone call to the distant observatory.

Description of the components of the system

The #103A Data-Set. It is mandatory that the connections to the phonelines be made by means of data-sets supplied

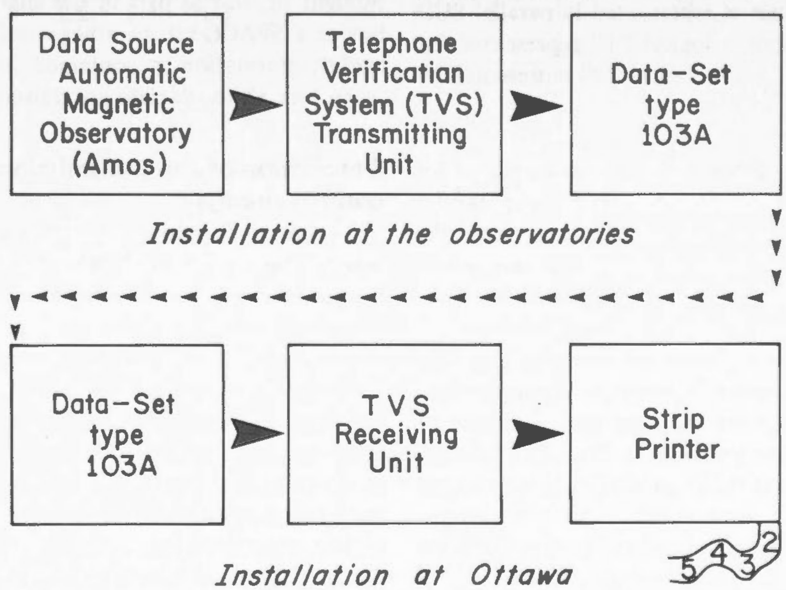

Figure 1. Block diagram of the Telephone Verification System.

and installed by the Telephone Company. Details of the operation of these data-sets can be found in the manufacturer's literature. They are summarized here for completeness. The data-sets permit simultaneous bi-lateral transmission of digital data in bit-serial format, with a logical "1" represented by a dc voltage of -5 to -25 volts and a logical "0" represented by a dc voltage of +5 to +25 volts. The maximum rate of transmission is 300 bits per second. A dc voltage between +5 and +25 volts is required to indicate that the data source is powered and ready to transmit data. For unattended stations an "automatic answer" feature is built into the data-set whereby the set will automatically answer an incoming call and connect the data source to itself for data transmission. Some means must be provided for automatic disconnection when a call is completed.

AMOS characteristics. The Automatic Magnetic Observatory System (AMOS) data characteristics have been described elsewhere (Andersen 1969, 1970). Again they are summarized here for completeness. Once each minute, on the minute, a burst of 24 digits issues from the AMOS. A few seconds later an additional burst of 8 digits is produced. Once each ten minutes this second burst is expanded to 24 digits. The rate of data output, within a burst, is about 170 digits per second. Each digit is represented in parallel BCD form with a logical "1" represented by -12 vdc and a logical "0" represented by 0 vdc.

Printer. Since only a small amount of data is needed to verify the proper operation of the AMOS, and since the data is of no further use once this proper operation has been ascertained, it is not necessary to have a very elaborate or long-lived printer. Accordingly, a very simple, low-cost printer is employed here. Its maximum printing rate is about 25 characters per second. The input requirements are BCD parallel data with signal voltages compatible with TTL Logic. Additional details may be found in the manufacturer's literature.

Transmission unit. This unit, shown in Figure 2, performs the interfacing required between the AMOS and the #103A data-set. The input from the AMOS consists of data, along with a character-strobe signal. The very first strobe pulse initiates a 1200 ms delay which puts the unit into the LOAD mode of operation. In this mode a burst of data characters is converted into TTL compatible signals and the data stored in a shift-register of 24-character capacity. At the conclusion of the 1200 ms delay the unit reverts to the TRANSMIT mode. In this mode, data is transferred, one character at a time, from the storage register to another shift register which performs the parallel to bit-serial conversion. The output of this register is amplified and fed to the #103A data-set.

Each data character is preceded in the serial bit-stream by a "1" bit which indicates the beginning of a new character, and by the Recorder Malfunction (REC MAL) bit which indicates the performance of the recording equipment. Each data character is followed by a "0" bit which indicates the end of a transmitted character. A complete transmitted character may be graphically represented as shown in Figure 3.

Thus each transmitted character consists of eight bits with the last one always a "0" bit. This last bit may also be thought of, not as part of the character, but as a SPACE bit. In other words, the useful information is contained in only seven bits, although eight are transmitted.

Description of the transmission unit control circuits

To understand the operation of the control circuits, suppose that the AMOS has just completed a measurement and is presenting the first digit to the tape recorder and at the same time also to the Telephone Verification System (TVS). The first recorder STEP signal initiates a 1200 ms delay in the TVS which results in the following action; the input gates to the storage register are enabled, the input to the control register is made a logical "1", the action of the serializing circuitry is halted. In this LOAD mode, the storage and control registers are under the control of the incoming data. Both registers are shifted in synchronism with the recorder STEP signal. These conditions prevail for the duration of the 1200 ms delay. During this time the AMOS may present up to 24 characters at virtually any speed, for loading into the storage register.

At the conclusion of the delay, the following action results: the data input gates are disabled, the control register input goes to a logical "0", the serializing circuitry is activated. In this TRANSMIT mode of operation, the storage and control registers are under the control of the serializer circuitry. A multivibrator operating with a cycle time of 5 milliseconds provides the serializer shift signal and also drives a divide-by-eight counter. The output of the divide-by-eight counter provides the shift signal to the storage and control registers. Thus eight serializer shifts occur for each storage register shift. A data character is transferred from the storage register into the serializer register only if the control register contains a logical "1". If the control register does not contain a "1", both control and storage registers are shifted but no characters are serialized and consequently there is no output to the data-set. This feature prevents the redundant zeros in an empty storage register from being transmitted as valid data, since the input to the control register is a logical "1" only during the LOAD mode, and hence contains a logical "1" only when the storage register also contains valid data.

As each character of valid data is presented to the serializer, it is loaded into the serializer along with the START, REC MAL, and STOP bits. Then the serializer is shifted eight times.

The output is a character of eight bits in serial form.

Description of the disconnect circuit

With the data-sets equipped with automatic answer capability, it is necessary to present the data-set with a

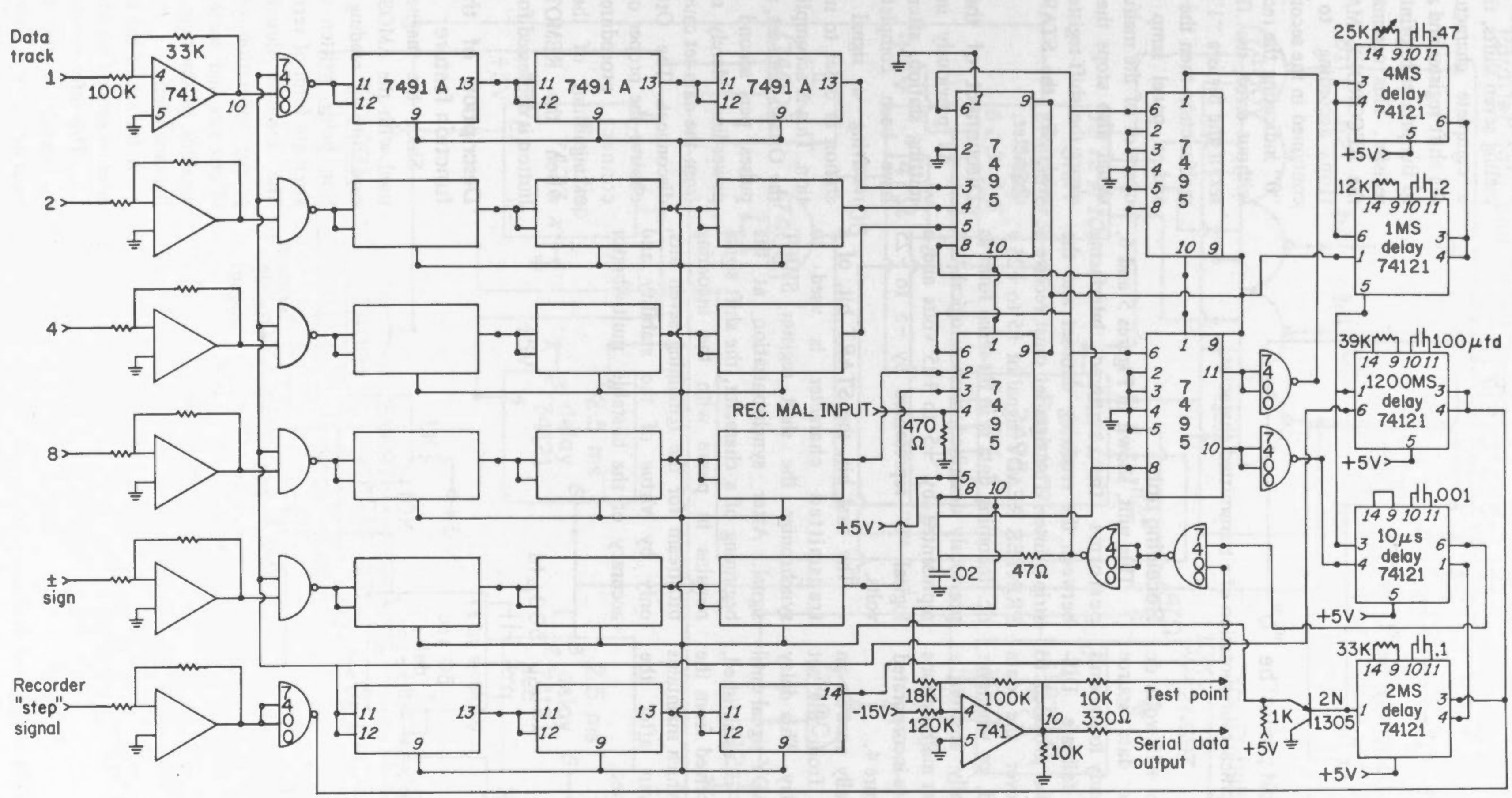

Figure 2. Circuit diagram of the transmission unit.

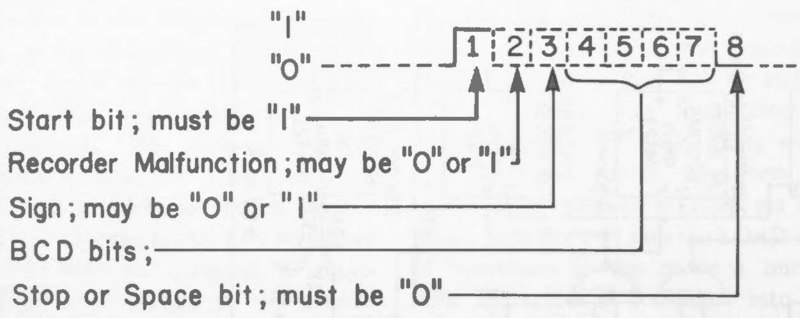

Figure 3. Graphical representation of a transmitted character.

READY signal of +5 to +25 volts dc which indicate that the data source (AMOS) is powered and ready to transmit data. In addition a fail-safe DISCONNECT signal must be provided to cause disconnect whenever the data transmission is completed, or whenever the data set automatically answers a wrong number, or whenever malfunctions occur. These capabilities are incorporated in the circuit shown in Figure 4.

As the set automatically answers an incoming call, a signal from the set initiates a 30-second delay. This delay provides a temporary READY signal until two-way communication is established, whereupon a signal is received from the calling station, Ottawa, which maintains the READY signal even after the 30-second delay is completed.

Receiving unit

This unit, shown in Figures 5 and 6, performs the required interfacing between the receiving data-set and the strip-printer. The data-set must receive a PRINTER READY signal of +5 to +25 v dc. Incoming data is in bit-serial form as previously described, with a logical "1" represented by +5 to +25 volts and a logical "0" represented by −5 to −25 volts.

The first bit, the START bit, of a transmitted character is used to synchronize the shift register SHIFT signal. After synchronization at the beginning of a character, the shift signal remains in phase with the incoming bit-stream for the remaining seven bits, only by virtue of the stability and accuracy of the bi-stable multivibrator providing the shift signal. Upon completing seven shifts, the unit assumes that a complete character is contained in the shift register and a command is issued to the printer to print the contents of the register. This command signal also sets the RECORDER MALFUNCTION flip-flop according to the information contained in the second bit. If this bit is a "0" indicating the recorder is functioning without error, the flip-flop will not be set; if the bit is a "1" indicating recorder malfunction then the flip-flop will be set and a panel lamp warns the Ottawa operator of the malfunction. The PRINT signal also stops the SHIFT signal and clears the shift-register. The unit is now ready for the START bit of the next character.

Disconnect of the remote station

As previously indicated, the transmitting station, after initial connections have been completed, depends upon receiving a signal from the calling station in order to maintain the connection. This is accomplished by inputing to the Ottawa data-set, a square-wave of 60 pulses per second derived from the power-line. Merely removing this signal from the data-set causes the distant set to disconnect. The Ottawa operator can observe the proper operation of this disconnect procedure by noting the extinguishing of the CARRIER lamp when the REMOTE DISCONNECT button is depressed for a few seconds.

Description of the recorder malfunction feature

Since the magnetic tape recorders used with the AMOS do not afford the capability of reading back the information being written on the tape, some alternate form of verification is desirable. The method described here verifies proper operation of all the recorder electronics and some of the mechanical handling of the tape but does not check the tape itself.

A feature of the tape recorders is the internal generation of the parity information. This information is computed from the signals on the data input lines. A separate parity computation is made

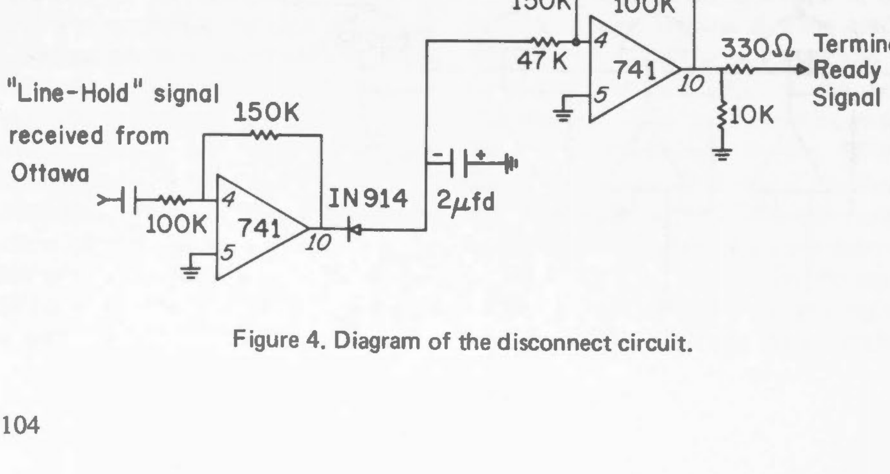

Figure 4. Diagram of the disconnect circuit.

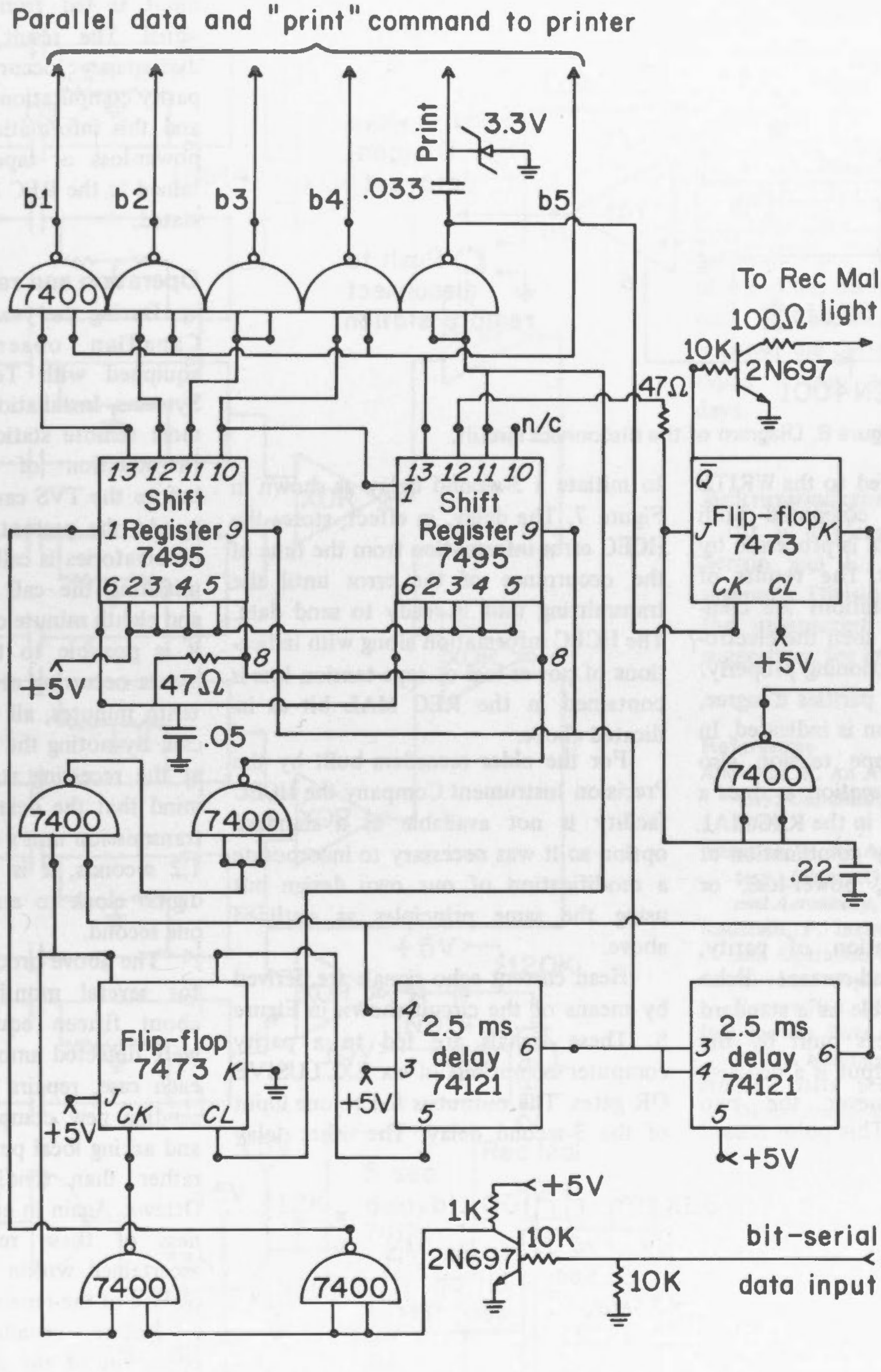

Figure 5. Diagram of the receiving circuit.

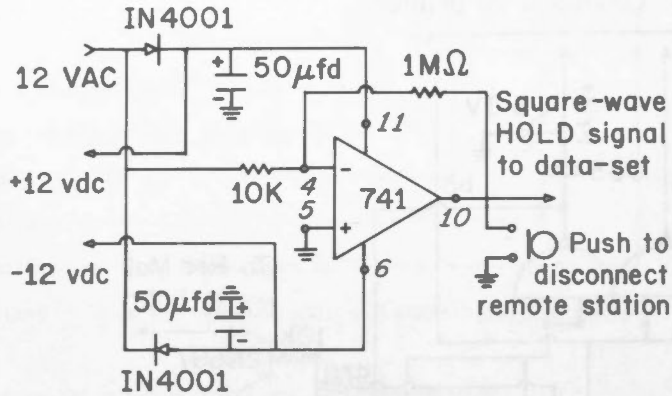

Figure 6. Diagram of the disconnect circuit.

using the signals being fed to the WRITE heads. Thus parity is computed both before and after the data is processed by the recorder electronics. The results of the two parity computations are compared and if they agree then the electronics are very likely functioning properly. Conversely, if the two parities disagree, an electronic malfunction is indicated. In addition, a loss of tape tension also indicates recorder malfunction as does a loss of power. Thus a "1" in the REC MAL bit indicates one or any combination of electronic malfunction, power-loss, or tape-tension loss.

The dual computation of parity, sometimes called Head-current Echo Check (HCEC) is available as a standard option on the recorders built by the Digi-Data Corp. The output is a negative pulse occurring whenever the two computations disagree. This pulse is used to initiate a 3-second delay as shown in Figure 7. The delay, in effect, stores the HCEC error information from the time of the occurrence of the error until the transmitting unit is ready to send data. The HCEC information along with indications of power-loss or tape-tension loss is contained in the REC MAL bit as indicated above.

For the older recorders built by the Precision Instrument Company the HCEC facility is not available as a standard option so it was necessary to incorporate a modification of our own design but using the same principles as outlined above.

Head current echo signals are derived by means of the circuit shown in Figure 8. These signals are fed to a parity computer comprised of six EXCLUSIVE OR gates. The output is fed to one input of the 3-second delay. The other delay input is fed from the recorder STEP signal. The result is that whenever a discrepancy occurs between the two parity computations, the delay is initiated and this information along with that of power-loss or tape-tension loss is contained in the REC MAL bit as previously stated.

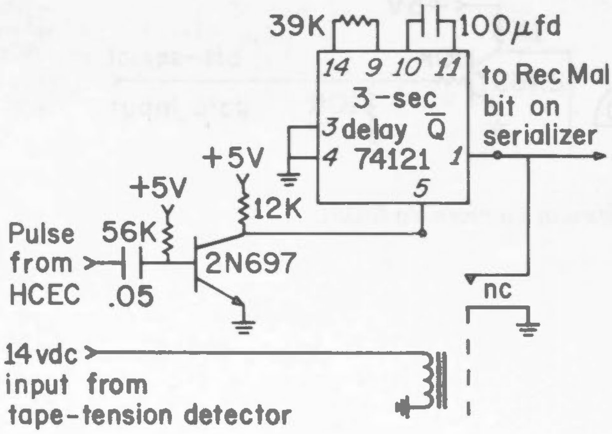

Figure 7. Diagram of the REC MAL indication circuit for Digi-Data Corp. recorders.

Operation and results

During the year 1972, a total of six Canadian observatories have been equipped with Telephone Verification Systems. Installations at a number of the most remote stations must wait for the introduction of telephone-via-satellite before the TVS can operate successfully.

At the present time each of the six observatories is called once each day. By initiating the call between the seventh and eighth minute of a ten-minute record, it is possible to transmit the measurements occurring at the eighth, ninth and tenth minutes, all within a three-minute call. By noting the time of arrival of data at the receiving station, and bearing in mind that the delay of data through the transmission unit's storage buffer is about 1.2 seconds, it is possible to check the digital clock to an accuracy of at least one second.

The above procedures have been used for several months. During this time about fifteen equipment malfunctions were detected among the six stations. In each case, repairs could be effected by sending new components to the station and asking local personnel to install them rather than sending technicians from Ottawa. Again in each case, the effectiveness of these repair procedures was ascertained within a short time of completion of the repair.

Before installation of TVS the operation of the AMOS could only be ascertained from the magnetic tapes which were sent to Ottawa once a month. Thus the AMOS could be out of service for several weeks before the malfunction was known and remedial action taken. In addition, a technician could not be certain of his success in repairing the AMOS until a test tape had reached Ottawa and verification performed by computer. The use of the TVS has resulted in early

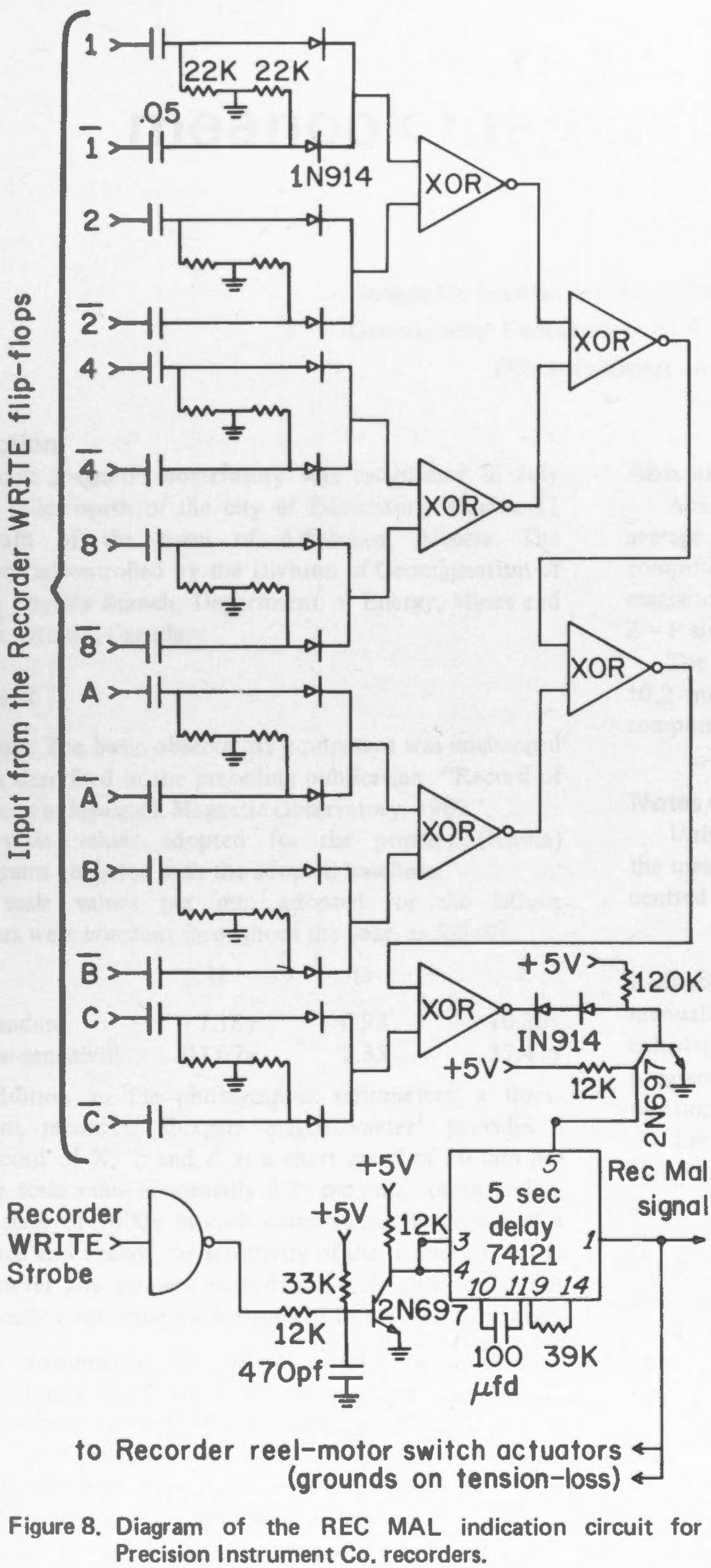

Figure 8. Diagram of the REC MAL indication circuit for Precision Instrument Co. recorders.

discovery of AMOS malfunctions; typically, a fault is known within 24 hours of its occurrence. The ability to effect most repairs by sending new components for installation by local personnel rather than sending technicians from Ottawa, has resulted in much less travel for the two technicians assigned to the AMOS project. Possibly the amount of travel has been reduced by a factor of ten. In addition, the elapsed time between the occurrence of a fault and its repair is now typically one to seven days.

Acknowledgments

It is a pleasure to thank Dr. P.H. Serson and E.I. Loomer of the Geomagnetic Division, for carefully reading the manuscript and making numerous suggestions for improvement thereof.

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PUBLICATIONS of the EARTH PHYSICS BRANCH

VOLUME 44 – NO. 6

record of observations at meanook magnetic observatory 1970

A. B. COOK

DEPARTMENT OF ENERGY, MINES AND RESOURCES

OTTAWA, CANADA 1973

record of observations at meanook magnetic observatory 1970

A. B. COOK

Geographic Coordinates: 54° 37′N; 113° 30′W
Geomagnetic Coordinates: 61.8°N; 301.0°E
Officer-in-Charge: Anne B. Cook

Introduction

Meanook magnetic observatory was established in July 1916, 85 miles north of the city of Edmonton, Alberta, 11 miles south of the town of Athabasca, Alberta. The observatory is controlled by the Division of Geomagnetism of the Earth Physics Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

Equipment

Variometers. The basic observatory equipment was unchanged from that described in the preceding publication, "Record of Observations at Meanook Magnetic Observatory, 1969".

The scale values adopted for the primary (Ruska) magnetograms are listed with the adopted baselines.

The scale values per mm adopted for the laCour variometers were constant throughout the year, as follows:

	H	D	Z
laCour standard	7.18γ	0.93′	10.36γ
laCour low-sensitivity	21.67γ	2.35′	37.47γ

In addition to the photographic variometers, a three-component recording fluxgate magnetometer[1] provides a visible record of X, Y and Z at a chart speed of 20 mm per hour. The scale value is normally 8.3γ per mm, corresponding to a full-scale of 1000γ in each component. By means of a limit switch and a relay, the sensitivity of the recorder is cut in half whenever any element exceeds full-scale indication, thus automatically converting the instrument into a storm recorder.

Absolute instruments. The absolute instruments used at Meanook during 1970 were: Cooke magnetometer No. 15 (with correction of −0.3′) for declination; quartz horizontal intensity magnetometer No. 259[2] (with correction of −0.00013H) for horizontal intensity; Ruska earth inductor No. 6540 (with correction of 0.0′) for inclination; and a Dominion Observatory proton precession magnetometer[3], (4257.60 cps/oersted for total intensity)[4].

Absolute observations and baseline values

Absolute observations were made twice a week, on the average. Baseline values for the vertical intensity were computed from the readings of the proton precession magnetometer and the earth inductor by the formula $Z = F \sin I$.

The rms value of the observed minus adopted baselines is ±0.2 minute for declination, ±1 gamma for the horizontal component, and ±2 gammas for the vertical component.

Notes on the tables

Universal time (U.T.) is used throughout. Tables 1-36 show the mean values of H, D and Z for the intervals of 60 minutes centred on the half hour.

Reductions. The hourly values of H, D and Z are scaled manually in mm, and punched on cards. The tables were calculated by a CDC 6400 computer. The computer was programmed so that the output was compatible with offset printing techniques.

Table 46 lists three-hour range indices and K-indices for Meanook. Lower limit K_9 is 1500γ. Throughout the year, these indices are sent twice a month to DeBilt, Netherlands, and Göttingen, Germany, for use in preparation of planetary K-indices published by the International Association of Geomagnetism and Aeronomy (IAGA).

The magnetograms were read each month for magnetic phenomena and the results sent to IAGA Commission IV. Copies of mean hourly values were sent each month to the World Data Center for Geomagnetism at Boulder, Colorado. Maximum hourly ranges in all components were also scaled. Copies of hourly ranges, three-hour indices and magnetograms were sent to the Defence Research Telecommunication Establishment and upon request to various scientific research institutions.

H Baselines γ			H Scale Value γ/mm		
		Adopted		Adopted	Observed
Jan.	1–2	13062	Jan.	10.29	10.17
	2–10	13061			
	11–31	13061			
Feb.	1–9	13060	Feb.	10.29	10.14
	10–28	13061			
Mar.	1–31	13060	Mar.	10.29	10.14
Apr.	1–19	13060	Apr.	10.29	10.00
	20–25	13059			
	26–30	13058			
May	1	13058	May	10.29	10.26
	2–6	13057			
	7–12	13056			
	13–26	13055			
	27–31	13056			
June	1–22	13056	June	10.29	10.38
	23–30	13057			
July	1–11	13057	July	10.29	10.31
	12–17	13058			
	18–26	13057			
	27–31	13056			
Aug.	1–3	13056	Aug.	10.29	10.24
	4–12	13055			
	13–17	13054			
	18–21	13053			
	22–25	13052			
	26–27	13051			
	28–31	13050			
Sept.	1	13050	Sept.	10.29	10.46
	2–4	13049			
	4–7	13048			
	8–11	13047			
	12–16	13046			
	17–21	13045			
	22–26	13044			
	27–30	13043			
Oct.	1–6	13042	Oct.	10.29	10.20
	7–12	13041			
	13–31	13040			
Nov.	1–17	13040	Nov.	10.29	10.31
	18–22	13039			
	23–29	13038			
	30	13037			
Dec.	1–5	13037	Dec.	10.29	–
	6–10	13036			
	11–31	13035			

D Baselines			D Scale Value ′/mm			
		Adopted		Adopted	Observed	
Jan.	1–2	23° 09.3′	Jan.	1.60′	1.61′	
	3–12	09.2				
	13–31	09.1				
Feb.	1–23	09.1	Feb.	1.60	1.61	
	24–28	09.0				
Mar.	1–8	09.0	Mar.	1.60	–	
	9–15	08.9				
	16–17	09.0				
	18–19	09.1				
	20	09.2				
	21–22	09.3				
	23	09.4				
	24–25	09.5				
	26	09.6				
	27–28	09.7				
	29	09.8				
	30–31	09.9				
Apr.	1	10.0	Apr.	1.60	1.61	
	2–3	10.1				
	4	10.2				
	5–6	10.3				
	7	10.4				
	8–9	10.5				
	10	10.6				
	11–12	10.7				
	13	10.8				
	14	10.9				
	15	11.0				
	16–29	10.9				
	21–23	10.8				
	24–29	10.7				
	30	10.6				
May	1–3	10.6	May	1.60	1.61	
	4–8	10.5				
	9–12	10.4				
	13–19	10.3				
	20–28	10.4				
	29–31	10.5				
June	1–6	10.5	June	1.62	1.61	
	7–14	10.6				
	15–23	10.7				
	24–30	10.8				
July	1–5	13.5	July	1.62	1.61	Shift in D base 00:00 July 1
	6–19	13.4				
	20–30	13.3				
	31	13.3				
Aug.	1–10	13.2	Aug.	1.64	1.61	
	11–17	13.1				
	18–22	13.0				
	23–27	12.9				
	28–31	12.8				
Sept.	1–2	12.8	Sept.	1.62	1.61	
	3–7	12.7				
	8–14	12.6				
	15–17	12.5				
	18–24	12.4				
	25–30	12.3				

D Baselines			D Scale Value ′/mm		
		Adopted		Adopted	Observed
Oct.	1	23° 12.3′	Oct.	1.64′	1.61′
	2–6	12.2			
	7–12	12.1			
	13–17	12.0			
	18–22	12.1			
	23–27	12.2			
	28–31	12.3			
Nov.	1–5	12.4	Nov.	1.58	1.61
	6–8	12.5			
	9–14	12.6			
	15–22	12.7			
	23–25	12.6			
	26–29	12.5			
	30	12.4			
Dec.	1–5	12.4	Dec.	–	1.61
	6–12	12.3			
	13–25	12.2			
	26–31	12.1			

Z Baselines γ			Z Scale Value γ/mm		
		Adopted		Adopted	Observed
Jan.	1–2	58498	Jan.	9.42	9.19
	3	58499			
	4–6	58500			
	7	58501			
	8–9	58502			
	10–12	58503			
	13	58504			
	14–18	58505			
	19–31	58506			
Feb.	1	58506	Feb.	9.42	9.39
	2–13	58507			
	14–22	58508			
	23–28	58509			
Mar.	1	58509	Mar.	9.42	9.34
	2–8	58510			
	9–17	58511			
	18–21	58510			
	22–25	58509			
	26–29	58508			
	30–31	58507			
Apr.	1	58507	Apr.	9.42	9.40
	2–5	58506			
	6–9	58505			
	10–13	58504			
	14–16	58503			
	17–19	58502			
	20–23	58501			
	24–26	58500			
	27–29	58499			
	30	58498			

Z Baselines γ			Z Scale Value γ/mm		
		Adopted		Adopted	Observed
May	1–2	58498	May	9.42	9.39
	3–5	58497			
	6–8	58496			
	9–11	58495			
	12–21	58494			
	22–27	58495			
	28–31	58496			
June	1–4	58496	June	9.42	9.46
	5–9	58497			
	10–14	58498			
	15	58499			
	16–17	58498			
	18–20	58497			
	21–23	58496			
	24–25	58495			
	26–28	58494			
	29–30	58493			
July	1	58493	July	9.42	9.42
	2–3	58492			
	4–5	58491			
	6–8	58490			
	9–10	58489			
	11–13	58488			
	14–16	58487			
	17–20	58486			
	21–23	58485			
	24–27	58484			
	28–30	58483			
	31	58482			
Aug.	1–3	58482	Aug.	9.42	9.51
	4–7	58481			
	8–10	58480			
	11–13	58479			
	14–17	58478			
	18–26	58478			
	27–31	58480			
Sept.	1–7	58480	Sept.	9.42	9.56
	8–19	58481			
	20–27	58480			
	28–30	58479			
Oct.	1–5	58479	Oct.	9.42	9.68
	6–14	58478			
	15–20	58477			
	21–26	58476			
	27–31	58475			
Nov.	1–2	58475	Nov.	9.42	9.41
	3–8	58474			
	9–20	58473			
Dec.	1–31	58473	Dec.	9.42	–

Mean annual values

Year	D(E)	H	Z	X*	Y*(E)	I*(N)	F*
1957	24° 23.1	12921	58801	11768	5335	77° 36.4	60204
1958	15.0	12943	58819	11801	5316	35.4	60226
1959	13.0	12960	58787	11819	5316	34.1	60198
1960	09.7	12985	58774	11848	5316	32.5	60192
1961	06.1	13022	58748	11887	5318	30.1	60175
1962	02.7	13054	58723	11921	5318	28.1	60156
1963	23° 58.7	13076	58711	11949	5314	26.5	60150
1964	54.9	13103	58694	11978	5312	24.9	60139
1965	51.7	13130	58672	12008	5312	23.1	60123
1966	49.6	13150	58663	12029	5312	21.9	60119
1967	47.2	13170	58663	12051	5312	20.8	60123
1968	45.0	13197	58659	12079	5315	19.4	60125
1969	42.1	13234	58662	12118	5320	17.2	60136
1970	39.8	13265	58672	12150	5324	15.6	60153

***X, Y, I, F are derived from annual means D, H and Z.**

References

[1] Serson, Paul H. 1967. An electrical recording magnetometer. Can. J. Phys., Vol. 35, pp. 1387-1394.

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[3] Serson, Paul H. 1962. A simple proton precession magnetometer. Report Dominion Observatory, Ottawa, 13 pp.

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HORIZONTAL INTENSITY

TABLE 1 MEANOOK — H = 13000 PLUS TABULAR VALUES IN GAMMAS — JANUARY 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		268	270	271	270	267	256	258	267	268	269	271	270	261	267	271	278	258	248	270	264	254	256	263	269	265
2	D	267	268	266	277	307	275	245	27	115	214	247	31	50	143	216	217	257	265	266	235	236	245	266	257	216
3		267	275	267	263	264	264	254	254	236	237	230	248	253	255	263	268	258	247	246	244	245	245	249	257	254
4	Q	263	262	264	266	267	266	267	265	258	249	255	257	265	264	266	267	267	262	258	255	255	254	250	258	261
5		264	266	265	266	265	264	267	267	265	258	246	267	266	258	261	268	273	268	265	263	262	263	264	259	263
6		255	267	272	272	271	267	266	266	266	267	268	258	248	257	262	263	255	254	245	250	255	259	265	266	261
7		267	269	269	268	276	272	270	269	268	268	275	272	267	266	267	266	258	246	233	234	248	258	257	258	262
8		263	267	267	266	266	267	267	268	267	265	257	269	269	267	268	267	263	255	264	266	268	268	270	275	266
9	D	258	260	269	268	263	258	270	267	279	257	265	265	266	262	259	260	255	249	254	257	265	260	259	257	262
10		255	267	271	274	269	267	266	263	261	262	265	259	264	263	267	262	255	248	249	250	248	255	259	265	261
11	Q	265	266	266	267	266	268	267	266	265	265	266	265	264	265	264	266	256	246	250	254	257	260	266	263	262
12		256	258	266	267	268	267	266	264	263	257	258	265	267	265	265	264	256	245	245	256	257	252	256	266	260
13	Q	266	266	272	271	268	267	267	267	267	267	267	267	266	261	247	256	254	257	260	262	265	268	266	266	264
14		267	266	267	266	270	275	276	273	267	266	265	266	265	260	265	266	254	250	246	250	258	264	267	266	264
15		274	279	277	286	285	285	278	277	275	273	272	275	275	273	268	264	253	238	243	246	247	248	253	258	267
16	D	266	262	257	266	267	274	260	250	223	138	80	79	148	195	172	191	182	186	213	211	214	223	263	297	215
17	D	355	328	370	387	347	337	284	256	246	241	245	253	247	254	256	256	249	245	236	232	226	237	245	250	274
18		253	247	257	262	265	265	258	254	257	256	244	254	266	264	263	265	257	256	245	244	245	245	245	249	255
19		257	260	266	270	268	267	266	265	264	258	265	266	267	266	263	254	257	246	237	236	238	235	242	254	257
20		264	256	258	257	265	264	264	265	261	258	266	265	265	244	254	275	257	257	250	243	234	245	250	257	258
21		265	266	267	269	266	259	269	268	265	261	257	263	267	251	257	268	257	245	243	242	244	246	256	264	259
22		257	268	266	267	266	268	266	266	267	266	265	264	268	269	268	265	254	247	246	247	248	253	257	260	261
23		264	265	258	254	261	262	266	266	264	266	265	266	266	270	270	268	264	256	251	247	247	254	254	256	261
24		260	263	265	266	266	266	264	247	243	238	257	244	264	266	269	268	263	258	253	254	245	238	253	256	257
25	Q	264	266	266	266	266	260	266	266	266	266	266	266	266	267	266	266	260	249	248	248	254	256	264	267	262
26	Q	268	267	266	266	268	267	267	266	265	266	265	266	268	272	271	267	256	243	236	238	245	254	258	264	261
27		266	267	266	265	275	274	268	268	267	265	267	266	269	272	270	273	264	254	251	245	246	251	259	263	264
28		265	266	268	274	275	275	275	275	275	274	276	275	275	276	280	279	268	256	247	236	254	263	264	257	268
29		256	265	267	273	271	266	254	204	233	275	268	267	267	267	268	266	259	251	251	254	257	265	272	275	260
30	D	256	266	275	272	266	256	234	274	266	266	244	270	275	274	276	275	256	253	243	243	248	254	258	262	261
31		259	258	256	272	275	260	266	266	265	265	266	266	272	271	270	268	264	245	236	235	242	246	256	263	260
MEAN	A	265	267	269	272	272	269	265	255	256	257	255	250	255	258	261	262	256	249	248	247	249	252	258	262	259
MEAN	Q	265	265	267	267	267	265	267	266	264	263	264	264	266	266	263	264	258	251	250	252	255	258	261	263	262
MEAN	D	280	276	287	294	290	280	259	215	226	233	216	180	197	226	236	240	240	240	243	236	238	244	258	264	246

DECLINATION

TABLE 2 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES JANUARY 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		39.7	40.1	41.0	41.2	40.2	39.9	38.3	40.1	40.2	41.2	40.4	40.7	39.7	44.1	43.1	43.1	41.7	33.5	38.1	39.9	39.9	38.0	38.1	36.7	39.9
2	D	38.3	39.6	40.5	41.8	54.9	44.7	42.8	36.5	36.5	50.8	45.2	47.9	39.7	41.0	51.2	36.8	38.4	42.9	41.8	41.5	39.9	38.8	38.0	42.8	42.2
3		41.7	42.8	43.3	48.0	40.4	40.0	42.7	38.2	36.7	40.1	43.0	39.5	39.5	39.1	41.1	43.2	44.5	44.6	43.0	41.7	40.3	40.0	40.1	40.1	41.4
4	Q	40.0	40.1	41.1	41.2	40.6	40.3	41.7	40.4	41.4	40.0	41.2	39.8	40.1	41.1	41.7	42.7	42.2	42.7	44.1	42.7	39.8	39.5	39.8	40.0	41.0
5		39.8	40.0	41.4	41.6	40.9	39.8	39.6	40.1	41.1	42.8	40.9	44.8	44.3	43.0	41.4	43.2	43.3	43.0	41.9	39.8	36.6	38.2	39.3	39.1	41.1
6		39.3	39.1	39.8	40.0	40.3	41.2	41.1	40.9	41.2	40.1	41.2	41.1	38.3	41.1	39.8	41.7	43.3	44.6	41.4	40.0	38.8	39.6	40.0	38.7	40.5
7		39.8	39.6	40.6	41.1	40.1	40.0	40.1	39.8	39.6	41.4	41.2	41.1	41.2	41.9	41.6	41.9	43.2	43.0	39.8	31.6	34.8	41.6	41.7	41.7	40.3
8		41.6	41.7	41.6	41.2	40.1	40.0	41.2	39.8	40.0	41.2	42.7	44.9	43.8	46.1	44.8	44.6	45.3	42.8	39.8	38.2	38.0	38.3	38.2	38.2	41.4
9	D	38.0	41.1	40.0	41.2	41.4	36.4	36.7	36.6	38.3	41.4	41.6	43.3	43.2	43.2	43.2	46.1	44.3	40.0	35.6	36.4	37.9	38.2	38.5	39.1	40.1
10		38.3	40.9	44.6	41.7	41.2	39.8	39.3	38.5	39.6	39.8	40.4	41.1	41.6	42.8	44.3	44.5	43.2	43.0	41.6	39.8	38.2	38.2	39.3	39.6	40.9
11	Q	39.5	39.5	39.8	40.0	40.9	40.3	39.6	38.0	38.3	39.6	40.3	41.2	41.2	43.0	43.2	44.5	43.8	42.8	41.2	39.8	38.0	38.2	37.9	37.4	40.3
12		39.5	41.6	40.9	42.7	41.4	41.1	40.8	43.0	43.2	43.2	43.0	45.1	43.2	43.2	43.5	44.3	45.9	44.5	39.5	37.5	37.2	37.4	37.2	39.8	41.6
13	Q	39.7	41.0	41.5	41.0	40.5	41.0	40.0	41.1	39.9	40.5	41.3	41.5	41.3	43.1	40.7	40.3	41.0	41.9	39.4	39.0	38.1	38.9	39.4	40.8	40.5
14		41.0	40.3	40.0	41.3	41.1	39.4	40.0	39.9	39.5	40.7	41.5	43.1	44.4	43.1	44.7	46.5	45.5	43.2	41.3	39.9	39.9	37.9	37.0	37.6	41.2
15		37.3	37.6	38.4	41.3	39.9	39.5	39.4	40.0	41.0	40.7	41.1	41.5	42.3	42.7	43.1	44.4	46.5	46.3	42.7	40.0	39.4	38.1	37.9	37.0	40.7
16	D	36.6	37.9	42.7	40.8	42.9	44.4	41.5	44.5	50.8	49.5	44.8	53.5	57.9	50.6	40.8	38.2	41.3	28.3	35.2	36.6	37.8	33.4	32.9	33.4	41.5
17	D	34.1	34.7	34.9	37.9	51.0	44.4	43.1	41.3	44.2	44.5	44.4	41.5	42.6	42.4	42.6	44.0	46.1	46.1	45.2	41.6	39.9	38.4	38.6	40.0	41.8
18		39.7	39.9	41.0	40.0	39.9	41.0	39.7	41.3	39.7	41.1	41.5	42.4	42.1	41.1	41.6	43.1	42.9	44.5	45.2	43.1	41.3	40.8	39.9	39.5	41.3
19		39.5	39.2	39.4	39.7	41.0	40.8	39.9	40.2	41.0	40.3	41.1	42.6	42.7	42.1	41.1	38.6	42.9	45.0	43.4	41.1	39.4	37.9	37.1	36.3	40.5
20		38.1	38.4	40.2	41.0	41.1	39.9	39.7	39.9	39.7	41.5	44.2	45.5	42.7	41.0	39.4	46.0	47.3	45.2	43.6	42.9	37.0	34.9	37.6	39.4	41.1
21		40.0	39.7	39.9	41.0	40.8	40.2	44.4	40.0	41.5	42.7	42.7	41.8	44.2	41.8	36.5	43.1	44.7	43.9	42.6	41.1	37.8	36.8	37.8	38.2	41.0
22		41.1	39.9	40.0	41.0	40.8	40.8	40.2	40.0	40.2	39.9	39.7	41.5	41.5	42.9	43.2	44.4	45.3	45.0	42.6	39.9	38.1	37.6	38.4	40.2	41.0
23		40.2	39.7	39.7	41.1	39.9	41.0	44.4	42.7	41.3	40.2	41.6	41.5	41.1	41.1	41.3	42.9	42.7	41.6	41.0	41.3	40.3	39.2	39.0	38.9	41.0
24		40.2	39.7	40.3	40.5	40.5	41.0	40.3	43.2	49.8	47.4	36.1	42.9	31.8	45.5	43.1	43.6	44.2	43.2	40.7	40.0	39.0	38.1	36.8	38.1	41.1
25	Q	40.0	40.5	41.1	41.0	41.8	42.3	40.3	39.9	39.7	39.7	39.9	40.3	40.5	40.7	41.0	42.7	44.4	43.4	41.6	39.9	38.2	38.1	38.2	38.7	40.6
26	Q	39.4	40.0	41.0	41.5	41.1	40.7	40.0	40.0	38.4	39.5	41.0	41.3	42.6	41.8	42.7	44.5	46.3	44.8	43.1	40.5	38.6	38.7	39.5	39.9	41.1
27		39.7	39.7	40.0	40.8	41.0	40.5	40.2	39.5	38.9	40.0	41.0	41.3	43.7	44.7	45.3	46.5	44.7	41.0	39.4	36.5	33.4	33.3	34.9	36.5	40.1
28		36.8	39.5	40.8	41.1	41.0	40.8	40.8	40.5	40.3	40.5	41.1	41.3	41.3	41.5	42.7	44.8	47.6	46.3	43.9	38.1	37.9	36.8	38.6	39.2	41.0
29		39.4	39.7	39.5	40.0	40.5	39.9	42.7	41.3	43.1	41.1	39.7	40.7	41.1	41.5	41.8	43.1	44.4	43.6	42.9	39.9	38.1	37.8	38.4	38.2	40.8
30	D	38.4	39.4	40.0	41.3	41.1	41.8	48.5	43.1	40.8	38.7	36.5	42.9	45.8	42.7	42.9	44.7	42.6	47.7	46.6	38.1	36.6	36.8	36.5	37.0	41.3
31		38.1	36.8	39.5	41.1	41.5	41.1	41.0	41.0	41.0	41.1	41.0	40.3	41.5	41.5	41.9	44.5	47.6	47.7	44.7	41.9	40.0	38.7	38.2	38.4	41.3
MEAN	A	39.2	39.7	40.5	41.1	41.6	40.8	41.0	40.4	40.9	41.7	41.3	42.5	42.2	42.6	42.4	43.3	44.1	43.1	41.7	39.7	38.4	38.0	38.2	38.7	41.0
MEAN	Q	39.7	40.2	40.9	40.9	41.0	40.9	40.3	39.9	39.5	39.9	40.7	40.8	41.1	41.9	41.9	43.0	43.5	43.1	41.9	40.4	38.5	38.7	39.0	39.3	40.7
MEAN	D	37.1	38.5	39.6	40.6	46.3	42.3	42.5	40.4	42.1	45.0	42.5	45.8	45.8	44.0	44.1	42.0	42.6	41.0	40.9	38.8	38.4	37.1	36.9	38.5	41.4

VERTICAL INTENSITY

TABLE 3 MEANOOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS JANUARY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		657	657	656	656	657	662	657	651	652	652	651	649	634	618	640	638	639	635	637	639	648	652	652	656	648
2	D	659	666	679	711	651	657	651	462	357	602	640	555	433	506	564	535	608	659	668	678	707	689	697	695	614
3		693	676	670	670	669	669	657	593	582	616	621	648	649	658	664	663	659	659	660	667	669	669	668	666	655
4	Q	662	661	660	660	661	663	661	663	662	654	642	650	657	658	660	660	660	661	662	661	660	662	661	662	659
5		661	662	662	662	662	661	660	660	659	657	639	644	650	651	651	657	658	659	658	652	653	653	653	659	656
6		661	660	660	660	661	662	661	660	661	659	653	645	639	642	659	659	662	666	668	661	663	668	666	662	659
7		662	664	664	663	664	665	666	669	670	670	663	660	660	659	660	660	661	661	663	654	643	664	663	668	662
8		671	670	664	663	670	681	675	671	670	665	660	656	663	656	658	656	655	656	655	653	656	660	663	664	663
9	D	670	682	681	678	673	655	664	675	663	684	683	673	664	663	662	657	659	656	653	654	656	660	664	669	667
10		673	674	681	671	664	663	662	663	664	664	664	662	661	663	663	663	664	665	670	670	664	663	665	664	666
11	Q	663	664	668	669	671	667	664	663	663	663	662	661	659	657	656	661	661	662	663	664	664	664	663	663	663
12		682	690	682	680	681	674	673	674	673	674	671	662	663	663	663	663	664	666	661	663	664	662	668	673	670
13	Q	666	669	669	664	665	668	668	670	669	669	669	669	664	662	648	641	645	658	657	662	663	663	663	664	663
14		665	666	668	668	674	665	674	674	675	674	673	667	666	664	657	663	665	674	674	673	674	674	676	676	670
15		675	676	676	675	675	675	670	667	667	667	665	665	664	664	664	666	673	674	673	673	673	674	673	672	671
16	D	674	683	704	705	695	686	674	655	622	588	514	475	512	514	507	562	615	601	654	685	706	711	730	773	635
17	D	790	791	795	777	769	775	724	693	676	667	659	666	665	672	674	675	676	682	683	683	676	683	676	677	704
18		677	685	684	684	678	675	654	676	676	675	657	656	666	669	671	676	672	675	676	678	677	676	676	675	673
19		674	669	673	673	672	671	669	669	668	665	663	667	666	666	665	666	668	672	675	676	676	676	685	685	671
20		686	685	682	676	674	671	670	668	660	640	656	656	648	628	611	646	657	664	666	669	676	677	673	674	663
21		674	667	667	673	674	675	666	666	657	642	646	658	658	646	655	663	666	668	659	669	674	669	669	676	664
22		676	676	675	674	673	671	668	669	667	665	659	656	652	658	660	665	668	673	674	674	675	668	665	666	668
23		667	668	674	675	676	675	666	652	658	666	665	659	649	651	654	656	656	657	666	667	668	666	666	666	663
24		668	667	666	665	666	665	662	666	657	628	649	617	634	633	651	651	648	648	657	659	661	663	670	670	655
25	Q	665	666	666	666	668	668	670	666	664	664	664	664	660	661	661	661	661	661	665	668	668	668	666	665	665
26	Q	666	666	667	667	666	665	665	663	655	663	665	664	659	664	665	667	687	666	667	665	664	663	664	664	665
27		665	665	666	666	665	665	665	658	641	651	663	659	657	656	656	657	657	656	656	657	658	664	665	667	660
28		673	674	668	665	664	664	665	664	664	664	663	662	659	660	660	663	665	661	659	658	659	659	664	666	664
29		670	667	668	666	665	666	676	639	598	658	667	666	665	664	665	666	666	667	666	666	666	666	665	666	662
30	D	667	666	665	665	666	668	590	640	656	646	609	647	647	657	658	658	647	660	661	659	665	667	665	666	654
31		678	694	706	693	661	673	667	666	666	665	659	658	663	666	667	668	674	671	666	665	665	666	666	665	671
MEAN	A	674	675	676	675	673	672	665	656	647	655	652	648	645	647	650	653	658	661	664	665	667	668	670	672	662
MEAN	Q	665	665	666	665	666	666	666	665	663	663	661	662	660	661	658	658	659	662	663	664	664	664	664	664	663
MEAN	D	692	698	705	707	691	689	660	625	595	637	621	603	584	602	613	617	641	652	664	672	682	682	686	696	655

HORIZONTAL INTENSITY

TABLE 4 MEANOOK — H = 13000 PLUS TABULAR VALUES IN GAMMAS — FEBRUARY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		264	266	265	268	265	268	275	268	268	269	270	270	274	275	276	274	266	256	253	252	256	257	265	244	265
2	D	266	275	274	278	276	286	276	277	277	267	200	90	62	245	275	276	264	254	236	226	234	264	266	243	245
3		258	273	275	267	276	269	266	267	267	266	257	245	254	267	267	266	257	251	249	251	256	258	261	263	262
4	D	265	267	267	268	268	267	268	268	254	211	249	246	225	191	243	276	246	243	237	252	254	258	260	265	252
5		261	266	264	265	276	289	274	267	266	264	265	265	260	219	218	270	265	257	256	257	258	264	256	254	261
6		260	266	267	267	274	275	269	266	254	268	267	267	266	266	265	263	258	257	254	256	262	261	257	256	263
7	Q	258	265	265	266	266	266	266	266	266	266	265	266	266	265	263	254	246	236	230	236	248	259	265	265	259
8	Q	265	266	267	267	272	273	270	272	271	271	270	272	275	270	266	264	254	245	238	243	246	253	256	264	263
9		266	271	273	270	274	274	267	268	275	272	274	276	276	276	269	266	257	245	239	244	248	256	258	267	265
10		275	277	277	276	276	268	268	267	273	275	276	277	277	277	277	259	257	252	237	235	235	238	246	258	264
11	Q	266	269	269	275	275	269	269	268	267	265	267	268	269	270	268	266	257	247	239	236	237	234	246	257	260
12		266	270	276	277	277	276	275	274	274	275	276	277	276	276	275	273	266	257	245	238	239	245	254	258	266
13		267	275	277	284	285	277	279	278	277	277	278	278	278	277	278	287	277	264	250	248	248	257	265	266	272
14	D	268	273	275	257	269	266	266	260	266	258	207	196	268	263	259	264	277	268	254	247	255	259	258	259	258
15		261	265	262	257	264	264	265	251	265	255	206	236	279	275	269	265	258	246	239	235	245	258	265	265	256
16		266	268	269	274	275	276	275	268	267	268	269	259	257	268	267	276	277	268	258	254	252	257	254	257	266
17		267	275	277	278	278	277	276	276	277	278	268	269	278	279	280	277	258	227	234	218	236	247	253	247	264
18		255	264	263	268	259	278	276	258	257	266	277	269	267	244	216	260	261	245	235	244	249	253	249	247	257
19		258	261	268	270	274	276	276	277	269	268	267	261	263	268	267	266	258	248	240	237	246	257	258	258	262
20		264	267	269	270	275	276	276	275	275	274	275	277	276	276	267	267	266	258	248	246	248	258	259	263	267
21	Q	267	271	275	276	277	275	267	266	266	273	276	276	276	278	275	268	258	248	238	244	247	257	265	267	266
22	Q	267	269	276	276	277	277	275	276	277	277	277	278	277	277	276	269	267	258	248	245	250	250	252	258	268
23		264	267	276	277	277	277	278	277	278	277	278	278	278	279	278	278	267	258	238	241	254	266	271	267	270
24	D	274	276	276	271	268	275	267	265	266	277	278	285	284	289	296	278	205	247	254	246	244	246	254	258	266
25		266	267	269	275	274	277	269	273	277	277	276	275	277	278	277	270	265	258	248	245	246	253	257	264	267
26		265	265	259	266	266	262	251	246	226	219	194	186	138	123	214	187	265	255	237	237	236	239	246	257	231
27		258	260	260	263	266	267	265	255	227	248	234	248	266	257	267	268	265	247	242	236	237	235	245	266	253
28	D	269	309	307	268	275	278	286	281	277	257	198	163	186	235	268	268	257	235	218	226	230	244	246	275	252
MEAN	A	264	270	271	270	273	273	271	268	266	265	257	252	255	259	265	266	260	251	243	242	246	253	257	259	261
MEAN	Q	264	268	270	272	273	272	269	269	269	270	271	272	273	272	269	264	256	247	239	241	246	251	257	262	263
MEAN	D	268	280	280	268	271	274	273	270	268	254	226	196	205	245	268	272	250	250	240	239	244	254	257	260	255

CECLINATION

TABLE 5 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES FEBRUARY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		38.6	39.4	41.1	40.0	44.7	42.7	39.7	39.9	39.7	39.9	40.2	41.0	41.1	41.3	41.6	44.2	46.6	47.3	44.7	42.6	40.8	38.4	36.6	33.4	41.1
2	D	33.4	39.4	39.4	39.5	46.1	42.6	41.3	40.8	44.0	41.8	54.0	51.4	48.1	39.5	44.4	46.5	45.8	44.5	40.8	38.1	36.1	38.2	35.5	38.1	42.1
3		38.6	36.5	40.8	41.3	41.9	41.0	41.1	41.1	41.0	41.1	41.1	41.6	39.7	41.5	41.6	43.1	44.7	44.4	42.6	41.3	40.3	39.7	39.9	39.7	41.1
4	D	39.5	39.5	39.4	39.7	40.3	39.9	40.8	39.7	42.7	44.8	43.1	46.1	38.1	32.9	44.8	44.7	41.0	41.1	39.7	36.5	36.8	39.5	41.1	39.9	40.5
5		38.4	37.9	39.7	41.3	44.7	40.7	38.4	39.5	40.2	40.5	41.3	41.8	41.5	38.9	34.7	44.7	42.9	43.1	41.6	38.6	37.9	36.5	37.8	39.5	40.1
6		39.0	38.4	39.5	41.1	41.6	39.5	39.7	39.4	36.6	40.8	41.0	41.3	41.3	41.1	41.5	42.6	43.1	42.7	39.9	38.2	37.8	38.4	39.7	39.7	40.2
7	Q	39.4	38.9	39.4	39.7	39.9	39.7	39.4	39.7	33.2	39.7	40.2	41.1	41.3	41.5	41.8	43.1	44.5	44.5	41.8	39.4	37.9	37.9	38.2	38.9	40.2
8	Q	38.9	38.9	38.9	39.4	39.5	39.7	39.7	39.4	38.9	39.5	39.9	41.1	41.5	41.3	41.5	42.9	42.7	39.7	37.8	36.3	36.5	36.8	38.1	38.2	39.5
9		38.1	38.2	39.4	39.7	39.7	39.5	40.7	41.6	38.2	39.7	40.7	41.0	41.3	42.3	43.1	44.8	46.3	46.1	41.9	39.4	37.1	37.0	38.1	39.2	40.5
10		39.0	39.4	39.5	40.0	40.0	40.8	39.7	36.2	39.9	39.5	40.0	41.0	41.1	41.1	42.3	41.3	37.9	39.9	33.4	36.5	36.8	38.2	38.1	38.2	39.2
11	Q	38.2	38.4	39.2	39.7	40.5	40.2	39.7	39.7	39.5	41.1	40.8	41.3	41.5	42.1	42.9	44.2	43.1	42.9	40.7	37.9	37.8	36.8	37.6	37.9	40.2
12		38.1	38.9	39.5	39.9	39.9	40.0	39.9	39.9	39.9	40.0	39.7	41.3	41.5	41.5	42.7	44.4	45.2	44.7	42.9	41.0	39.5	39.5	38.6	38.1	40.7
13		37.9	37.9	38.2	38.6	38.6	41.1	38.4	39.5	39.4	39.7	40.0	40.5	39.9	41.0	43.1	46.3	46.5	44.5	41.8	39.9	38.1	37.9	37.9	38.1	40.2
14	D	37.9	38.1	38.4	39.7	37.8	41.1	40.0	41.6	41.5	39.4	44.7	48.2	44.0	41.6	37.3	35.2	38.2	39.7	42.6	41.8	40.0	39.4	39.7	39.7	40.3
15		39.2	39.2	38.6	39.5	40.3	43.1	39.9	41.5	41.9	41.0	38.6	38.4	43.2	42.9	41.5	41.5	43.7	42.7	38.1	38.2	37.9	38.1	36.6	38.1	40.2
16		39.4	38.7	39.4	39.5	39.5	39.5	39.7	44.4	44.7	43.1	42.6	40.2	39.4	41.1	41.3	41.5	42.6	40.0	39.9	39.4	39.5	38.2	39.5	38.4	40.5
17		38.1	38.4	39.0	39.5	39.7	39.7	39.7	39.9	39.9	41.1	44.4	46.1	44.6	44.2	43.9	44.2	44.7	44.5	42.6	29.9	31.6	37.8	39.5	40.0	40.5
18		39.5	37.8	38.9	39.0	44.4	41.0	39.4	38.4	39.9	39.9	44.4	43.1	42.9	41.3	39.9	39.7	45.2	42.9	40.7	38.6	37.1	37.0	38.1	39.5	40.3
19		39.4	39.4	39.5	39.7	39.7	39.9	39.7	39.2	38.6	39.5	41.0	39.5	39.5	41.0	41.5	43.6	44.7	44.7	42.9	40.2	37.9	37.6	38.1	38.6	40.2
20		38.4	38.1	38.2	39.0	39.5	39.7	39.7	39.5	39.7	39.9	41.0	41.1	41.5	42.4	41.3	42.4	44.7	44.4	41.1	38.1	37.0	36.6	38.1	38.7	40.0
21	Q	38.2	38.2	38.2	39.4	39.5	39.7	39.5	39.5	39.7	41.3	41.3	41.3	41.3	41.3	41.9	42.9	44.5	44.7	41.6	38.1	37.3	36.5	36.6	37.6	40.0
22	Q	38.1	38.1	38.1	39.4	39.4	39.4	39.5	39.5	39.7	39.9	39.9	39.7	39.9	41.1	42.1	44.2	45.8	46.1	43.1	39.2	34.9	35.3	36.6	38.1	39.9
23		38.1	38.1	39.4	39.5	39.5	39.5	39.4	39.7	39.7	39.9	40.2	40.7	41.3	41.6	42.7	44.4	46.1	46.0	42.6	39.9	39.0	37.4	37.1	38.2	40.4
24	D	38.1	38.4	39.4	39.7	39.4	39.5	38.7	42.6	42.9	39.7	39.5	40.7	40.5	41.1	42.6	42.9	31.8	35.0	34.5	37.9	37.8	36.1	37.9	39.7	39.0
25		39.0	39.4	38.7	39.2	39.5	39.7	39.5	41.3	39.9	39.9	41.0	41.1	41.5	41.6	42.9	44.5	44.2	43.9	43.1	40.7	38.4	38.1	37.9	38.1	40.5
26		38.4	38.2	38.4	38.1	37.6	40.3	41.1	46.3	47.6	50.8	52.2	54.0	53.2	56.9	52.2	41.3	47.7	46.1	42.6	41.0	39.9	39.7	39.4	39.0	44.3
27		39.4	39.5	39.7	40.0	40.0	39.7	39.4	39.7	41.0	45.2	44.7	47.4	41.8	41.9	42.3	44.5	44.2	39.5	39.9	39.9	36.5	34.7	32.1	33.3	40.3
28	D	33.1	33.1	35.0	39.4	39.9	41.1	39.7	37.9	42.7	42.9	46.0	53.9	51.6	49.5	44.8	44.7	49.0	46.1	41.3	39.7	36.5	34.5	35.0	33.1	41.3
MEAN	A	38.3	38.4	39.0	39.7	40.5	40.4	39.8	40.3	40.6	41.1	42.3	43.1	42.3	42.0	42.3	43.2	43.6	43.3	40.9	38.9	37.7	37.6	37.8	38.2	40.5
MEAN	Q	38.6	38.5	38.8	39.5	39.8	39.7	39.6	39.6	39.2	40.3	40.4	40.9	41.1	41.5	42.0	43.5	44.1	43.6	41.0	38.2	36.9	36.7	37.4	38.1	39.9
MEAN	D	36.4	37.7	38.3	39.6	40.7	40.8	40.1	40.5	42.8	41.7	45.5	48.1	44.5	40.9	42.8	42.8	41.2	41.3	39.8	38.8	37.4	37.6	37.9	38.1	40.6

VERTICAL INTENSITY

TABLE 6 MEANOOK   Z = 58000 PLUS TABULAR VALUES IN GAMMAS   FEBRUARY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		666	668	674	673	677	676	665	664	665	664	663	663	664	664	665	666	667	666	666	666	665	665	664	664	667
2	D	669	669	670	678	706	704	694	688	669	646	574	458	521	640	657	660	658	666	668	675	677	694	693	713	656
3		705	694	686	686	685	678	669	667	665	665	657	615	631	651	664	665	667	668	667	667	668	669	668	667	668
4	D	667	666	666	667	667	666	669	666	655	656	659	647	622	562	598	646	635	651	668	667	670	678	677	684	655
5		678	678	685	686	687	673	677	669	669	665	662	660	657	613	601	658	664	666	669	668	667	671	676	684	666
6		678	674	668	669	669	667	671	669	656	669	670	667	666	666	666	668	668	667	665	662	663	666	662	666	667
7	Q	666	662	663	663	663	663	662	662	662	662	662	662	662	662	662	665	662	663	662	665	667	668	667	666	664
8	Q	666	665	665	662	664	663	661	663	663	663	663	663	662	662	661	661	662	662	662	666	668	669	670	669	664
9		667	667	667	667	666	667	669	667	666	666	665	665	663	662	662	664	666	665	660	665	667	667	667	666	666
10		663	663	663	663	664	665	666	655	660	665	665	665	663	662	660	654	643	632	635	646	658	661	667	667	659
11	Q	665	665	664	664	662	663	665	666	651	653	659	666	665	665	665	664	663	659	659	661	665	667	669	668	663
12		667	666	665	663	663	662	661	661	661	660	656	659	659	660	661	662	666	667	670	675	676	675	668	666	665
13		666	666	665	661	665	668	666	665	665	662	660	659	656	639	642	656	657	657	658	660	664	666	665	663	661
14	D	662	662	666	687	697	697	679	653	648	647	591	543	639	631	638	639	659	662	669	670	669	669	668	668	655
15		667	668	669	676	676	678	650	640	658	647	562	610	666	657	661	662	667	667	668	667	669	669	668	667	658
16		664	665	665	666	666	667	668	668	658	659	659	651	638	632	629	644	658	658	656	661	664	668	669	668	658
17		666	667	667	667	666	666	665	665	664	659	630	646	659	661	662	666	662	661	676	698	690	695	687	679	668
18		678	684	679	678	689	687	685	649	651	650	668	666	659	640	619	651	664	663	669	678	679	678	678	677	667
19		677	676	668	668	667	669	668	659	659	668	667	657	658	659	667	669	671	670	671	675	670	667	666	668	667
20		668	665	664	664	665	666	666	665	665	662	664	665	661	661	662	661	665	666	667	669	669	668	666	667	665
21	Q	668	668	668	667	665	667	668	662	658	664	667	665	666	666	666	665	666	666	664	668	668	668	667	667	666
22	Q	668	668	665	666	666	666	660	660	659	659	659	659	660	662	661	662	663	663	659	661	666	666	663	668	663
23		666	666	664	664	660	663	660	660	660	660	660	660	661	663	664	668	669	669	665	667	667	663	661	661	663
24	D	660	659	658	660	660	661	660	656	651	659	658	660	659	661	660	660	621	620	635	650	664	673	674	670	656
25		669	668	667	667	665	664	660	659	658	659	660	662	663	663	663	663	663	663	663	665	669	670	668	668	664
26		668	669	670	672	678	678	670	643	593	575	550	555	513	537	576	604	630	689	686	688	690	692	691	687	640
27		680	678	676	672	670	671	670	678	648	643	604	623	648	641	659	667	671	669	669	671	678	688	690	704	665
28	D	708	747	756	706	686	696	697	696	694	677	620	544	561	598	658	667	669	669	678	687	683	688	686	688	673
MEAN	A	671	672	672	671	672	672	669	664	658	657	644	636	643	644	650	659	662	662	664	669	670	673	672	673	662
MEAN	Q	667	666	665	665	664	665	663	663	659	660	662	663	663	664	663	664	664	663	661	664	667	668	667	668	664
MEAN	D	673	681	683	679	683	685	680	673	663	657	620	570	600	618	642	654	648	654	664	670	673	680	679	685	659

HORIZONTAL INTENSITY

TABLE 7 MEANOOK — H = 13000 PLUS TABULAR VALUES IN GAMMAS — MARCH 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		246	256	286	318	308	308	360	297	80	-104	13	132	212	141	91	174	230	260	243	237	245	249	268	285	216
2		276	296	296	285	303	306	294	265	212	79	-33	164	256	283	275	268	257	253	247	244	243	246	264	265	243
3		248	266	275	269	274	275	269	266	140	214	276	283	275	267	266	264	253	228	227	223	226	250	260	256	252
4		267	267	266	273	274	276	277	269	173	100	194	48	81	152	172	194	224	235	195	205	217	221	245	284	213
5		276	266	262	268	277	283	284	277	268	285	284	282	277	277	276	274	266	244	219	214	225	216	242	275	263
6	D	284	329	318	265	263	260	258	253	202	151	-148	192	276	277	268	260	234	223	214	224	233	265	316	417	243
7	D	327	298	399	366	346	256	246	161	90	-11	-129	-145	-44	-104	-65	76	212	193	127	143	236	236	258	309	157
8	D	286	306	315	306	264	277	204	-126	-75	-357	-532	-77	14	15	---	---	107	315	76	11	243	463	297	264	---
9	D	253	280	369	370	351	272	180	172	182	138	114	102	71	-22	161	151	39	153	216	205	203	211	246	235	196
10		257	235	254	244	245	244	245	247	234	228	226	238	245	252	247	245	236	225	202	205	208	212	225	234	235
11		236	243	244	245	253	253	253	253	253	254	256	256	256	254	244	256	250	234	218	214	215	227	238	236	244
12		253	257	259	252	256	260	250	218	224	182	140	231	266	276	269	265	260	246	234	233	234	239	245	252	242
13		256	263	264	265	266	267	266	267	268	260	152	266	273	246	245	259	268	254	235	223	216	227	243	248	250
14		261	258	257	262	265	266	266	267	266	267	268	268	266	267	266	266	257	252	237	234	233	233	236	246	257
15		257	265	258	263	264	264	264	257	260	262	245	266	263	268	268	246	258	243	223	224	227	235	243	247	253
16	Q	260	265	265	266	267	267	269	267	266	267	266	269	269	268	268	267	263	246	235	234	236	237	245	251	259
17		261	256	270	270	273	276	274	276	277	279	280	282	284	275	272	273	274	257	247	242	243	245	250	249	266
18		251	258	271	272	271	272	267	274	276	275	262	242	245	266	268	262	251	249	239	241	245	245	261	256	259
19		258	260	266	266	266	269	266	266	274	276	276	276	274	266	276	277	269	265	254	245	245	239	235	245	263
20		266	266	268	271	271	271	270	267	274	272	275	271	265	267	274	272	254	262	240	235	236	241	245	257	262
21	Q	256	266	266	270	271	270	273	273	272	272	266	274	275	277	274	266	260	250	237	235	236	243	243	253	262
22	Q	260	266	269	274	274	274	273	275	276	275	266	264	275	277	276	271	260	253	243	240	237	238	245	253	263
23		258	266	266	269	274	276	278	277	268	253	277	286	281	277	277	276	276	267	250	238	235	235	244	254	265
24	Q	265	267	272	271	275	275	277	278	278	281	283	284	286	290	290	286	272	260	244	237	243	243	244	256	269
25	Q	265	269	275	275	276	275	275	275	276	280	286	285	286	285	284	279	275	260	247	245	244	243	247	260	270
26		267	276	277	276	269	269	275	276	278	284	286	286	286	286	281	270	267	257	246	245	245	250	253	256	269
27		266	275	276	277	278	278	284	298	307	287	242	297	307	296	286	277	260	251	246	243	246	265	276	260	274
28		257	265	288	263	285	253	203	257	224	-36	-146	-71	174	194	181	215	257	258	254	252	257	285	297	285	206
29		265	306	318	330	317	297	254	87	232	273	259	236	155	226	234	186	235	242	237	233	235	245	267	315	249
30		317	276	265	266	264	297	296	267	118	234	174	92	131	148	284	257	238	249	245	240	242	245	263	265	236
31	D	266	277	267	285	283	286	230	60	-32	20	-136	-83	154	162	-116	119	264	266	252	256	254	273	311	292	175
MEAN	A	264	270	279	278	279	273	266	248	224	203	176	202	231	230	230	242	251	244	232	230	235	241	255	267	244
MEAN	Q	261	266	269	271	273	272	273	274	274	275	273	275	278	280	279	274	266	254	241	238	239	241	245	255	264
MEAN	D	283	296	338	321	311	268	228	162	111	74	-75	17	114	78	62	151	200	208	203	207	232	246	283	313	193

DECLINATION

TABLE 8 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES MARCH 1970

HOUR UT DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		33.2	33.3	34.6	32.8	33.3	39.4	41.2	49.6	30.1	27.5	28.8	47.3	50.7	51.2	28.0	36.7	48.3	47.8	46.2	42.6	38.0	36.2	34.9	34.4	38.6
2		35.1	35.1	38.0	34.8	39.6	44.4	41.4	42.6	43.1	49.3	38.1	36.2	42.3	43.3	44.4	46.0	49.6	49.3	47.5	43.9	39.8	37.8	36.0	34.9	41.4
3		37.8	38.0	38.3	39.4	39.6	39.8	41.0	39.6	39.4	36.4	42.5	43.0	42.6	43.1	43.0	45.7	49.3	49.4	44.1	42.5	36.5	33.5	35.9	35.7	40.7
4		36.0	36.9	38.1	38.1	40.1	39.6	41.0	40.7	34.8	31.9	43.0	47.6	26.5	41.5	36.2	37.8	42.8	44.3	37.5	33.2	31.4	33.3	34.4	36.5	37.6
5		34.9	34.1	37.5	38.3	39.6	39.9	41.2	40.9	42.8	39.9	41.0	43.0	44.1	44.9	47.5	50.7	52.3	53.9	49.6	40.6	38.0	33.5	31.5	29.9	41.2
6	D	29.4	32.8	37.8	38.3	41.4	41.0	39.8	43.3	54.4	49.1	39.8	43.0	40.4	41.4	39.6	39.4	40.9	44.3	35.6	40.7	37.0	33.3	35.7	34.3	39.7
7	D	33.8	28.3	45.1	29.9	32.7	41.0	39.8	32.0	39.6	47.6	59.2	55.5	42.5	44.3	41.0	21.2	33.5	49.3	41.8	19.0	36.5	34.8	34.8	36.7	38.3
8	D	36.4	36.7	39.8	39.6	34.8	31.3	34.8	35.8	49.5	71.5	58.6	78.6	50.7	52.5	---	---	76.2	73.9	70.9	76.8	94.5	79.7	39.8	32.9	---
9	D	38.0	38.0	37.9	54.6	36.6	41.1	34.0	40.1	43.8	41.1	38.5	40.9	40.8	36.8	41.1	40.8	34.5	48.3	42.9	44.8	40.5	39.3	38.0	39.7	40.5
10		36.9	37.1	37.7	39.3	39.7	40.9	40.9	41.4	41.7	40.8	41.1	40.0	40.6	41.4	44.0	45.9	47.5	49.0	44.6	41.9	39.2	36.4	36.4	36.4	40.9
11		37.7	37.9	38.4	39.2	39.5	39.5	39.5	39.5	39.5	39.3	39.7	39.7	39.5	40.6	41.1	46.3	48.2	48.5	48.2	43.7	40.1	36.3	34.8	36.4	40.5
12		36.3	37.7	39.3	40.1	39.8	40.9	42.4	39.5	40.1	40.3	45.1	44.8	39.5	40.9	44.3	47.5	49.5	49.2	45.6	41.3	37.9	36.3	35.9	36.3	41.3
13		36.9	37.7	38.0	38.2	39.3	39.2	40.1	44.8	40.8	39.5	31.9	45.4	40.9	39.3	37.6	42.5	45.9	48.7	47.4	43.0	36.6	36.3	36.1	36.4	40.1
14		37.4	37.9	37.9	38.7	39.2	39.2	39.3	39.5	39.7	40.8	40.6	40.8	40.9	41.4	44.0	45.9	47.7	47.4	45.1	42.2	39.7	38.0	37.6	37.6	40.8
15		37.4	37.9	39.2	38.8	38.5	41.4	46.7	42.5	40.3	39.0	34.8	39.2	40.5	40.9	41.1	40.9	44.0	47.5	44.5	39.8	36.3	36.3	36.4	37.7	40.1
16	Q	36.9	37.8	38.3	38.8	38.9	39.3	39.4	40.2	40.4	41.2	40.2	39.8	40.6	41.7	43.8	45.2	47.2	46.7	43.5	39.9	37.8	36.2	34.9	35.7	40.2
17		35.9	36.0	36.5	37.8	37.8	38.0	39.6	38.8	39.3	39.6	39.9	40.6	38.9	40.2	43.0	48.1	47.2	47.8	42.0	40.2	38.9	38.0	37.2	37.5	40.0
18		36.1	38.1	38.1	38.4	39.0	38.9	39.2	39.7	39.9	40.2	41.3	42.3	48.5	43.7	44.5	46.5	44.5	43.6	39.9	35.7	34.9	34.9	36.1	36.5	40.1
19		36.5	37.0	38.4	38.7	38.9	38.7	38.9	45.3	43.4	41.1	41.3	39.9	39.7	40.0	43.9	46.5	46.1	45.2	43.2	41.3	39.5	36.6	36.5	36.3	40.5
20		36.6	36.7	37.9	38.2	38.8	39.0	39.5	39.6	39.8	40.0	40.4	40.0	39.8	42.7	45.9	47.5	47.8	48.2	42.2	40.0	37.5	35.6	34.8	35.0	40.1
21	Q	35.1	35.1	35.9	38.0	38.9	39.1	38.4	38.3	39.7	40.5	40.5	40.7	40.9	41.5	43.3	42.5	42.1	42.8	39.2	38.0	35.4	34.3	34.4	35.2	38.7
22	Q	35.7	36.7	36.8	37.5	38.8	38.9	38.8	41.5	41.5	40.2	39.9	36.7	41.2	42.9	44.7	46.3	46.3	47.3	45.0	41.2	37.8	35.1	35.1	35.9	40.1
23		35.3	36.1	36.8	37.3	38.1	38.4	38.9	39.0	46.4	42.6	42.9	41.0	41.4	43.4	43.7	45.9	45.6	46.3	45.6	39.8	36.8	34.5	34.4	35.3	40.2
24	Q	35.9	36.9	37.5	38.3	38.6	39.3	39.3	39.9	40.3	40.3	41.1	41.1	41.7	42.7	45.1	48.0	48.5	48.3	45.1	40.9	36.9	35.1	35.3	35.3	40.5
25	Q	35.4	36.7	37.4	38.2	38.6	38.8	40.3	40.7	41.4	40.4	40.9	40.6	41.2	41.5	43.5	46.0	46.7	47.7	46.2	43.1	39.6	37.0	35.6	35.3	40.5
26		35.4	37.0	38.4	38.3	38.9	38.4	38.6	39.9	40.5	41.6	41.6	41.8	43.1	43.6	46.3	47.8	46.3	47.9	45.0	42.1	38.6	37.0	36.8	36.8	40.9
27		37.1	37.4	38.4	38.8	39.6	40.1	40.0	39.5	39.5	43.2	48.2	54.5	51.7	50.3	51.7	51.2	50.9	50.0	43.5	39.0	35.6	35.9	33.9	32.7	42.6
28		33.9	33.5	38.5	48.2	41.6	53.0	45.0	45.3	43.7	51.9	74.7	56.4	49.8	46.7	43.3	46.7	43.5	43.0	43.8	43.0	38.4	35.8	34.5	32.6	44.4
29		33.8	32.7	34.1	33.8	45.2	40.6	43.6	35.2	40.6	41.0	41.8	41.0	37.3	38.5	42.3	40.4	41.7	40.6	45.9	37.0	37.3	34.0	32.5	30.9	38.4
30		34.1	36.8	37.3	38.9	40.0	38.9	39.0	36.9	30.8	38.9	43.9	51.1	64.3	47.3	45.0	49.8	46.8	46.9	48.2	42.4	39.0	36.9	35.7	36.5	41.9
31	D	37.3	37.3	38.7	38.9	41.8	40.0	37.3	46.0	33.6	50.2	54.0	70.9	55.1	55.0	67.4	49.8	45.5	45.6	41.9	36.8	34.4	34.1	33.9	35.8	44.2
MEAN	A	35.8	36.1	37.9	38.6	39.1	40.2	40.1	40.7	40.4	41.2	42.6	44.1	42.9	43.1	43.7	44.5	45.7	47.1	44.0	40.0	37.5	35.7	35.3	35.5	40.5
MEAN	Q	35.8	36.6	37.2	38.1	38.8	39.1	39.2	40.1	40.7	40.5	40.5	39.7	41.1	42.1	44.1	45.6	46.2	46.5	43.8	40.6	37.5	35.5	35.0	35.5	40.0
MEAN	D	34.6	34.1	39.9	40.4	38.1	40.8	37.7	40.4	42.8	47.0	47.9	52.6	44.7	44.3	47.3	37.8	38.6	46.9	40.6	35.3	37.1	35.4	35.6	36.6	40.7

VERTICAL INTENSITY

TABLE 9 MEANOOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS MARCH 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		697	696	699	734	761	736	712	647	644	517	394	532	605	575	530	558	639	689	694	689	690	688	696	704	649
2		706	746	754	726	745	737	728	691	580	482	519	559	669	681	681	682	679	683	688	686	687	683	681	687	673
3		680	680	679	678	679	688	684	676	586	616	661	669	669	661	669	670	672	680	698	696	692	710	713	687	675
4		689	688	706	700	689	688	695	687	612	501	536	518	532	537	573	603	642	688	681	678	681	697	716	728	644
5		709	697	687	681	688	688	681	687	669	688	680	679	677	673	672	670	665	668	693	700	695	697	698	708	685
6	D	724	754	726	697	680	670	669	662	519	550	513	606	664	665	661	670	670	699	705	723	742	792	797	779	681
7	D	733	746	707	759	782	713	685	627	557	516	443	603	646	624	619	655	632	660	685	706	681	672	680	731	661
8	D	744	746	749	726	736	721	694	835	774	859	669	497	462	606	504	501	804	725	904	794	686	583	654	746	697
9	D	732	763	722	603	747	727	686	698	719	693	671	654	604	647	669	688	682	759	716	710	710	719	732	740	700
10		737	714	714	707	705	701	700	692	653	660	667	689	699	703	709	710	708	709	705	700	709	707	703	705	700
11		704	699	699	699	699	699	698	698	698	698	697	698	696	698	697	698	698	697	695	695	698	704	704	702	699
12		702	703	699	705	704	706	694	648	629	553	506	590	639	677	695	695	636	695	692	690	690	690	691	690	670
13		689	689	688	688	689	690	698	652	660	671	548	645	678	658	651	662	630	688	687	694	699	698	699	697	676
14		696	692	691	689	689	688	687	682	682	680	681	682	682	686	688	689	687	682	682	682	685	689	690	685	686
15		686	691	692	696	713	723	675	683	672	671	639	662	682	685	680	671	677	682	681	681	682	685	685	686	682
16	Q	685	685	685	685	685	683	683	683	681	677	658	675	676	676	675	682	632	682	728	681	685	686	686	679	683
17		675	676	675	676	676	676	676	678	676	671	671	671	670	661	666	667	668	675	681	681	681	690	695	685	676
18		685	680	679	678	680	680	675	675	672	670	637	575	609	664	675	677	675	684	681	681	685	689	700	698	671
19		694	688	684	681	680	680	674	672	662	675	680	679	675	672	680	680	680	681	680	680	683	693	691	687	680
20		689	684	683	681	680	680	675	675	676	670	672	664	647	664	675	677	675	680	684	681	689	689	691	693	678
21	Q	694	694	698	698	691	681	680	679	678	678	678	678	678	678	680	680	680	680	675	670	675	678	680	680	681
22	Q	674	674	674	674	674	674	674	663	671	669	674	648	660	668	672	674	673	674	674	669	669	669	669	674	670
23		673	675	674	674	674	674	674	671	667	618	660	674	673	669	673	672	672	669	671	670	671	675	676	676	670
24	Q	680	674	674	674	674	674	674	674	675	676	678	678	674	674	674	674	674	673	666	660	661	663	668	674	672
25	Q	672	673	674	674	673	671	669	670	673	671	669	669	669	670	673	672	674	677	673	668	668	669	670	672	671
26		672	670	676	677	679	687	678	676	672	667	665	661	667	671	674	677	677	678	671	666	667	667	668	669	672
27		670	669	669	670	670	670	669	670	666	653	630	601	643	659	668	667	669	668	668	668	669	685	733	727	668
28		708	710	753	734	725	631	614	654	613	503	536	601	592	582	572	610	695	698	690	695	700	715	725	735	658
29		733	743	744	679	729	727	647	462	638	674	669	651	597	634	644	626	643	661	686	695	695	695	698	718	670
30		760	694	678	678	676	698	720	665	527	639	572	494	444	593	679	665	674	688	666	679	694	703	690	686	654
31	D	678	668	687	704	723	669	661	717	646	751	743	611	582	610	584	580	643	659	675	694	706	716	742	741	676
MEAN	A	699	699	697	691	700	692	682	673	650	642	623	629	637	652	654	659	678	685	693	689	688	690	697	702	675
MEAN	Q	681	680	681	681	679	677	676	674	675	674	671	670	671	673	675	676	677	677	683	670	672	673	675	676	676
MEAN	D	722	739	718	698	734	704	679	708	643	674	608	594	592	630	608	619	616	700	737	725	705	696	721	747	683

HORIZONTAL INTENSITY

TABLE 10 MEANOOK H = 13000 PLUS TABULAR VALUES IN GAMMAS APRIL 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		276	260	254	252	256	258	256	257	260	264	265	266	266	266	258	259	247	235	235	235	235	237	260	257	255
2		254	264	265	264	267	266	270	268	265	264	266	267	266	248	223	239	250	235	233	235	239	241	251	266	254
3		278	267	266	279	307	318	132	159	229	200	154	226	237	244	275	277	274	257	239	229	234	244	254	266	244
4		257	268	264	263	266	267	268	265	210	266	275	258	235	275	277	276	260	257	251	245	244	245	256	258	258
5		270	277	279	278	278	279	279	287	274	225	223	224	286	267	288	278	267	251	250	244	243	254	257	282	265
6	D	285	286	276	284	296	243	67	194	257	179	-194	101	193	247	213	237	254	267	256	258	258	269	265	286	220
7		288	281	275	276	276	284	268	60	258	258	282	271	276	274	275	267	257	248	237	247	246	253	258	277	258
8		305	270	266	275	269	267	275	272	257	193	223	285	278	258	276	276	251	252	244	237	235	246	258	268	260
9		275	279	276	276	277	284	275	277	71	225	286	108	82	10	277	296	275	266	256	253	257	270	266	268	237
10	Q	277	284	277	276	276	276	278	279	284	285	284	284	286	287	286	285	272	260	246	235	234	235	256	254	271
11		275	269	276	278	270	266	268	266	238	181	236	204	285	286	284	283	275	270	263	257	256	256	264	267	261
12		277	278	282	274	276	274	268	248	257	276	277	278	277	280	267	256	256	253	245	245	247	254	256	250	265
13	Q	268	276	274	274	275	277	280	281	281	282	282	264	260	280	285	280	266	253	244	245	246	253	260	267	269
14	Q	279	276	276	275	277	278	279	283	285	286	285	284	277	279	276	267	256	244	246	254	258	265	265	273	272
15	Q	274	275	276	277	283	283	285	287	276	286	293	287	285	283	279	265	241	218	226	237	254	257	269	307	271
16		303	308	325	389	379	329	260	278	277	276	268	268	276	267	265	254	244	241	253	246	251	267	318	372	288
17	D	407	482	342	378	346	338	298	274	92	-61	175	253	263	172	161	233	243	237	224	273	285	308	321	237	262
18		253	254	266	263	265	266	266	270	256	193	-3	-109	-219	-129	224	272	256	253	247	244	263	266	307	347	199
19		263	316	349	475	399	259	-12	-20	-154	-116	-167	52	153	297	303	265	261	248	257	271	273	275	266	274	199
20	D	276	277	274	302	273	276	275	267	266	266	263	226	100	50	265	237	239	213	257	253	255	257	264	265	246
21	D	266	287	276	276	275	255	108	-185	-237	-315	-363	-407	-471	-877	-466	-409	-204	13	171	304	490	688	545	643	28
22	D	606	439	348	362	58	171	273	277	151	-11	193	253	265	266	257	259	245	255	247	244	236	242	244	264	256
23		273	284	263	256	272	294	286	283	271	215	131	151	49	51	182	234	234	235	235	252	262	285	297	334	235
24		306	327	371	346	345	369	294	232	241	225	226	181	162	205	245	164	233	214	220	240	240	242	252	294	257
25		330	314	284	288	289	287	263	264	162	149	187	151	197	231	252	253	264	244	236	238	222	265	293	315	249
26		358	314	273	279	265	262	263	268	273	276	275	270	237	206	254	263	252	243	234	227	241	264	273	322	266
27		387	306	275	274	274	239	225	274	274	274	268	235	242	263	272	271	263	244	241	243	254	254	257	266	266
28	Q	278	278	284	278	284	284	283	273	280	282	274	267	261	263	265	259	246	241	242	247	257	262	261	265	267
29		282	292	287	284	286	284	282	281	272	266	276	271	250	245	258	257	242	240	239	243	251	265	255	256	265
30		294	304	340	353	410	340	304	326	150	141	158	205	274	279	232	241	241	251	257	258	264	265	304	280	269
MEAN A		300	296	288	297	286	279	247	235	209	191	187	196	194	186	234	236	239	238	241	248	258	273	278	293	247
MEAN Q		275	278	278	276	279	280	281	281	281	285	284	277	274	279	278	271	256	243	241	244	250	254	262	273	270
MEAN D		368	354	303	320	250	257	204	165	105	12	15	85	70	-28	86	111	156	197	231	266	305	353	328	339	202

DECLINATION

TABLE 11 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES APRIL 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		38.2	40.1	40.1	43.6	42.2	41.2	42.0	41.4	42.5	42.0	40.8	40.6	40.8	42.2	44.9	47.0	48.2	48.0	46.2	42.2	39.1	38.2	36.7	37.4	41.9
2		37.5	37.3	38.3	39.1	39.7	40.0	39.2	39.9	39.1	42.3	42.1	42.3	41.5	41.5	43.3	48.1	51.6	52.0	46.8	43.4	41.3	37.5	36.5	36.3	41.5
3		34.4	36.2	35.9	35.5	40.5	30.7	26.4	33.4	41.0	46.8	45.8	43.3	43.1	47.9	46.8	49.5	50.2	48.1	46.0	43.9	40.4	37.3	35.9	34.4	40.6
4		36.0	37.4	39.2	39.2	39.2	40.0	40.0	52.1	46.6	42.4	41.0	43.0	36.8	44.2	48.0	49.5	51.1	49.2	46.9	43.8	39.5	36.0	34.0	34.4	42.1
5		34.9	36.2	37.3	38.5	39.0	39.1	39.3	39.6	42.5	36.5	47.5	51.2	43.6	40.9	48.0	49.1	53.0	49.3	47.5	43.6	37.7	34.9	33.0	33.8	41.5
6	D	33.0	36.1	38.2	37.7	41.7	40.9	48.9	48.9	42.2	39.6	47.2	51.4	49.1	42.2	38.6	42.2	44.6	44.3	44.3	39.3	36.1	35.4	35.6	35.1	41.4
7		36.3	37.6	37.8	36.8	38.6	41.5	49.2	41.2	45.7	45.8	39.5	39.2	40.2	42.6	47.3	50.3	50.7	47.6	42.3	38.1	36.0	33.4	32.9	32.9	41.0
8		32.7	36.4	36.4	37.9	42.5	41.1	37.7	38.2	39.3	35.0	44.0	42.1	42.5	43.0	44.8	46.7	47.0	45.9	44.5	41.9	38.2	35.1	33.0	32.7	39.9
9		33.0	34.8	36.7	39.5	44.3	41.4	39.5	42.7	30.6	38.4	41.3	40.9	41.9	44.0	49.0	50.9	50.8	48.7	42.7	39.2	35.6	34.5	32.6	31.4	40.2
10	Q	33.1	34.6	35.1	35.4	36.5	37.6	37.8	38.0	38.3	38.6	39.3	39.9	41.0	43.1	47.5	50.9	52.3	50.7	45.9	41.0	35.1	31.5	29.8	28.8	39.2
11		28.6	33.2	40.0	38.1	36.6	38.4	38.4	41.3	49.8	44.5	43.2	30.2	37.7	39.5	44.3	46.4	47.7	46.1	41.3	38.2	35.0	33.6	33.2	33.6	39.1
12		34.9	36.3	38.1	38.2	38.2	39.7	41.3	43.1	46.6	40.8	39.7	41.0	41.9	44.3	44.5	44.8	46.0	45.8	42.7	34.7	39.5	33.1	34.9	37.1	40.3
13	Q	37.4	38.2	35.6	36.7	30.0	39.3	39.3	38.7	39.6	40.4	40.6	39.3	38.0	43.6	45.6	46.9	50.9	47.8	43.2	39.5	35.9	33.2	31.7	31.7	39.3
14	Q	33.3	34.6	34.9	36.2	36.7	37.1	38.1	38.4	38.6	39.1	39.6	39.4	41.8	45.4	47.9	48.3	47.6	44.2	38.3	34.6	32.2	33.1	33.4	33.9	38.6
15	Q	35.2	35.2	35.5	36.6	36.4	36.8	36.8	37.1	35.0	39.8	40.5	43.0	43.2	44.8	46.6	47.1	46.6	44.8	31.8	30.3	31.8	30.5	31.0	30.2	37.8
16		32.0	31.3	28.6	25.9	33.6	33.6	27.0	38.9	38.4	39.7	38.6	40.0	41.5	43.3	44.9	46.6	45.7	41.3	35.2	36.8	38.6	34.7	33.0	31.5	36.7
17	D	33.4	26.5	35.1	33.6	35.1	36.7	36.5	36.7	30.1	11.7	36.2	41.5	44.4	44.9	41.3	43.1	41.7	44.9	40.5	33.0	37.3	38.6	37.3	35.7	36.5
18		35.2	36.8	37.9	38.3	38.4	38.8	38.3	38.3	37.6	51.8	57.8	47.8	54.2	57.3	62.4	52.8	47.8	44.7	38.4	33.4	35.2	36.7	35.5	34.1	42.9
19		33.0	30.1	33.4	36.7	38.6	44.9	41.3	55.7	55.2	42.8	54.2	46.6	41.2	48.3	51.5	49.7	45.0	41.5	38.3	37.0	36.2	36.3	36.5	37.9	42.2
20	D	38.8	39.9	40.0	41.5	44.5	41.8	38.3	37.9	38.1	39.6	38.3	39.2	57.8	61.0	46.6	46.2	43.3	36.5	32.0	33.4	31.8	32.0	33.4	34.9	40.3
21	D	36.9	40.7	38.2	39.9	41.4	53.3	56.4	31.2	52.5	74.7	81.5	71.2	63.6	42.2	36.6	46.5	68.4	55.9	42.5	49.8	75.2	70.2	46.5	46.7	52.6
22	D	32.1	31.7	44.4	39.5	33.0	38.0	40.9	41.4	38.2	27.4	46.9	44.6	46.5	49.9	52.8	52.7	52.3	48.8	44.4	41.2	39.0	35.4	34.8	33.3	41.2
23		33.5	35.0	36.7	36.6	37.0	38.5	44.9	38.5	37.8	36.2	37.0	37.7	51.5	56.0	55.6	54.1	51.5	47.8	46.5	38.3	33.3	33.2	31.7	31.6	40.9
24		33.1	29.9	33.6	34.5	39.7	41.6	47.2	43.1	42.4	41.3	47.4	47.7	41.9	46.4	47.7	39.4	42.3	36.8	30.2	30.7	30.0	30.0	32.1	32.3	38.4
25		34.9	35.5	34.4	36.6	47.9	38.1	42.6	41.0	38.4	39.0	44.7	41.6	42.9	48.4	51.1	49.7	46.3	45.2	43.7	41.5	32.4	31.6	30.7	31.0	40.4
26		31.6	32.9	33.4	35.8	35.5	37.4	37.3	38.1	38.4	38.6	39.4	41.0	40.8	41.3	44.7	46.3	47.7	46.6	44.3	40.6	33.4	33.2	32.8	32.4	38.5
27		35.2	33.2	36.6	37.4	37.7	34.9	36.3	41.3	36.2	38.6	38.4	36.6	42.6	46.3	46.4	45.8	44.0	43.9	41.1	37.6	36.5	34.9	33.6	34.0	38.8
28	Q	33.6	36.5	37.6	36.5	37.1	36.5	35.2	37.7	39.7	39.7	39.5	40.2	44.3	44.0	46.6	47.9	47.7	46.4	42.9	38.2	36.1	33.6	32.6	33.1	39.3
29		33.9	35.8	37.1	39.2	37.9	36.1	38.9	38.2	40.8	43.1	43.9	43.2	43.4	48.2	48.9	51.1	49.3	45.2	40.0	32.6	31.5	31.5	31.8	32.1	39.8
30		32.5	33.5	33.8	35.6	34.8	39.9	37.0	36.0	43.4	50.7	44.9	46.2	44.7	44.1	49.7	46.5	39.6	36.4	36.4	36.2	37.5	35.9	35.1	37.3	39.5
MEAN	A	34.3	35.1	36.7	37.2	38.5	39.2	39.7	40.3	40.9	40.9	44.0	43.1	44.2	45.7	47.1	47.9	48.4	45.8	41.6	38.5	37.2	35.5	34.1	34.1	40.4
MEAN	Q	34.5	35.8	35.7	36.3	35.3	37.5	37.4	38.0	38.2	39.5	39.9	40.4	41.7	44.2	46.8	48.2	49.0	46.8	40.4	36.7	34.2	32.4	31.7	31.5	38.8
MEAN	D	34.8	35.0	39.2	38.4	39.1	42.1	44.2	39.2	40.2	38.6	50.0	49.6	52.3	48.0	43.2	46.1	50.1	46.1	40.8	39.3	43.9	42.3	37.5	37.1	42.4

VERTICAL INTENSITY

TABLE 12 MEANOOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS APRIL 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		705	690	684	686	687	684	677	677	672	677	680	681	682	685	686	686	689	681	680	675	677	681	682	681	683
2		679	679	679	680	677	679	681	684	665	655	676	680	677	664	633	646	672	679	678	677	683	693	694	693	675
3		691	683	685	691	700	709	680	698	652	632	620	633	632	637	663	680	635	685	688	680	680	681	682	686	673
4		680	675	691	686	680	680	673	660	627	630	662	655	628	653	675	677	680	679	670	670	671	677	683	680	668
5		679	676	676	676	676	676	676	671	660	599	562	512	615	658	661	675	671	667	668	671	671	676	676	681	655
6	D	682	688	693	699	715	644	511	617	648	604	484	623	554	617	646	658	630	684	688	693	692	698	699	685	650
7		680	684	679	673	672	682	647	639	428	624	666	665	665	668	676	673	670	668	664	665	663	665	669	677	657
8		694	702	682	676	692	692	683	664	626	507	549	553	664	656	669	674	675	676	676	674	673	682	690	691	659
9		679	681	679	683	672	674	675	649	407	566	638	526	479	484	656	674	675	675	676	676	676	684	692	684	636
10	Q	682	681	675	675	674	674	673	673	673	672	672	672	674	674	673	673	674	673	666	664	663	666	681	682	673
11		692	698	702	685	691	686	685	656	610	506	559	577	638	666	664	674	673	671	667	665	663	666	673	673	656
12		674	674	675	675	676	683	683	616	644	655	663	674	674	674	663	646	654	666	675	675	674	673	681	682	668
13	Q	675	675	675	675	675	675	676	672	675	675	675	664	644	647	664	668	675	674	666	666	667	668	668	672	669
14	Q	672	667	666	667	668	670	671	672	671	670	670	671	669	669	671	672	673	672	669	666	667	672	674	673	670
15	Q	672	672	672	671	671	671	669	669	638	627	652	660	663	663	664	665	664	663	662	658	665	672	674	690	664
16		700	722	742	774	747	708	579	657	673	675	674	680	681	676	677	675	674	672	672	680	709	758	793	797	700
17	D	784	699	725	681	721	726	709	699	596	466	558	645	671	624	636	650	670	683	714	705	723	751	733	676	677
18		677	676	678	676	676	673	667	668	662	559	478	689	650	470	596	654	675	690	689	692	693	716	755	764	659
19		720	733	766	769	721	634	494	435	726	639	490	782	647	689	696	674	633	689	689	701	701	701	699	690	676
20	D	691	698	697	708	688	700	698	683	676	674	653	612	505	511	655	652	668	671	682	681	684	690	709	711	667
21	D	710	725	714	698	680	651	639	644	569	790	900	606	898	340	925	933	769	716	758	786	709	679	719	563	713
22	D	594	540	529	434	424	585	623	688	689	587	623	672	699	707	703	702	700	699	698	698	696	696	697	700	641
23		701	715	720	714	716	734	719	720	709	708	594	576	468	472	574	644	664	679	702	709	709	720	731	753	673
24		742	749	791	800	784	727	696	669	630	641	621	614	566	604	640	613	669	678	684	692	695	691	689	699	685
25		730	722	710	720	703	703	667	652	613	609	645	645	618	642	665	662	678	686	690	694	693	705	717	730	679
26		740	720	706	726	703	685	675	674	679	678	679	675	651	609	641	661	673	679	684	694	718	727	719	743	689
27		759	730	717	706	696	593	621	675	684	683	673	650	646	668	678	678	678	674	681	678	685	686	689	694	680
28	Q	700	712	715	714	718	710	687	670	669	669	675	672	664	669	675	680	680	684	682	685	689	694	689	686	687
29		690	698	699	702	697	705	702	689	669	611	661	668	624	614	637	658	662	667	667	670	680	695	702	697	673
30		702	722	764	767	790	769	725	704	604	598	656	665	681	686	660	665	683	693	691	693	702	706	722	734	700
MEAN A		696	693	696	693	690	683	662	661	640	631	634	643	641	623	667	675	678	679	683	684	686	692	699	696	672
MEAN Q		680	681	680	680	681	680	675	671	665	663	669	668	663	664	669	671	673	673	669	668	670	674	677	681	673
MEAN D		692	670	672	644	646	661	636	666	636	624	643	632	665	560	713	719	637	690	708	713	701	703	711	667	670

HORIZONTAL INTENSITY

TABLE 13 MEANOOK H = 13000 PLUS TABULAR VALUES IN GAMMAS MAY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		264	267	271	284	281	316	301	242	288	292	287	287	276	232	262	271	270	257	251	263	268	305	264	294	275
2		294	286	275	281	291	275	281	260	258	290	282	280	282	284	286	283	263	280	245	253	253	274	267	273	275
3		284	281	283	276	276	276	277	282	283	283	283	262	235	264	268	284	262	256	247	261	263	267	262	266	270
4		277	284	281	273	276	274	275	283	282	293	275	281	285	291	293	283	254	255	245	241	254	253	264	283	273
5		282	283	282	285	282	282	283	283	294	245	76	147	262	272	261	275	263	271	257	251	259	260	264	291	259
6		263	282	283	274	273	273	276	280	283	281	276	281	280	276	277	275	267	270	277	276	271	265	273	275	275
7		282	286	284	293	282	280	282	281	283	284	293	281	272	282	283	281	262	240	233	239	245	257	271	273	273
8	Q	284	281	284	284	284	283	283	283	290	291	289	291	293	294	293	280	253	243	236	249	250	262	264	272	276
9	Q	274	282	284	282	281	279	280	273	280	281	281	281	280	281	282	280	270	261	241	235	237	250	262	274	272
10	Q	279	281	283	281	281	282	282	281	285	283	282	283	284	284	281	264	247	240	235	240	249	263	272	277	272
11	Q	282	285	282	282	282	282	284	289	292	292	293	294	296	296	293	285	271	254	239	249	255	270	282	300	280
12	D	272	315	265	314	296	282	284	290	289	292	217	233	248	245	243	250	237	222	244	248	280	333	303	280	270
13		263	294	303	325	301	281	280	271	271	273	280	275	280	280	264	263	251	240	241	247	248	264	268	271	272
14		292	279	291	291	296	312	293	243	189	289	302	294	282	297	289	254	222	211	237	249	274	268	302	346	275
15		416	355	258	249	273	275	281	280	233	139	240	289	291	294	280	275	261	238	241	249	252	271	282	279	271
16		281	280	281	273	281	282	274	279	246	283	291	291	282	273	251	246	237	227	233	241	249	251	268	280	266
17		298	304	284	282	331	399	315	289	281	294	294	254	240	234	280	310	231	283	257	259	267	285	291	292	288
18		294	307	296	270	274	278	284	292	300	300	301	301	294	293	284	281	275	272	265	270	270	270	272	281	284
19		292	294	300	300	285	282	282	283	272	156	228	282	299	308	313	294	271	246	253	260	269	282	295	302	277
20	D	310	305	280	281	344	310	285	280	280	213	169	211	218	181	230	232	232	233	251	260	260	280	303	324	262
21		337	293	285	260	262	270	271	274	281	259	212	255	259	243	246	246	249	235	229	240	238	261	285	305	262
22		316	324	316	282	271	279	284	283	289	284	282	266	255	266	251	254	238	226	236	261	260	281	278	291	274
23		283	282	291	281	272	278	281	292	281	271	283	281	294	298	281	263	249	224	228	243	256	271	282	303	274
24		320	302	280	285	277	272	274	281	291	284	274	270	285	271	266	269	260	256	266	264	261	272	281	295	277
25		309	333	284	312	291	289	251	288	282	282	280	254	244	240	230	248	243	230	230	249	262	279	298	298	271
26	Q	292	284	281	275	274	280	281	282	289	289	291	293	294	292	280	267	258	246	247	254	261	271	290	276	277
27	D	300	282	296	293	293	294	295	293	272	282	291	282	255	228	270	271	252	235	240	242	262	300	344	440	284
28	D	563	549	379	305	267	262	270	272	285	181	-141	-295	-344	-478	-245	21	236	293	293	302	273	293	294	391	176
29	D	376	351	300	290	326	296	245	-141	90	179	181	289	281	273	282	269	276	275	261	281	264	272	292	307	255
30		304	272	272	294	285	291	272	292	237	39	17	241	305	295	302	250	283	270	286	254	261	262	270	281	256
31		281	282	280	282	273	275	284	269	272	281	293	293	240	235	272	292	280	258	252	252	269	279	291	293	274
MEAN	A	305	303	288	285	286	287	281	266	269	258	243	252	253	246	256	262	257	250	248	254	259	273	282	297	269
MEAN	Q	282	283	283	281	281	282	282	282	287	287	287	288	289	289	286	275	260	249	240	246	250	263	274	280	275
MEAN	D	364	361	304	297	305	289	276	199	243	229	147	144	132	90	156	209	247	252	258	267	268	296	307	348	249

DECLINATION

TABLE 14 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES MAY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TC 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TC 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		35.9	35.9	36.4	38.0	37.8	37.6	43.4	43.0	42.3	40.2	41.2	42.6	42.6	45.1	46.8	49.2	47.6	46.8	39.6	34.6	31.7	36.7	32.7	34.3	40.1
2		35.2	36.4	38.0	40.7	43.6	39.6	39.4	45.9	44.7	42.5	41.2	41.7	44.4	49.2	51.2	52.5	51.2	46.7	43.0	36.8	35.6	35.1	35.9	36.8	42.0
3		37.5	38.0	37.8	37.0	37.8	38.0	39.3	39.6	40.1	39.3	38.8	36.4	39.3	47.1	52.9	54.2	50.9	44.9	36.7	32.2	35.4	33.1	33.0	34.9	39.7
4		35.3	37.5	37.5	37.5	37.7	37.9	37.9	37.9	42.5	42.4	39.5	42.4	46.1	47.9	52.8	53.3	51.9	46.1	40.9	39.2	37.4	34.8	34.7	35.1	41.1
5		36.3	37.9	37.7	38.0	37.9	37.7	37.9	38.0	38.2	36.3	37.5	60.1	50.3	47.4	55.6	52.4	50.9	45.9	41.6	38.5	36.1	35.3	34.2	35.0	41.5
6		36.9	38.2	39.3	39.5	39.5	40.0	38.7	37.9	35.0	34.5	35.9	37.9	40.9	45.0	48.7	48.8	48.7	44.5	40.6	37.4	36.9	34.7	34.3	35.0	39.5
7		35.8	34.2	36.3	39.5	39.0	38.0	39.0	39.3	39.3	39.3	38.8	41.3	42.2	45.8	47.2	48.7	48.8	47.9	41.3	36.3	33.2	32.9	32.4	34.2	39.6
8	Q	35.0	37.5	37.7	37.7	37.9	36.0	38.2	38.4	39.3	39.2	39.6	40.9	44.0	45.9	48.7	49.3	51.1	46.1	40.8	36.4	33.0	33.0	32.9	33.4	39.7
9	Q	35.0	36.0	37.9	39.4	39.9	40.7	40.8	37.8	39.4	39.5	38.1	38.3	40.7	44.0	47.6	50.0	50.5	45.7	41.3	36.5	34.4	33.4	33.7	34.7	39.8
10	Q	36.0	36.6	37.8	38.9	41.0	39.1	38.6	38.3	39.7	38.9	38.1	40.8	44.0	47.4	48.7	49.4	48.7	45.5	39.7	35.0	33.1	33.9	34.2	34.2	39.9
11	Q	34.4	34.7	36.2	37.8	38.6	39.1	39.4	39.2	39.4	39.1	38.4	39.5	42.4	46.0	47.8	49.2	49.4	47.4	43.9	39.2	34.1	31.3	29.9	29.2	39.4
12	D	32.9	33.3	36.2	34.6	37.8	37.6	37.0	36.5	37.8	39.1	34.2	40.8	45.8	51.0	53.7	53.2	50.7	51.8	34.9	34.1	34.9	35.0	31.3	31.5	39.4
13		31.4	33.3	36.4	37.2	36.7	39.8	38.6	37.7	37.7	38.0	38.8	39.8	42.0	43.1	45.7	46.5	46.2	43.8	41.4	38.3	35.6	34.3	33.0	32.7	38.7
14		33.8	36.4	36.1	36.2	36.2	36.2	39.3	40.7	44.4	43.0	39.9	41.2	43.0	45.9	48.3	52.6	49.7	45.2	40.7	32.8	29.6	26.2	27.8	29.9	39.0
15		33.6	29.6	36.9	37.2	37.8	39.0	37.5	35.7	39.1	43.8	39.1	39.3	43.0	46.4	49.4	48.6	48.1	47.3	37.7	34.0	31.2	29.6	29.8	31.9	38.6
16		34.8	36.5	37.2	37.2	37.7	38.0	38.8	34.9	34.3	37.7	40.4	41.1	43.8	46.5	47.7	51.7	50.4	45.1	38.5	38.6	35.3	30.1	29.9	34.0	39.2
17		33.5	34.8	35.7	35.1	34.8	39.3	39.6	38.3	36.4	36.4	36.5	36.7	42.2	50.4	57.0	53.0	52.2	46.4	40.6	36.4	34.5	34.6	34.5	35.7	39.8
18		37.5	38.8	39.3	39.3	37.2	37.0	37.5	38.0	37.8	39.0	39.8	42.3	42.5	45.7	47.3	48.0	46.4	44.1	42.2	41.5	37.2	34.9	34.5	35.7	40.1
19		36.2	37.7	38.0	39.3	39.6	39.4	47.5	40.9	37.7	41.2	45.6	45.2	47.3	51.7	52.5	49.7	48.3	45.4	39.6	35.6	33.2	32.7	31.1	32.2	41.1
20	D	34.4	35.8	37.8	37.9	38.3	41.0	42.4	37.3	35.8	31.3	33.9	45.0	53.2	46.3	49.2	51.5	47.6	46.9	37.8	37.8	34.7	33.3	31.3	32.5	39.7
21		33.9	36.6	38.1	38.4	37.8	39.2	38.9	38.1	38.1	38.9	39.7	39.2	43.2	46.3	51.1	48.7	47.8	45.8	37.8	31.3	28.8	28.8	30.4	33.1	38.7
22		32.9	32.9	33.1	37.4	35.2	37.0	37.3	37.6	35.8	36.2	36.8	37.6	39.1	47.8	49.2	50.8	51.3	47.8	40.5	33.4	29.7	29.6	31.0	32.8	38.0
23		34.9	37.4	37.6	37.6	37.8	37.4	37.4	37.6	42.6	39.2	38.4	41.0	46.0	46.6	49.5	50.5	49.7	49.0	41.0	35.0	31.3	28.4	28.1	30.0	39.3
24		29.7	34.1	36.5	38.4	39.1	38.4	37.8	36.6	37.8	36.6	36.2	36.2	41.2	45.7	51.1	51.9	52.6	47.6	38.1	35.2	33.9	32.9	33.3	34.4	39.0
25		34.4	34.7	38.1	37.8	40.8	37.8	37.0	38.9	36.5	37.1	35.7	34.4	41.6	45.8	45.8	47.6	46.1	42.6	37.4	34.4	32.8	31.3	32.6	34.7	38.2
26	Q	36.6	36.8	37.6	37.6	37.6	37.6	37.8	38.3	38.4	38.4	39.4	41.0	43.6	45.5	47.4	47.3	46.8	43.4	39.7	34.1	31.2	31.2	31.5	32.5	38.8
27	D	32.8	34.4	34.7	35.7	36.0	37.6	37.8	38.6	39.7	41.0	41.2	41.0	44.4	43.7	49.7	53.9	50.5	48.2	44.5	39.4	36.2	33.3	34.7	36.8	40.2
28	D	36.0	32.5	37.8	36.0	35.7	37.4	37.6	37.3	37.3	34.7	68.4	74.5	55.8	75.9	59.5	54.7	43.6	38.9	35.5	34.4	29.7	32.6	33.6	33.4	43.0
29	D	40.9	38.2	38.0	39.2	42.9	43.8	48.8	45.0	39.5	40.0	41.9	44.3	47.7	54.0	50.9	48.8	43.7	40.8	37.4	38.0	33.0	31.4	33.5	35.3	41.5
30		39.5	40.0	39.5	39.3	42.7	33.2	36.3	36.1	41.1	47.4	49.1	47.4	45.8	50.4	52.0	49.5	47.5	41.4	36.1	34.7	31.4	31.8	33.0	34.7	40.8
31		36.4	38.2	39.5	39.6	39.0	37.9	36.7	34.5	36.9	37.7	38.4	39.5	39.3	47.2	47.4	50.4	48.7	44.0	38.2	33.4	28.9	28.5	29.7	31.1	38.4
MEAN	A	35.1	36.0	37.3	37.9	38.4	38.4	39.2	38.5	38.9	39.0	40.0	42.2	44.1	48.0	50.1	50.5	48.9	45.6	39.6	35.9	33.3	32.4	32.3	33.6	39.8
MEAN	Q	35.4	36.3	37.4	38.3	39.0	38.9	38.9	38.4	39.2	39.0	38.7	40.1	42.9	45.8	48.0	49.0	49.3	45.6	41.1	36.2	33.2	32.6	32.4	32.8	39.5
MEAN	D	35.4	34.8	36.9	36.7	38.1	39.5	40.7	38.9	38.0	37.2	43.9	49.1	49.4	54.2	52.6	52.4	47.2	45.3	38.0	36.7	33.7	33.1	32.9	33.9	40.8

VERTICAL INTENSITY

TABLE 15 MEANOOK — Z = 58000 PLUS TABULAR VALUES IN GAMMAS — MAY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		715	695	688	698	699	713	643	591	678	696	690	690	683	649	649	665	666	665	669	688	689	711	708	721	682
2		732	715	706	706	715	696	690	613	594	669	681	685	687	684	687	687	635	688	684	681	681	688	701	706	686
3		700	686	683	678	678	678	675	676	675	675	676	650	606	628	644	666	671	671	667	673	684	694	704	714	673
4		698	689	683	680	680	678	678	671	631	648	630	648	672	684	676	677	676	680	684	684	688	688	687	694	675
5		694	693	684	685	692	676	675	678	678	617	445	450	616	659	657	680	675	684	689	691	688	693	698	713	659
6		698	686	682	681	681	678	677	676	675	675	677	679	677	672	666	668	673	675	673	668	667	673	677	677	676
7		678	674	673	677	675	674	674	675	675	674	673	671	663	672	673	677	677	674	667	665	666	669	680	681	673
8	Q	677	675	674	673	673	672	669	668	667	663	668	675	675	676	675	674	673	666	666	667	667	675	683	689	673
9	Q	685	686	685	683	682	682	676	662	666	666	666	664	666	673	673	673	670	666	658	655	660	668	673	679	672
10	Q	682	679	677	675	677	675	674	672	665	667	672	676	677	677	677	674	673	672	663	657	662	664	666	671	672
11	Q	674	674	674	673	673	673	673	668	669	669	670	674	674	673	669	671	671	666	665	664	664	665	672	684	671
12	D	683	703	683	700	712	688	667	663	662	663	569	595	608	606	595	619	641	657	656	665	701	770	761	724	666
13		697	705	720	730	733	709	692	684	677	666	672	673	673	681	681	685	632	688	680	675	673	676	686	692	689
14		701	696	686	691	699	681	701	603	603	671	681	682	676	680	675	666	654	655	678	696	711	699	694	723	679
15		749	742	692	670	678	684	681	665	598	483	547	563	673	683	682	681	677	681	682	681	682	681	680	681	663
16		682	681	675	672	675	680	679	673	587	647	673	676	670	664	651	651	661	658	664	663	668	676	680	690	666
17		695	691	672	666	693	695	709	681	654	665	662	606	586	600	645	684	610	681	681	681	676	683	686	700	670
18		705	702	697	692	678	671	670	669	666	667	671	673	675	672	671	673	673	670	674	673	674	675	675	678	677
19		680	682	682	684	689	681	663	646	652	492	581	626	655	667	676	673	669	665	664	665	667	675	681	686	658
20	D	698	706	694	688	717	677	678	676	664	579	551	586	566	563	632	651	656	681	689	702	714	722	717	727	664
21		760	712	697	673	664	664	664	663	662	626	551	607	616	598	612	637	657	657	661	663	665	674	684	691	656
22		704	703	712	700	683	675	670	654	666	672	667	655	640	656	646	652	658	661	675	682	682	687	683	682	674
23		676	676	682	681	673	670	667	666	630	633	646	652	666	672	671	671	668	666	669	673	681	684	693	713	670
24		721	714	691	683	677	672	666	665	663	656	614	610	657	663	659	665	669	670	659	661	663	669	677	685	668
25		693	712	702	714	700	691	616	664	671	671	669	647	627	629	617	644	667	672	673	682	684	687	700	700	672
26	Q	685	670	665	665	667	667	667	667	671	671	671	673	674	673	669	666	666	662	661	659	655	660	674	673	668
27	D	682	676	680	679	679	676	676	674	648	662	670	666	630	603	619	648	654	653	655	661	681	731	774	812	675
28	D	772	767	725	729	703	683	675	666	664	703	455	562	936	744	573	485	616	687	692	714	703	709	710	749	684
29	D	780	764	715	701	696	697	617	562	722	648	646	666	673	667	687	687	634	693	694	703	707	694	696	705	688
30		721	712	702	701	697	674	639	689	596	446	517	591	683	683	679	656	665	675	678	682	690	690	684	683	662
31		680	683	683	687	684	663	678	618	607	600	630	668	631	602	626	653	673	675	677	677	683	691	691	684	661
MEAN	A	703	698	689	688	688	681	672	658	653	640	629	640	662	657	655	660	668	671	672	676	680	688	693	700	672
MEAN	Q	681	677	675	674	675	674	672	668	668	667	670	672	673	674	673	672	671	666	662	660	661	666	674	679	671
MEAN	D	723	723	699	699	701	684	662	648	672	651	578	615	682	637	621	618	652	674	677	689	701	725	731	743	675

HORIZONTAL INTENSITY

TABLE 16 MEANOOK — H = 13000 PLUS TABULAR VALUES IN GAMMAS — JUNE 1970

DAY \ HOUR UT		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	299	310	326	446	357	331	302	278	199	40	252	252	179	126	158	160	250	284	285	293	274	288	295	296	262
2		303	302	325	326	299	280	282	284	291	292	285	288	280	281	283	254	263	254	247	244	242	258	269	272	279
3		292	324	313	307	295	272	282	263	189	214	209	208	202	274	254	259	266	262	231	231	255	274	271	314	261
4		325	334	334	303	294	280	261	262	261	263	262	281	279	269	241	249	262	264	259	253	269	265	284	281	276
5		271	293	324	303	295	291	262	244	272	271	255	281	302	306	300	285	272	252	255	244	252	262	270	279	277
6	Q	282	293	293	295	294	293	292	284	282	282	290	301	301	302	296	283	270	262	271	272	283	292	293	293	287
7		292	290	291	293	291	292	292	298	293	302	303	304	305	304	303	293	231	282	291	303	316	269	333	447	303
8		415	417	439	335	308	261	-35	221	293	278	259	259	237	274	288	280	272	274	284	282	283	274	282	282	282
9		281	292	304	290	283	281	282	284	282	276	275	276	272	274	270	271	272	266	264	265	282	294	283	290	280
10		302	291	293	282	276	292	292	294	283	274	271	283	283	264	250	242	238	246	256	261	271	288	278	313	276
11	Q	310	303	304	285	281	281	292	284	282	280	282	283	286	280	274	270	269	256	259	261	252	255	274	275	278
12	Q	302	303	313	296	295	291	283	290	274	283	273	280	284	283	291	285	290	264	260	261	260	256	262	281	281
13		302	302	303	296	293	290	309	294	192	211	220	201	161	152	262	270	289	274	265	261	255	267	271	285	259
14		323	359	365	335	294	285	276	272	274	282	285	285	303	312	303	281	269	244	223	219	228	264	293	324	287
15		392	380	348	310	311	347	346	200	137	184	190	115	195	263	276	262	245	231	233	239	263	262	280	334	264
16		355	337	344	313	324	335	282	269	274	273	282	282	267	282	256	265	252	241	232	247	263	273	293	290	285
17		283	275	277	281	282	288	285	297	314	311	305	300	245	267	276	288	241	232	238	272	285	317	375	373	288
18	D	373	346	302	269	272	292	277	184	80	-14	-286	-366	-223	-166	-34	172	260	272	267	272	306	354	395	444	169
19		397	365	344	276	271	265	250	265	275	263	269	273	274	262	252	255	270	279	277	264	263	297	312	348	286
20	D	397	445	383	384	381	149	45	64	62	98	142	136	138	184	171	170	189	195	250	279	356	438	463	517	252
21	D	596	601	473	447	325	333	257	168	242	250	160	225	221	222	239	233	252	280	291	276	266	271	280	272	299
22	Q	302	294	276	291	280	281	278	282	283	284	282	290	298	301	293	280	278	263	247	241	246	249	272	280	278
23	Q	296	302	304	306	303	295	292	285	284	282	283	283	292	293	289	281	266	254	254	254	254	264	275	285	282
24		309	313	283	292	294	293	292	295	296	296	304	304	314	319	303	302	295	263	249	259	267	274	313	316	293
25		325	314	273	284	280	292	290	287	293	284	282	270	264	282	294	294	294	278	274	271	274	295	278	281	286
26		293	304	304	312	314	304	294	183	202	250	295	302	315	325	312	248	233	264	251	262	262	305	294	270	279
27	D	301	293	325	366	347	315	347	71	-53	-66	-25	130	-220	29	255	307	285	290	269	292	273	273	282	283	207
28		297	345	312	296	303	290	283	283	275	257	142	209	191	211	244	266	284	281	270	243	250	254	276	278	264
29		275	267	281	283	292	294	294	275	283	292	293	294	304	302	297	249	223	226	231	251	267	265	270	263	274
30		277	276	284	287	284	292	294	263	251	261	269	282	287	304	306	304	235	279	281	273	272	273	270	276	281
MEAN	A	326	329	321	313	301	289	269	251	239	235	230	237	228	246	260	262	264	260	259	261	270	282	296	311	273
MEAN	Q	298	299	298	295	291	288	287	285	281	283	282	288	292	292	288	280	273	260	258	258	259	263	275	283	281
MEAN	D	393	399	362	382	336	284	246	153	106	62	49	75	19	79	158	208	247	264	272	282	295	325	343	362	238

DECLINATION

TABLE 17 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES JUNE 1970

DAY (HOUR UT)		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	34.3	36.9	39.3	42.7	37.5	37.9	36.3	37.9	38.5	45.4	41.1	44.5	42.7	47.9	48.7	47.7	53.5	52.0	42.2	37.4	37.1	39.8	39.5	37.5	41.6
2		40.6	41.4	39.0	41.7	41.7	40.1	39.5	39.0	38.2	36.7	37.9	40.0	42.7	47.9	48.8	49.1	49.6	46.4	44.3	38.0	37.5	36.3	34.3	34.7	41.1
3		35.9	36.6	40.8	40.0	47.2	44.8	40.9	39.0	37.2	36.9	39.6	39.5	41.4	43.8	43.3	47.2	47.9	47.0	41.1	34.8	33.7	35.9	35.8	37.5	40.3
4		38.0	38.2	38.8	40.1	39.5	40.4	37.5	42.9	41.1	39.5	37.9	38.4	42.2	44.5	45.4	46.1	46.6	44.8	39.5	37.5	34.2	34.2	36.3	36.4	40.0
5		36.4	37.7	39.5	45.3	41.1	39.2	41.1	39.5	38.0	34.8	33.4	39.5	45.8	47.9	49.0	51.4	48.8	45.3	41.1	36.6	33.0	31.3	31.8	34.7	40.1
6	Q	36.6	38.0	38.2	39.0	39.5	39.3	36.4	39.2	38.4	34.7	37.9	40.8	44.3	47.4	48.0	47.5	47.0	44.1	39.3	33.8	32.7	33.5	35.0	36.3	39.5
7		37.5	37.8	37.8	38.0	39.1	37.5	37.8	37.8	38.0	39.1	39.1	41.4	44.9	47.1	48.3	49.7	47.1	46.0	40.5	39.9	36.2	29.8	28.0	26.9	39.4
8		33.8	24.9	28.5	36.7	36.4	36.4	23.5	37.6	38.0	36.4	37.8	44.2	41.2	47.8	50.7	51.3	50.9	48.6	42.8	37.6	34.3	34.6	35.2	34.8	38.5
9		34.9	34.8	36.4	38.1	37.6	37.5	37.6	36.4	38.1	38.0	39.6	41.7	43.8	47.3	49.2	49.4	49.4	46.7	45.1	38.3	33.8	32.0	31.5	31.9	39.5
10		33.3	36.2	35.4	36.0	36.8	36.8	37.0	38.5	36.8	36.4	34.4	36.8	40.2	41.5	44.4	45.9	46.2	39.7	33.8	29.6	27.7	29.8	32.7	33.1	36.6
11	Q	35.6	36.2	39.4	37.0	36.5	36.7	36.4	36.5	37.8	38.0	39.6	41.0	43.3	46.3	49.1	50.9	51.3	50.7	41.4	38.3	36.0	33.8	33.1	34.3	40.0
12	Q	34.6	34.8	35.7	38.0	38.0	38.3	37.5	37.5	34.9	36.8	38.3	41.2	43.9	46.5	49.4	51.5	54.1	53.9	49.7	42.0	36.5	34.8	31.7	31.4	40.5
13		32.0	34.1	34.9	35.9	35.2	36.4	36.2	33.6	33.3	41.2	41.4	41.2	49.6	54.1	54.4	50.4	50.4	50.9	46.5	41.4	36.2	33.0	32.7	33.1	40.3
14		33.6	33.1	36.2	36.4	36.0	36.5	36.2	37.0	38.0	38.3	39.6	40.9	44.7	48.3	51.2	54.1	50.9	48.8	45.9	41.0	26.4	26.5	28.1	27.0	38.9
15		28.2	29.4	32.9	35.3	34.7	31.6	30.5	41.3	42.7	40.0	40.0	41.5	41.8	53.8	57.2	55.0	53.0	48.1	44.0	37.9	33.2	30.3	29.9	31.6	39.3
16		32.0	31.5	30.2	34.9	38.1	39.7	35.3	33.6	35.0	36.5	38.1	40.5	41.6	46.0	47.2	51.1	52.1	50.3	46.4	39.5	35.2	33.2	33.2	34.4	39.0
17		33.7	34.9	35.3	36.1	36.1	36.1	35.5	36.3	36.3	38.1	39.0	42.6	41.9	50.8	54.2	53.7	56.4	48.9	43.5	41.3	34.0	32.0	28.4	28.1	39.7
18	D	25.2	33.2	36.1	36.0	34.7	36.9	38.4	37.1	37.7	39.2	28.7	85.9	66.9	54.3	55.9	43.2	37.6	42.1	41.0	37.9	34.9	36.8	36.3	38.1	41.4
19		33.9	29.4	30.7	37.1	36.0	36.1	35.8	38.1	36.1	37.1	43.2	42.9	46.1	47.7	49.2	52.2	50.5	48.9	42.6	37.7	34.9	35.0	34.9	31.6	39.5
20	D	31.3	27.0	29.7	29.5	29.9	28.4	36.5	47.7	33.6	20.2	40.5	46.1	49.3	60.8	57.2	47.6	48.7	48.9	44.3	43.1	44.3	45.6	42.7	39.8	40.5
21	D	36.8	34.2	22.3	35.5	31.3	32.4	33.2	31.6	35.0	34.9	40.6	33.4	38.2	42.6	46.3	49.2	49.5	47.7	41.8	41.3	40.8	38.1	34.9	33.2	37.7
22	Q	32.0	33.2	36.0	36.5	36.5	36.9	37.4	36.5	36.6	38.2	38.1	42.7	42.6	44.7	46.8	50.0	47.7	44.2	39.7	35.0	29.9	27.0	28.4	30.0	37.8
23	Q	31.8	33.6	36.5	36.3	36.5	36.5	36.3	36.3	38.4	38.1	38.7	41.5	45.8	48.4	49.5	47.7	46.1	46.1	41.9	37.9	33.7	33.2	32.6	34.9	39.1
24		37.2	39.1	39.9	38.2	36.9	36.6	36.7	36.7	37.2	38.0	39.5	41.4	44.8	44.9	45.9	49.0	46.4	43.6	42.7	38.2	31.7	31.6	31.9	35.0	39.3
25		33.3	35.3	38.3	36.7	38.2	39.9	41.1	39.5	39.1	37.8	36.9	38.3	37.7	40.4	43.0	45.7	47.8	46.5	43.3	39.6	36.7	36.1	34.8	35.0	39.2
26		36.4	38.3	39.3	40.4	41.6	39.1	41.4	47.3	44.3	43.2	39.6	38.5	44.8	48.5	58.8	49.6	46.5	43.0	41.9	38.2	31.1	31.7	34.0	34.8	41.3
27	D	36.2	37.2	40.1	48.8	44.3	38.7	36.1	28.5	43.6	46.4	48.0	49.3	47.8	55.7	52.0	52.3	50.7	45.6	37.7	38.2	37.0	33.7	33.3	33.3	42.3
28		34.8	38.0	40.9	38.7	40.1	47.7	40.4	38.2	37.7	36.9	37.7	38.0	45.1	47.5	49.8	49.6	48.5	44.9	42.0	36.6	33.7	33.3	33.2	34.8	40.3
29		35.0	35.4	36.7	37.5	38.0	40.3	39.8	40.1	36.4	36.1	36.4	38.7	42.0	44.3	47.8	47.8	46.2	41.9	31.9	30.0	28.5	26.3	29.5	31.6	37.4
30		33.7	35.1	36.4	36.7	36.4	36.6	37.8	39.8	39.3	39.8	41.2	39.8	44.3	48.0	50.7	49.4	47.8	43.0	39.8	35.9	34.6	34.8	34.8	34.5	39.6
MEAN	A	34.3	34.8	36.0	38.0	37.7	37.7	36.9	38.0	37.8	37.7	38.8	42.4	44.4	47.9	49.7	49.5	49.0	46.6	41.9	37.8	34.3	33.5	33.3	33.7	39.7
MEAN	Q	34.1	35.2	37.2	37.3	37.4	37.5	36.8	37.2	37.2	37.2	38.5	41.4	44.0	46.7	48.6	49.5	49.3	47.8	42.4	37.4	33.8	32.5	32.2	33.4	39.3
MEAN	D	32.8	33.7	33.5	38.5	35.5	34.9	36.1	36.6	37.7	37.2	39.8	51.8	49.0	52.3	52.0	48.0	48.0	47.3	41.4	39.6	38.8	38.8	37.3	36.4	40.7

VERTICAL INTENSITY

TABLE 18 MEANOOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS JUNE 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	684	691	713	712	715	733	711	683	581	451	604	632	611	507	499	532	624	668	677	701	696	713	726	705	649
2		704	697	699	731	711	686	687	680	675	666	664	674	669	668	675	667	671	668	670	668	681	694	701	703	684
3		703	712	706	706	703	686	691	649	542	579	592	588	600	647	644	632	654	669	669	674	688	699	700	719	661
4		732	732	702	694	697	689	656	654	639	635	634	658	653	640	618	628	653	680	673	671	674	674	694	710	670
5		695	690	704	712	692	691	667	648	660	638	627	658	678	683	674	667	664	660	659	659	667	674	677	679	672
6	Q	678	678	678	679	682	678	670	665	657	654	628	677	677	674	668	667	667	667	669	668	668	668	668	670	669
7		670	673	673	673	675	673	669	668	659	650	666	676	676	668	663	663	653	641	635	640	643	661	687	761	668
8		749	752	793	758	728	660	618	668	679	684	666	665	652	671	684	684	672	671	669	665	658	660	679	686	686
9		684	681	686	679	674	668	668	667	668	668	674	677	677	683	684	682	678	668	658	665	676	675	674	676	675
10		686	680	684	680	673	668	670	659	652	651	627	639	665	660	652	652	696	666	667	675	684	682	677	682	666
11	Q	684	685	693	677	668	668	669	669	674	674	675	675	675	674	669	660	653	653	651	650	652	657	663	669	668
12	Q	679	685	687	686	685	681	675	673	643	644	660	669	668	658	655	658	658	655	658	658	662	665	675	685	668
13		693	694	686	680	677	669	676	678	610	591	583	583	451	478	611	664	635	685	688	694	699	706	704	698	649
14		711	733	721	690	693	688	682	677	676	679	682	682	684	680	675	670	669	669	670	679	674	672	673	692	684
15		727	771	744	710	707	726	727	512	516	596	621	666	601	631	655	662	666	670	681	687	690	697	702	718	670
16		734	734	750	748	729	724	702	677	670	674	679	681	675	679	666	674	675	669	664	667	673	673	684	693	691
17		685	674	671	668	668	668	668	669	671	667	664	663	619	615	636	656	658	652	657	668	679	726	760	758	672
18	D	764	744	707	675	665	672	652	537	553	682	373	511	598	493	540	570	655	678	687	713	733	775	797	791	648
19		751	749	771	737	697	683	618	670	673	649	638	676	680	670	665	656	663	660	658	649	652	685	707	715	682
20	D	753	784	770	779	689	714	684	668	642	586	538	530	524	520	497	517	577	624	690	711	771	816	813	801	667
21	D	781	695	754	718	732	724	705	695	693	671	602	549	635	636	641	650	656	669	675	679	687	698	697	690	681
22	Q	698	696	693	692	683	675	674	675	673	674	657	661	661	665	666	664	666	661	651	656	659	664	675	685	672
23	Q	694	701	699	686	692	694	686	676	675	674	674	671	669	669	671	665	660	652	656	664	663	668	675	678	676
24		683	691	683	674	668	665	665	665	665	665	667	666	667	660	654	665	660	659	660	659	664	666	685	698	669
25		715	721	706	675	665	669	662	666	659	646	638	621	608	623	641	649	655	665	668	672	676	687	698	704	666
26		699	688	679	686	697	698	693	537	542	577	645	668	678	673	663	642	597	628	648	663	683	704	690	670	656
27	D	674	681	707	732	732	717	710	649	794	789	675	672	623	541	670	702	633	698	673	671	686	694	696	693	691
28		695	727	728	699	697	681	680	682	673	651	535	598	591	591	618	648	673	683	684	680	681	681	684	690	665
29		680	676	674	674	674	675	655	637	656	671	671	673	680	672	669	663	663	670	676	688	700	702	695	682	674
30		680	672	669	672	671	674	672	570	569	600	614	633	655	675	679	672	664	662	661	661	661	661	672	685	654
MEAN	A	706	706	708	699	691	687	675	651	645	645	629	643	640	633	643	649	658	664	667	672	679	690	698	703	670
MEAN	Q	686	689	690	684	682	679	675	672	664	664	659	671	670	668	666	663	661	658	657	659	661	664	671	677	670
MEAN	D	731	719	730	723	707	712	692	646	653	636	559	579	598	540	569	594	641	668	680	695	715	739	746	736	667

HORIZONTAL INTENSITY

TABLE 19 MEANOOK — H = 13000 PLUS TABULAR VALUES IN GAMMAS — JULY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		279	314	319	313	325	307	273	251	219	274	273	304	295	256	263	316	237	300	255	262	271	282	284	295	284
2		298	302	293	292	304	306	310	223	283	292	267	-7	283	330	316	308	233	290	284	270	272	271	282	305	278
3		325	315	325	306	342	304	301	150	-23	-25	-150	253	307	302	320	322	303	275	266	273	303	304	322	590	263
4		783	456	325	284	317	294	143	254	100	244	245	282	293	282	282	274	274	274	283	274	266	263	264	273	293
5		287	294	306	369	439	330	301	230	151	263	284	294	300	287	275	273	263	238	253	257	253	255	283	339	284
6		395	404	368	317	312	238	232	170	8	180	263	251	167	230	294	296	298	305	296	282	281	274	277	281	267
7	Q	292	292	287	283	277	260	285	287	285	280	281	283	283	293	291	291	287	276	278	264	254	251	270	313	282
8		322	325	326	324	322	294	283	277	283	283	282	284	272	222	240	255	253	258	260	273	284	294	310	386	288
9	D	418	386	334	530	360	342	274	272	242	-188	-77	-155	-200	-217	-311	-86	242	312	309	307	223	274	55	-108	147
10	D	-106	315	303	258	241	250	244	253	267	274	283	280	262	285	273	212	253	251	282	274	272	314	326	324	258
11		303	295	282	258	262	271	273	281	270	254	259	233	222	262	271	271	261	265	257	245	242	265	276	313	266
12		354	346	382	326	305	288	305	291	171	145	268	274	232	260	263	246	264	267	241	223	243	264	285	314	273
13		327	337	337	315	295	295	296	281	281	284	278	282	287	282	278	271	262	249	250	254	255	256	272	293	284
14		315	313	318	305	285	276	281	285	256	275	277	284	291	286	290	290	294	258	244	243	263	274	294	294	283
15	Q	309	290	308	295	293	287	291	284	281	274	266	274	293	296	300	296	237	278	262	256	261	264	277	279	283
16		321	319	297	294	291	287	283	284	285	284	286	277	250	256	296	287	271	264	244	249	254	272	269	283	279
17		285	314	305	285	285	285	293	294	293	288	294	295	290	285	282	300	234	264	266	264	284	297	313	314	290
18	Q	283	295	298	292	307	304	289	286	285	286	282	284	294	300	295	281	273	266	258	258	257	263	267	263	282
19	Q	282	290	302	303	299	294	294	294	292	283	272	292	304	305	273	303	283	261	263	267	264	257	293	302	286
20		292	293	294	284	292	292	294	294	294	294	289	303	303	304	304	295	281	265	251	251	264	272	256	353	288
21	D	345	360	318	396	404	385	385	399	401	328	230	107	251	68	107	255	195	262	232	242	313	306	333	333	290
22		350	295	282	302	280	294	285	263	192	223	291	290	289	284	273	263	226	248	274	285	300	326	351	392	286
23		417	427	345	283	281	294	274	295	285	293	313	315	302	305	305	322	305	283	266	272	272	267	276	287	304
24		308	366	426	524	379	371	54	205	310	304	292	294	241	201	230	258	306	292	282	295	291	278	297	302	296
25	D	399	374	736	748	464	222	-164	-365	-35	178	-118	-146	283	60	114	283	311	310	302	283	294	407	496	623	253
26		572	553	489	388	220	268	68	250	211	205	17	3	125	202	289	292	346	282	275	263	271	304	345	283	272
27		291	289	304	284	323	254	262	280	274	209	202	242	291	235	226	261	267	260	264	261	275	262	290	290	266
28	Q	286	271	273	283	280	281	282	286	294	291	283	282	291	302	297	295	278	257	240	240	252	259	279	291	278
29	D	333	296	305	313	324	40	-332	-426	-205	-302	-272	-144	-330	-208	219	2	173	312	253	290	304	303	285	284	76
30		284	285	286	286	302	294	288	282	282	280	271	265	279	288	292	286	277	252	237	242	265	295	324	332	282
31		333	328	282	313	293	233	272	193	201	127	255	243	264	260	272	255	252	233	234	272	279	293	310	315	263
MEAN	A	332	333	334	334	313	283	233	223	217	216	209	214	236	229	249	260	272	271	263	264	270	283	292	314	269
MEAN	Q	291	287	294	291	291	289	288	288	287	283	277	283	293	299	291	293	232	268	260	257	257	259	277	290	282
MEAN	D	278	346	399	449	359	248	81	27	134	58	9	-11	53	-2	80	133	235	290	276	279	281	321	299	291	205

DECLINATION

TABLE 20 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES JULY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		35.6	37.8	39.9	39.3	38.1	43.8	47.3	41.2	44.6	39.3	37.7	41.0	42.5	44.7	58.1	58.3	51.0	52.0	44.3	38.0	34.1	33.0	33.1	34.4	42.0
2		36.2	38.0	39.6	38.9	41.0	40.5	38.1	41.5	39.4	39.1	36.2	36.4	44.3	47.8	53.8	53.9	55.7	53.4	47.1	40.7	36.5	34.3	32.8	31.7	41.5
3		33.9	34.9	36.0	36.0	36.2	48.6	41.0	39.3	39.6	47.8	37.8	39.3	42.8	47.8	50.5	48.6	45.7	43.0	40.4	37.7	35.9	36.2	35.9	43.0	40.7
4		48.9	27.0	29.3	34.6	32.7	43.0	44.1	37.7	38.0	39.4	37.8	44.3	45.4	46.2	49.2	51.2	51.3	48.8	44.6	40.9	36.7	34.3	32.8	32.8	40.4
5		35.1	35.9	35.9	34.4	53.6	42.5	31.7	31.5	38.8	40.1	40.9	42.8	45.7	46.8	50.5	52.1	54.7	51.0	42.8	39.7	34.4	30.9	31.2	31.7	40.6
6		34.2	34.2	32.6	35.3	37.2	31.8	39.5	41.6	55.1	43.8	43.8	41.4	40.6	45.8	52.4	53.7	53.8	51.9	45.9	40.4	36.4	34.2	33.8	34.3	41.4
7	Q	34.8	35.9	37.6	37.9	37.7	37.7	37.6	37.6	40.3	40.6	39.6	40.9	42.7	45.8	47.5	49.0	48.8	47.5	44.2	39.6	35.9	32.7	34.3	34.5	40.0
8		35.0	35.8	34.5	33.7	34.7	34.5	36.1	37.4	37.6	36.6	37.4	40.4	41.7	41.7	44.2	47.0	45.6	44.5	40.3	36.4	32.7	30.1	30.5	25.3	37.2
9	D	18.2	21.5	21.9	18.1	-.9	3.7	29.3	34.3	27.4	28.2	71.2	65.6	73.8	61.4	69.8	74.7	59.6	46.9	45.6	40.9	40.8	39.0	48.2	48.5	41.2
10	D	47.4	30.9	31.1	34.3	35.8	35.9	35.8	36.6	37.7	37.6	36.1	35.8	36.6	40.3	34.3	49.3	49.0	44.0	47.9	40.9	34.0	29.3	28.1	29.3	37.4
11		31.1	32.9	37.6	37.4	37.4	37.6	37.6	47.2	39.3	37.7	38.8	39.5	40.1	49.1	49.1	50.6	49.6	47.2	45.4	41.9	38.7	36.1	32.7	32.4	40.3
12		34.3	30.0	37.1	40.1	34.7	36.1	35.8	34.3	34.7	39.0	39.2	40.6	40.3	47.0	48.8	48.5	47.7	49.0	49.5	35.6	34.0	34.3	33.0	34.0	39.1
13		32.6	34.0	39.3	36.6	34.5	44.0	38.7	35.9	36.6	38.0	38.8	41.3	44.6	47.0	47.5	50.6	49.8	46.6	34.5	36.3	34.3	32.7	32.6	32.4	39.1
14		33.8	34.7	35.8	34.7	37.2	36.4	36.4	36.4	37.4	37.9	39.2	41.9	43.5	45.6	46.7	47.2	47.7	50.3	46.6	36.6	34.2	34.3	34.2	35.9	39.4
15	Q	35.6	36.1	35.9	39.0	36.4	37.1	37.6	36.4	35.8	35.6	42.2	41.4	42.4	43.2	44.2	46.2	46.4	45.0	42.9	39.2	37.4	35.6	33.7	33.7	39.1
16		34.5	35.9	37.6	35.9	37.1	36.3	36.1	37.4	38.8	39.2	40.4	40.8	40.8	44.5	48.3	47.7	48.8	45.8	41.1	36.1	32.9	33.5	34.3	34.2	39.1
17		35.3	37.9	38.5	38.8	37.6	37.6	37.2	37.4	37.7	38.8	39.8	40.8	43.7	46.9	46.7	48.8	47.5	42.1	37.6	35.6	32.9	32.2	29.8	31.6	38.9
18	Q	34.3	35.8	36.3	36.1	35.9	42.4	38.5	37.1	37.6	37.6	37.2	38.8	41.4	44.8	45.8	46.2	45.8	44.5	40.8	37.9	34.8	32.4	32.7	33.2	38.7
19	Q	34.3	35.6	37.2	39.8	40.6	37.6	37.4	36.7	37.6	36.3	32.7	37.7	42.4	45.3	47.2	49.6	50.1	47.2	39.3	36.1	32.7	31.1	31.1	31.6	38.6
20		33.9	36.0	38.9	37.6	35.8	37.6	39.4	39.2	38.4	38.1	38.7	40.5	42.4	45.3	45.5	47.3	49.5	49.7	45.8	40.5	32.6	30.0	30.2	28.0	39.2
21	D	39.2	39.1	29.4	29.4	35.5	35.5	37.8	37.0	36.6	37.5	35.5	49.0	43.9	58.1	50.5	47.3	52.3	47.3	46.8	31.2	31.8	31.2	30.2	35.8	39.5
22		35.7	35.8	36.2	37.9	42.3	38.9	37.3	37.8	26.5	32.6	37.5	42.0	45.3	47.3	48.7	51.1	50.3	44.1	39.4	37.1	35.7	32.5	32.8	36.0	39.2
23		36.2	36.8	37.6	40.7	40.3	36.0	45.8	39.4	37.1	37.5	37.3	36.5	40.8	46.6	48.9	50.0	51.8	51.0	39.9	35.8	36.2	32.8	30.7	32.5	39.9
24		32.9	34.4	28.4	26.0	32.6	38.9	47.3	38.7	39.4	38.7	39.1	38.9	40.7	45.3	48.2	34.2	37.5	39.7	42.4	36.5	34.2	35.8	37.5	37.3	37.7
25	D	41.0	32.9	23.8	23.0	35.8	26.2	73.5	19.7	44.1	46.1	45.3	50.2	36.6	64.2	46.1	43.9	46.6	42.9	37.6	35.5	33.7	45.7	50.2	44.2	41.2
26		32.6	24.7	26.3	28.0	31.0	37.6	29.4	39.4	39.4	33.9	37.8	43.1	32.5	35.7	46.6	49.0	52.1	47.3	46.0	39.7	37.6	34.2	39.2	35.2	37.4
27		34.9	36.5	37.6	38.4	41.3	40.8	42.1	39.1	37.6	34.1	40.8	40.5	40.8	46.3	45.2	51.3	44.5	43.9	44.1	43.9	38.3	30.0	32.5	35.2	40.0
28	Q	35.8	36.5	38.7	38.9	39.1	39.2	39.4	39.2	40.5	39.9	39.2	41.3	44.2	46.5	49.5	50.5	48.7	47.8	42.1	37.3	33.1	30.5	32.6	34.2	40.2
29	D	37.6	37.0	37.9	37.5	56.1	44.2	42.8	44.2	45.2	78.7	58.4	54.7	52.4	59.5	45.0	54.8	52.4	47.8	40.7	35.2	34.4	36.0	37.1	37.8	46.1
30		39.1	40.2	39.4	40.8	43.6	54.0	40.0	37.6	37.6	37.5	37.8	40.3	45.0	47.1	49.2	49.8	46.3	41.6	36.3	31.3	26.8	29.9	34.6	35.4	40.1
31		37.4	36.4	39.6	42.3	39.1	31.2	41.2	38.6	40.6	34.5	36.2	38.3	43.8	50.1	52.2	48.5	43.3	40.2	33.0	26.1	30.6	35.3	35.3	32.8	38.6
MEAN	A	35.5	34.5	35.1	35.5	37.1	37.6	39.7	37.7	38.6	39.4	40.3	42.1	43.3	47.5	48.7	50.0	49.2	46.6	42.4	37.4	34.7	33.6	34.1	34.5	39.8
MEAN	Q	35.0	36.0	37.1	38.3	37.9	38.8	38.1	37.4	38.3	38.0	38.2	40.0	42.6	45.1	46.8	48.3	48.0	46.4	41.8	38.0	34.8	32.5	32.9	33.4	39.3
MEAN	D	36.7	32.3	28.8	28.4	32.5	29.1	43.8	34.4	38.2	45.6	49.3	51.0	48.7	56.7	49.1	54.0	52.0	45.8	43.7	36.7	34.9	36.2	38.7	39.1	41.1

VERTICAL INTENSITY

TABLE 21 MEANOOK — Z = 58000 PLUS TABULAR VALUES IN GAMMAS — JULY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		680	694	703	708	739	728	634	633	636	655	653	685	681	608	576	647	656	670	662	672	681	681	681	680	669
2		678	680	680	672	683	691	559	477	626	639	623	531	652	691	692	679	671	672	675	669	671	679	680	686	652
3		700	695	700	698	737	669	679	680	700	706	599	501	644	646	679	683	681	680	683	685	699	711	728	774	682
4		579	709	745	725	725	593	509	668	717	737	651	662	688	690	692	689	691	681	685	689	692	698	697	692	679
5		692	686	682	709	670	631	661	702	597	652	675	687	686	678	663	661	662	667	672	678	669	673	687	716	673
6		762	758	751	744	696	651	648	604	496	564	641	635	568	603	676	691	697	693	682	688	688	688	689	688	667
7	Q	681	677	677	676	676	676	678	679	663	659	667	670	671	678	677	676	670	666	660	666	670	675	686	710	674
8		727	725	724	736	738	724	698	680	681	684	679	680	669	631	639	657	659	669	669	669	677	692	724	741	690
9	D	792	762	714	698	386	567	670	611	713	685	440	634	858	401	415	523	612	656	690	713	765	859	923	820	663
10	D	621	697	708	707	701	696	688	684	686	688	689	677	643	670	677	631	658	670	688	700	714	723	719	710	685
11		708	733	721	694	685	685	694	666	668	659	676	662	648	665	665	672	676	674	678	687	689	703	714	732	686
12		752	724	738	738	728	716	711	694	601	539	637	657	630	642	660	642	659	673	683	685	686	696	707	724	680
13		724	733	742	714	698	706	697	687	685	683	680	679	679	676	667	659	654	659	666	665	679	686	696	695	688
14		686	687	704	685	700	686	678	676	610	651	675	685	685	678	676	676	675	674	682	678	679	682	686	698	679
15	Q	712	692	691	688	678	674	670	668	665	589	614	647	674	689	694	693	683	679	674	675	675	677	687	691	674
16		704	706	720	698	694	688	684	675	675	674	674	670	632	618	657	666	663	660	657	658	664	668	674	674	673
17		673	685	687	677	674	673	668	669	669	669	673	674	667	663	646	648	656	656	658	656	665	684	719	725	672
18	Q	693	683	684	685	701	642	666	668	667	667	655	656	672	674	677	675	673	673	673	663	662	664	674	678	672
19	Q	684	683	684	691	688	680	677	679	673	659	616	638	669	676	674	668	667	663	663	664	669	679	694	709	673
20		720	710	699	689	679	677	673	670	666	665	667	676	680	680	680	677	674	674	674	663	666	675	688	703	680
21	D	741	780	743	745	711	701	672	673	666	679	614	532	613	493	495	624	661	655	675	692	698	693	711	739	667
22		722	689	684	700	702	688	673	693	459	516	645	674	674	673	670	678	673	673	673	676	706	721	725	760	673
23		746	721	712	706	689	681	629	649	656	655	648	680	684	679	677	680	673	666	661	662	665	666	674	680	677
24		684	733	780	739	711	719	411	617	709	702	689	690	644	587	598	618	651	665	667	679	688	691	710	736	671
25	D	785	794	787	745	778	612	872	801	784	806	639	571	650	512	605	708	720	701	684	684	692	738	747	658	711
26		645	680	720	674	737	701	525	552	630	601	598	525	527	548	684	712	699	687	686	692	700	710	738	720	654
27		701	696	700	698	692	544	658	681	682	607	571	643	683	655	635	671	685	687	681	691	710	690	701	705	669
28	Q	704	694	682	683	682	682	681	681	675	676	678	682	683	686	686	686	675	671	671	664	669	664	679	688	680
29	D	711	694	686	697	654	537	434	835	625	635	762	530	516	857	654	557	595	700	719	711	712	692	692	700	663
30		700	696	690	691	704	683	689	681	681	682	681	675	681	678	679	674	680	681	683	687	689	701	713	725	688
31		734	728	730	731	710	673	651	568	571	575	604	620	653	652	660	644	637	659	669	670	694	701	727	749	667
MEAN	A	705	710	712	705	692	667	650	665	653	653	646	640	658	645	649	660	667	673	676	678	687	696	709	713	675
MEAN	Q	695	686	683	684	685	671	674	675	669	650	646	658	674	681	682	680	673	671	668	667	669	672	684	696	675
MEAN	D	730	745	728	718	646	623	667	721	695	699	629	589	656	587	569	609	649	676	691	700	716	741	758	725	678

HORIZONTAL INTENSITY

TABLE 22 MEANOOK H = 13000 PLUS TABULAR VALUES IN GAMMAS AUGUST 1970

HOUR UT DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	328	312	282	265	278	281	282	284	283	272	271	292	295	295	291	274	252	250	249	255	265	272	285	304	280
2		282	312	311	303	303	285	283	286	290	283	292	294	295	294	302	291	275	255	249	252	253	261	275	284	284
3	Q	296	303	304	306	303	294	296	301	296	300	293	293	302	295	292	290	281	269	270	262	259	262	275	291	289
4	Q	297	293	293	292	293	292	293	296	300	294	292	291	293	294	293	293	281	273	252	240	251	251	262	280	283
5	Q	291	300	307	301	293	292	291	290	291	292	291	294	302	305	304	301	292	276	259	261	270	269	276	284	289
6		298	301	301	296	300	300	302	301	302	285	302	312	312	312	311	302	293	283	279	272	281	293	302	304	298
7		302	290	277	298	303	302	307	310	301	234	302	301	302	292	280	273	274	271	263	261	282	312	313	333	293
8	D	343	313	362	362	280	280	300	255	-53	-355	-203	-157	158	348	288	292	284	296	276	272	281	302	320	333	216
9	D	444	500	427	287	334	333	306	238	169	259	201	115	239	290	301	291	282	269	269	270	269	272	272	280	288
10		289	300	292	293	287	288	293	292	260	230	270	219	221	269	301	292	231	259	259	257	267	265	274	283	272
11		293	272	292	292	296	293	293	302	249	220	296	298	293	270	272	282	293	281	261	251	260	267	308	332	282
12		372	345	324	336	342	281	287	282	290	292	297	288	293	297	289	283	267	249	232	234	240	283	267	276	289
13		280	292	290	278	282	294	291	292	289	279	265	279	292	264	288	291	264	240	220	207	237	277	278	282	273
14		282	281	305	296	302	292	289	291	300	291	295	291	297	298	264	263	239	219	209	228	253	279	297	306	279
15		296	294	307	282	298	300	284	296	295	291	284	280	281	293	292	282	248	215	215	229	247	292	321	301	280
16		291	312	310	289	299	311	299	303	302	303	301	288	280	295	301	292	265	247	230	260	282	295	410	389	298
17	D	556	573	581	189	126	5	-148	82	56	280	252	79	286	158	231	216	134	190	221	232	233	295	342	369	233
18	D	485	476	433	442	141	127	203	-14	32	-30	-92	-235	-236	105	-51	239	113	112	220	296	279	278	291	352	165
19		476	402	391	300	299	269	276	270	259	176	124	279	268	250	244	251	239	255	266	258	261	262	269	277	276
20		273	271	278	278	280	281	281	278	299	280	279	252	257	279	287	278	274	261	247	239	240	250	260	279	270
21		287	282	288	281	280	281	280	279	287	289	289	280	290	294	292	278	251	247	245	246	247	260	268	269	275
22		278	286	289	290	290	290	289	290	288	277	282	253	157	267	276	271	268	276	256	248	242	254	278	290	270
23		299	285	289	299	298	267	238	228	195	261	278	284	277	282	297	281	267	256	256	258	269	277	277	281	271
24	Q	288	286	290	280	288	288	289	289	290	291	289	288	288	290	291	289	269	258	257	268	278	287	288	295	284
25		302	298	300	299	298	286	285	272	267	266	258	217	215	216	245	237	236	246	263	265	279	308	317	310	270
26	D	311	288	297	305	298	250	239	101	28	-46	49	29	-7	144	217	235	248	266	269	267	280	290	291	323	207
27		309	316	301	285	291	234	256	288	289	267	288	289	287	277	205	173	224	244	249	255	266	288	289	280	269
28		279	297	294	286	278	288	309	296	279	289	297	291	295	288	253	219	226	230	216	218	255	274	276	287	272
29		288	277	297	306	299	287	289	246	230	236	296	279	266	288	287	276	267	254	230	244	262	276	292	304	274
30		306	302	286	287	287	287	288	287	270	298	296	295	293	299	297	288	268	254	247	255	266	276	286	290	284
31		296	287	289	298	304	305	293	288	216	244	317	300	297	247	251	264	246	216	229	249	268	286	278	286	273
MEAN	A	323	321	319	297	285	273	270	261	240	233	243	231	248	271	268	271	257	249	247	252	262	278	292	302	270
MEAN	Q	300	299	295	289	291	289	290	292	292	290	287	291	296	296	294	289	275	265	257	257	265	268	277	291	285
MEAN	D	428	430	420	317	236	199	180	132	47	22	41	-34	88	209	197	254	224	226	251	267	269	287	303	331	222

DECLINATION

TABLE 23 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES AUGUST 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TC 6	6 TO 7	7 TO 8	8 TC 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TC 23	23 TO 24	MEAN
1	Q	35.7	37.4	39.1	39.0	36.7	37.7	37.5	38.6	37.4	36.5	35.4	39.0	43.3	45.6	47.7	50.4	50.4	45.1	38.0	32.2	30.1	30.4	30.7	32.5	38.6
2		36.1	36.1	41.5	35.7	34.9	35.7	35.7	35.9	36.1	39.4	37.2	40.1	42.2	46.4	47.3	49.7	48.9	46.0	42.5	39.1	35.6	32.4	31.9	33.8	39.2
3	Q	34.5	34.6	34.8	34.8	35.7	35.7	36.7	37.7	37.4	39.1	40.2	41.9	44.0	46.5	48.9	50.6	49.7	46.2	41.4	37.7	34.5	31.9	31.1	33.5	39.1
4	Q	35.9	37.2	36.4	36.5	36.4	36.5	36.2	37.0	37.7	39.1	38.2	40.4	42.7	44.8	46.7	45.4	45.1	44.0	40.7	35.1	29.3	27.7	29.5	31.4	37.9
5	Q	34.1	35.6	36.4	37.5	38.8	37.0	35.7	35.9	37.2	37.7	37.7	39.6	40.7	42.8	45.1	46.8	46.2	45.2	41.7	35.7	35.4	32.0	30.9	32.4	38.3
6		34.5	36.4	36.4	35.7	36.5	37.2	37.0	37.5	38.8	41.2	43.5	39.3	41.9	42.3	44.6	45.7	48.6	44.9	43.5	36.7	32.4	29.1	27.9	26.2	38.2
7		27.4	28.5	33.2	32.5	32.5	34.0	35.4	34.8	36.4	38.8	39.1	40.6	43.5	47.0	48.8	50.4	49.9	45.2	40.4	33.8	30.1	29.3	30.3	30.9	37.2
8	D	29.3	31.6	35.4	34.1	34.0	36.5	34.5	48.6	52.0	14.5	32.0	53.5	39.1	43.0	51.5	50.2	51.2	50.1	43.6	37.7	32.5	32.4	29.6	31.1	38.7
9	D	71.3	82.6	69.4	48.8	57.0	57.5	52.0	41.9	30.7	44.4	34.1	18.2	41.5	50.2	52.0	49.9	48.9	46.4	43.3	38.2	35.7	35.6	35.7	36.1	46.7
10		35.7	36.1	37.0	37.2	35.9	37.5	39.1	39.9	40.6	43.8	43.6	37.7	38.2	42.5	47.2	47.0	47.8	44.0	41.2	37.2	34.3	32.5	31.1	31.7	39.1
11		34.2	37.1	36.0	36.0	48.4	37.1	37.3	37.3	36.3	39.2	42.1	41.9	43.4	43.7	46.9	49.2	49.3	48.7	45.3	39.0	34.0	31.6	30.6	32.1	39.9
12		32.4	33.7	30.8	36.9	35.8	33.4	38.9	37.4	42.1	41.1	37.1	37.9	40.6	43.5	45.9	48.5	48.7	49.8	42.9	36.6	28.9	29.2	30.8	32.6	38.1
13		36.3	37.6	37.4	37.3	36.4	36.3	40.3	35.5	37.3	37.4	37.1	40.3	43.7	46.1	50.1	52.9	50.1	45.5	43.5	35.0	29.4	29.2	31.0	35.3	39.2
14		37.3	39.0	37.3	35.6	35.6	35.6	40.3	37.3	35.8	37.7	38.9	40.1	43.7	45.3	47.2	48.5	48.5	43.7	34.2	29.4	29.0	29.4	29.4	31.3	37.9
15		34.0	35.0	35.2	35.6	34.8	35.3	34.0	35.6	37.6	37.9	37.9	40.1	44.0	47.2	47.2	50.0	48.2	45.3	39.5	34.0	28.2	29.2	28.9	30.2	37.7
16		32.4	32.4	32.1	34.7	35.8	40.5	38.5	39.5	37.1	38.7	38.9	40.3	44.3	49.6	51.7	48.7	48.7	45.0	35.6	30.2	29.0	32.3	34.2	11.3	37.6
17	D	34.0	34.7	38.7	1.3	4.9	-10.1	77.2	23.7	49.8	65.4	81.7	60.0	55.4	51.7	58.5	46.6	54.3	56.6	38.7	34.0	27.6	33.2	38.1	39.3	41.5
18	D	44.9	42.8	37.3	40.4	-1.2	31.8	38.8	42.8	48.3	48.4	58.2	126.5	67.1	50.2	45.5	51.2	49.4	46.0	29.9	33.8	34.1	33.9	33.9	35.4	44.6
19		42.1	33.9	41.3	40.4	41.2	47.8	42.5	38.6	37.6	36.8	26.0	38.1	42.3	44.6	48.4	49.7	48.3	45.2	43.3	37.0	34.9	33.8	33.9	37.0	40.2
20		38.4	38.6	38.6	38.6	38.8	38.8	38.9	38.4	42.3	45.8	42.0	40.7	46.5	49.7	48.3	48.1	48.9	48.4	44.9	42.1	36.3	33.9	32.0	32.5	41.3
21		34.1	37.2	38.6	37.5	38.0	38.6	38.8	41.7	38.9	37.6	37.3	36.8	43.6	45.7	48.1	51.3	52.0	48.9	44.9	40.0	33.9	32.2	31.8	33.8	40.0
22		35.5	37.2	37.6	38.3	39.1	38.4	38.4	37.6	39.1	40.2	39.9	36.0	35.2	46.3	51.6	52.4	48.7	45.7	41.2	35.5	32.6	30.9	32.2	34.3	39.3
23		36.9	38.5	38.3	37.2	38.2	36.9	41.9	45.3	51.9	45.4	40.1	39.0	40.1	43.3	48.2	49.9	50.1	44.8	40.1	36.1	34.0	33.8	34.6	35.4	40.8
24	Q	35.8	37.2	38.5	39.8	36.9	37.1	37.5	38.3	38.7	38.7	37.1	36.9	39.0	42.0	43.8	44.9	45.3	45.7	41.4	36.7	34.0	35.4	38.3	40.4	39.1
25		43.3	44.5	41.9	42.2	38.0	35.4	36.7	38.5	38.5	38.5	40.1	39.3	39.5	46.9	47.2	43.5	40.3	37.9	36.7	33.8	30.8	33.5	35.3	39.0	39.2
26	D	40.3	40.3	38.7	37.5	44.3	38.7	39.9	50.3	46.4	69.9	50.3	65.2	39.0	39.5	45.4	47.2	41.9	39.1	37.9	36.7	35.3	35.3	36.7	37.2	43.0
27		38.3	40.4	40.6	39.8	40.3	40.3	40.1	38.7	37.1	32.5	35.9	40.3	42.0	43.5	41.2	43.5	40.4	38.7	33.7	30.6	30.8	32.1	31.1	35.3	37.8
28		38.9	40.2	40.0	38.7	38.6	37.4	38.4	37.0	35.5	37.6	38.9	40.3	41.9	44.7	45.2	45.5	41.6	36.1	34.1	27.1	24.4	27.0	28.6	31.5	37.0
29		36.6	39.8	41.1	48.2	40.5	45.6	41.8	38.9	41.8	36.0	37.3	37.6	40.3	47.9	51.9	51.1	47.4	43.4	37.6	32.0	39.4	32.9	35.3	37.8	40.9
30		39.2	38.6	37.1	37.3	37.4	41.8	38.4	38.7	38.2	38.6	38.9	38.7	38.7	43.4	47.4	33.7	48.2	44.7	39.8	37.8	34.1	33.6	35.2	36.6	39.0
31		37.3	38.1	36.8	36.6	36.6	37.6	32.3	39.5	37.0	40.3	40.3	41.3	41.5	43.9	50.5	51.3	47.9	41.9	35.0	29.1	27.3	31.8	35.0	36.8	38.6
MEAN	A	37.3	38.5	38.5	36.8	36.0	36.8	39.7	38.7	39.7	40.6	40.5	43.5	42.9	45.5	48.1	48.2	47.9	45.1	39.9	35.2	32.2	31.9	32.4	33.4	39.5
MEAN	Q	35.2	36.4	37.0	37.5	36.9	36.8	36.7	37.5	37.6	38.2	37.7	39.5	41.9	44.3	46.4	47.6	47.3	45.2	40.6	35.5	32.7	31.5	32.1	34.0	38.6
MEAN	D	44.0	46.4	43.9	32.4	27.8	30.9	48.5	41.4	45.4	48.5	51.3	64.7	48.4	46.9	50.6	49.0	49.1	47.6	38.7	36.1	33.0	34.1	34.8	35.8	42.9

VERTICAL INTENSITY

TABLE 24 MEANOOK — Z = 58000 PLUS TABULAR VALUES IN GAMMAS — AUGUST 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	722	708	706	691	662	680	682	683	677	663	646	678	688	689	689	688	687	680	671	664	672	682	684	690	683
2		688	701	712	713	726	708	681	674	670	666	680	684	687	687	689	690	630	688	671	671	680	681	682	684	688
3	Q	682	681	680	679	680	680	680	678	678	678	678	679	680	679	675	677	676	669	666	663	669	674	678	674	676
4	Q	674	674	678	678	678	677	674	674	668	662	670	674	677	677	680	681	677	677	670	667	668	674	684	688	675
5	Q	689	688	688	688	691	689	686	684	677	678	678	680	682	680	674	669	668	664	660	658	661	666	666	669	676
6		674	674	674	672	671	670	670	673	669	615	637	670	679	679	678	669	671	660	661	660	670	671	680	698	669
7		709	707	688	679	677	679	674	683	679	674	674	675	673	671	677	657	656	652	651	645	652	668	715	749	678
8	D	726	726	742	761	724	686	698	616	452	764	864	726	710	745	710	698	632	687	693	689	674	692	711	735	705
9	D	766	686	653	699	736	691	699	674	626	659	634	529	634	669	697	698	635	683	692	687	688	691	689	687	677
10		687	689	690	692	684	685	691	655	612	621	646	620	644	664	683	673	668	669	669	668	676	683	684	687	668
11		692	686	688	694	678	679	686	678	622	549	611	658	672	666	663	668	678	677	671	676	681	682	686	714	669
12		753	733	744	779	733	599	696	669	621	624	676	678	682	686	686	686	635	681	676	677	688	705	705	687	690
13		686	687	689	681	679	689	697	690	674	657	639	667	686	671	685	683	632	684	681	682	686	714	724	713	684
14		689	685	690	689	702	693	667	672	673	673	672	675	680	681	681	677	681	676	667	666	671	677	684	685	679
15		686	687	697	693	687	695	695	680	679	666	668	672	672	681	682	689	683	674	667	672	672	681	677	685	681
16		699	704	715	705	698	681	704	704	697	661	667	655	651	660	674	681	681	681	672	672	677	678	677	687	683
17	D	785	855	862	455	578	580	719	802	889	523	550	508	630	681	723	693	661	717	719	727	692	710	737	769	690
18	D	761	743	747	729	623	625	641	633	653	619	756	684	463	432	609	662	622	643	701	681	707	709	718	752	663
19		744	767	747	732	730	671	681	692	678	626	583	675	673	684	675	681	630	684	698	695	694	689	692	695	690
20		693	687	685	685	685	686	686	668	622	657	677	666	668	676	685	684	679	677	679	681	685	688	696	697	679
21		711	712	714	713	708	696	686	681	685	680	676	656	683	687	686	685	686	681	679	678	678	684	688	686	688
22		685	680	679	679	685	688	685	679	669	650	667	642	536	618	630	638	650	666	677	685	685	686	687	695	664
23		701	697	696	711	724	639	610	602	553	582	639	660	667	666	670	684	683	680	678	676	677	684	685	685	665
24	Q	685	678	682	686	679	677	676	676	676	675	677	679	681	670	666	666	675	679	677	677	684	687	695	695	679
25		696	688	686	685	680	676	665	650	615	631	613	573	556	554	621	615	630	642	673	685	698	707	713	706	653
26	D	713	707	695	698	694	629	634	476	545	666	649	462	558	642	617	622	638	658	689	704	715	717	715	724	649
27		723	753	718	706	669	600	633	660	656	619	669	681	683	676	629	580	612	638	658	668	688	704	715	703	668
28		685	680	685	679	681	696	715	699	667	668	686	680	679	677	657	621	623	647	667	683	702	719	717	716	680
29		706	698	692	717	721	710	680	734	724	599	651	675	636	673	673	682	633	694	693	704	706	701	698	701	690
30		708	715	706	706	697	679	673	668	650	674	683	683	679	678	679	683	639	688	686	687	689	691	688	685	686
31		683	680	678	678	679	696	661	631	688	699	679	677	686	642	623	641	648	660	677	689	710	706	697	686	675
MEAN	A	707	705	703	692	689	672	678	669	656	648	665	652	654	663	670	668	668	673	677	679	684	690	696	701	677
MEAN	Q	691	686	687	684	682	681	680	679	675	671	670	678	681	679	677	676	677	674	669	666	671	677	681	683	678
MEAN	D	750	743	740	669	671	642	678	640	633	646	691	582	599	634	671	674	658	678	699	698	695	704	714	734	677

HORIZONTAL INTENSITY

TABLE 25 MEANOOK — H = 13000 PLUS TABULAR VALUES IN GAMMAS — SEPTEMBER 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	289	294	296	297	298	295	306	131	-0	124	-220	186	347	321	275	218	234	237	241	260	276	308	320	306	235
2		296	296	276	281	287	298	299	295	294	264	-35	195	273	288	275	274	252	225	233	256	276	273	286	293	260
3		287	286	295	294	298	277	276	284	253	155	212	47	143	314	296	257	268	252	251	236	255	255	310	263	253
4		297	287	286	286	278	286	293	257	257	297	295	267	272	289	287	265	243	253	247	246	253	265	276	298	274
5		284	293	294	292	290	295	294	286	286	285	284	286	275	273	284	244	240	242	239	242	242	276	272	272	274
6	Q	276	286	289	295	292	293	286	292	293	295	295	294	294	293	274	263	254	246	236	245	263	274	285	277	279
7		295	287	288	286	289	291	290	292	294	289	292	298	290	287	293	286	268	258	254	260	273	269	276	277	283
8		284	283	286	293	295	294	296	286	254	289	295	292	294	282	244	245	261	253	238	241	237	255	276	273	273
9	Q	274	282	285	288	298	296	296	294	293	292	287	286	290	285	284	275	274	272	255	261	260	266	284	293	282
10		308	303	289	319	306	293	282	284	284	233	282	283	281	279	275	264	251	241	240	258	263	274	290	293	280
11	Q	286	282	282	284	284	284	285	286	287	287	289	288	286	286	285	273	262	246	243	257	268	280	294	296	279
12	Q	292	300	289	299	291	291	286	197	199	306	295	294	293	293	284	279	263	257	260	262	274	288	293	295	278
13	D	293	284	293	293	304	295	295	117	-76	-221	-71	23	-46	-93	221	197	252	252	273	256	252	292	338	344	182
14	D	286	321	293	279	280	282	291	284	260	262	281	-118	159	109	147	145	217	256	257	242	250	264	284	308	235
15		287	292	333	323	324	294	289	270	272	231	271	260	252	274	284	271	260	235	240	251	264	282	266	284	277
16		283	282	274	286	283	284	282	239	252	284	272	265	270	272	283	281	259	247	242	252	264	273	292	291	271
17		291	285	284	281	284	301	241	283	271	291	290	290	285	290	284	272	261	249	249	259	267	283	283	284	277
18		293	284	290	292	283	283	281	236	237	281	292	294	290	282	281	262	265	248	242	260	270	290	284	282	275
19		291	290	286	283	280	260	293	268	157	86	189	271	274	247	272	283	258	246	237	249	252	301	283	285	256
20		284	288	283	283	285	284	283	282	229	138	245	261	253	249	255	260	273	272	272	287	268	286	303	302	268
21	D	300	318	309	300	292	303	246	87	92	292	302	244	67	139	207	236	238	234	243	273	284	282	281	292	244
22		290	283	286	290	290	294	289	281	260	208	253	279	271	291	284	281	261	231	242	260	270	282	289	295	273
23		291	283	280	282	281	283	282	269	241	146	188	289	282	291	290	290	280	269	262	268	277	281	290	290	270
24		283	281	283	282	288	291	280	263	261	272	293	291	291	285	289	282	270	260	260	259	274	281	282	280	278
25		280	282	289	289	279	293	314	282	158	282	301	292	291	290	281	273	258	248	240	260	270	280	283	284	275
26		282	289	291	285	284	292	291	285	282	288	292	298	293	296	292	281	265	252	249	251	263	274	287	281	281
27	D	268	273	284	318	353	389	387	217	179	269	186	209	289	289	261	248	249	250	230	237	249	296	300	294	272
28		300	290	287	269	273	280	280	279	281	283	289	289	289	290	289	280	270	263	256	259	263	264	271	269	278
29	Q	278	281	288	291	296	291	290	289	288	290	293	292	291	289	288	280	268	267	259	259	261	279	278	269	281
30		282	293	291	297	308	299	293	291	292	291	291	299	299	295	294	289	275	265	258	259	269	270	276	290	286
MEAN	A	288	289	289	291	292	293	290	257	231	240	234	245	258	262	272	262	258	251	248	256	264	278	288	289	268
MEAN	Q	281	286	286	291	292	291	288	272	272	294	292	291	291	289	283	274	264	258	251	257	265	277	287	286	280
MEAN	D	287	298	295	297	305	313	305	167	91	145	96	109	163	153	222	209	238	246	249	254	262	288	304	309	234

DECLINATION

TABLE 26 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES SEPTEMBER 1970

DAY (HOUR UT)		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	37.1	37.1	37.0	37.0	37.1	37.0	35.0	58.0	48.4	46.6	42.1	56.3	51.3	59.3	57.9	50.0	43.1	38.1	33.7	33.6	26.6	29.1	28.9	30.8	41.3
2		33.4	35.0	33.6	35.2	35.2	35.3	36.0	36.8	38.2	40.2	44.0	46.4	50.6	46.1	46.9	44.7	45.0	45.0	38.7	32.9	31.5	31.2	33.6	35.7	38.8
3		36.9	37.2	36.7	38.6	42.2	35.2	35.4	35.6	33.1	45.2	48.1	37.0	51.5	48.1	51.5	53.3	48.3	43.1	39.7	35.1	33.6	33.6	32.2	32.7	40.2
4		30.6	32.2	33.8	35.2	36.7	37.0	36.9	32.8	41.8	39.9	38.8	41.7	41.0	43.3	48.1	48.8	47.8	43.5	40.1	35.4	33.3	31.9	32.0	32.0	38.1
5		35.4	35.6	35.7	38.1	41.5	38.0	38.1	37.8	38.3	38.6	38.1	40.2	40.1	44.6	48.1	49.6	44.7	42.0	36.7	34.0	30.2	28.0	30.4	32.2	38.2
6	Q	35.2	36.7	37.0	38.0	37.7	37.7	36.7	36.9	36.9	38.5	38.5	39.7	41.5	43.3	44.9	45.1	44.9	42.8	36.9	27.2	27.4	28.0	30.4	33.6	37.3
7		35.2	38.1	38.1	37.2	37.0	36.9	37.2	38.1	38.6	38.8	39.9	40.2	40.1	43.6	48.1	47.8	46.5	42.0	38.6	36.7	33.8	31.9	31.5	34.6	38.8
8		36.6	36.4	36.3	35.9	36.4	36.6	41.6	38.4	34.7	37.1	40.0	41.7	41.7	44.3	43.0	43.2	43.2	43.5	42.9	34.8	31.9	35.0	35.0	35.3	38.6
9	Q	36.8	36.6	36.6	36.8	36.6	35.0	35.0	35.3	38.2	39.6	40.0	41.3	42.1	44.6	47.5	49.3	45.1	41.6	39.8	35.3	34.0	32.1	31.8	32.2	38.5
10		42.4	35.1	33.0	28.7	35.1	36.4	36.9	35.5	36.9	38.7	39.8	40.3	41.6	43.5	44.6	46.2	45.1	42.9	39.5	36.8	35.1	35.3	36.4	36.9	38.5
11	Q	38.0	36.9	36.9	37.9	38.0	38.2	38.4	38.5	38.8	39.5	40.0	40.3	41.6	43.8	46.4	48.2	48.3	46.2	40.8	38.0	35.3	35.3	37.2	37.6	40.0
12	Q	36.9	35.8	36.1	35.3	46.4	49.6	40.0	35.0	35.1	41.6	40.8	40.9	43.0	44.6	45.6	46.1	45.1	42.4	35.9	34.8	33.5	34.3	36.6	37.1	39.7
13	D	36.8	36.6	36.4	36.6	41.9	49.8	40.3	39.6	35.0	35.5	61.2	64.4	68.6	78.0	51.4	49.5	44.0	37.9	33.4	34.3	30.5	31.1	31.9	34.0	43.3
14	D	37.1	43.4	38.5	37.7	36.6	36.8	38.7	39.2	35.8	40.8	41.7	27.3	47.2	41.4	47.2	43.2	40.0	40.1	36.9	35.1	34.7	31.4	35.1	35.3	38.4
15		38.4	40.2	45.7	44.9	42.0	37.0	36.5	33.4	35.4	39.1	40.2	42.9	41.6	47.0	46.8	46.5	45.3	43.6	36.5	35.4	34.9	35.0	35.5	38.1	40.1
16		39.9	40.0	43.4	38.1	36.8	40.5	36.3	32.1	39.7	41.5	38.4	41.0	39.9	40.5	44.7	44.9	46.3	44.9	40.0	35.0	32.0	33.1	36.2	38.3	39.3
17		38.4	38.6	39.5	38.3	39.7	46.0	36.7	41.6	33.8	39.1	38.4	40.0	41.0	43.3	46.0	46.3	45.7	40.2	34.6	30.5	30.2	32.1	34.7	36.7	38.8
18		38.3	39.4	39.6	41.2	40.9	39.8	38.2	35.1	46.2	41.5	39.8	40.1	41.4	43.2	43.6	44.6	45.1	44.4	34.0	33.5	31.6	33.7	35.6	36.7	39.5
19		38.2	38.2	38.3	37.5	38.6	46.5	42.5	42.3	43.2	57.6	49.4	42.7	41.5	41.5	46.0	47.8	46.0	44.8	35.3	32.0	28.2	30.1	33.0	36.2	40.7
20		38.2	38.3	37.8	38.0	38.2	53.3	43.5	39.9	38.3	41.4	41.7	41.1	44.1	42.8	43.0	44.4	44.3	41.5	39.0	35.1	31.7	34.3	35.1	37.7	40.1
21	D	37.4	38.5	44.9	46.9	39.8	41.2	42.0	52.8	54.3	45.7	41.9	42.3	31.4	33.0	41.5	46.5	45.7	46.0	39.1	32.5	31.6	33.3	34.9	36.9	40.8
22		38.5	43.2	47.3	37.8	51.2	39.8	38.0	37.8	35.3	33.3	42.3	41.9	44.3	43.0	43.6	45.6	44.4	39.9	33.8	32.2	33.3	35.3	36.9	37.0	39.8
23		39.4	38.0	36.7	36.7	36.9	36.6	44.1	41.5	48.1	43.2	57.3	47.8	43.6	45.1	45.9	46.0	44.8	42.8	40.3	35.9	34.1	34.6	35.1	36.4	41.3
24		36.6	38.2	38.0	39.3	37.7	36.4	38.2	39.4	44.6	42.8	42.5	40.1	39.9	41.4	43.0	45.6	46.4	46.0	42.5	37.0	35.9	35.1	35.4	36.4	39.9
25		36.5	36.5	36.5	36.3	40.6	34.8	35.8	41.1	23.7	49.3	41.6	39.7	39.7	41.1	42.9	44.3	44.8	41.8	33.4	28.6	30.2	31.9	35.0	37.1	37.6
26		37.9	36.8	36.1	38.1	37.7	33.7	36.5	35.3	35.2	41.0	39.7	41.0	41.4	41.1	44.3	46.3	44.3	41.1	37.7	36.3	31.6	31.9	33.4	34.7	38.0
27	D	34.8	33.1	32.3	28.2	31.5	33.1	30.0	39.8	44.8	41.1	44.3	46.1	41.6	44.2	41.3	40.0	36.1	36.3	29.7	28.1	29.8	33.1	34.8	34.5	36.2
28		34.7	36.6	36.5	37.9	38.4	37.9	37.9	38.1	38.2	38.2	39.3	39.8	39.8	41.6	43.2	45.9	46.3	44.3	41.1	37.9	36.6	36.1	36.1	36.3	39.1
29	Q	36.1	35.8	36.3	36.0	35.8	36.5	36.8	38.1	39.7	38.2	38.2	38.4	39.3	40.8	41.6	42.7	44.2	42.6	39.5	36.8	35.2	33.4	34.5	34.8	38.0
30		34.5	34.5	34.8	37.1	41.3	36.1	34.7	36.6	37.7	38.2	39.7	39.8	41.0	42.1	43.2	44.8	45.9	43.1	40.8	38.2	35.0	34.5	34.4	33.6	38.4
MEAN	A	36.9	37.3	37.7	37.3	38.8	38.9	37.8	38.8	38.9	41.1	42.3	42.1	43.1	44.7	45.7	46.2	44.9	42.5	37.7	34.3	32.4	32.9	34.1	35.4	39.2
MEAN	Q	36.6	36.4	36.6	36.8	38.9	39.4	37.4	36.7	37.7	39.5	39.5	40.1	41.5	43.4	45.2	46.3	45.5	43.1	38.6	34.4	33.1	32.6	34.1	35.1	38.7
MEAN	D	36.6	37.7	37.8	37.3	37.4	39.6	37.2	45.9	43.6	41.9	46.3	47.3	48.0	51.2	47.9	45.8	41.8	39.7	34.6	32.7	30.6	31.6	33.1	34.3	40.0

VERTICAL INTENSITY

TABLE 27 MEANOOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS SEPTEMBER 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	679	678	679	678	677	677	688	441	443	638	619	637	723	704	658	631	635	656	664	677	680	707	716	717	654
2		715	725	699	687	687	697	685	685	682	662	458	549	554	685	682	683	677	676	692	687	702	697	692	687	669
3		682	680	686	704	723	697	678	676	593	547	611	599	545	698	697	668	676	683	683	687	689	698	716	706	668
4		705	704	697	689	686	678	680	650	638	676	680	666	667	678	686	677	678	689	686	688	689	696	691	695	682
5		696	693	687	687	688	685	682	679	676	677	673	678	672	668	672	661	670	666	667	667	677	685	696	698	679
6	Q	685	680	679	679	678	677	678	677	672	676	677	677	677	676	668	667	667	668	669	668	670	677	684	678	675
7		679	682	680	676	675	675	676	676	678	677	669	679	670	667	677	678	678	677	677	678	681	681	686	680	677
8		679	678	678	677	678	681	698	680	602	641	671	677	680	671	642	639	656	668	671	682	682	686	689	688	671
9	Q	679	678	677	677	681	688	698	695	692	687	683	679	679	679	678	678	676	675	673	680	687	700	709	708	685
10		725	716	718	743	746	726	697	687	691	685	681	683	681	681	686	688	631	690	688	688	688	687	686	679	697
11	Q	677	677	678	678	678	678	678	678	677	678	678	678	679	679	681	680	679	678	677	676	678	679	678	673	678
12	Q	670	674	674	674	684	658	662	585	580	680	680	679	675	675	675	683	684	679	674	679	679	679	674	670	668
13	D	668	668	673	671	684	628	674	692	833	627	586	553	599	588	542	651	658	675	683	693	717	745	760	711	666
14	D	711	722	718	712	688	683	674	630	598	633	657	489	577	467	560	580	636	674	698	707	727	724	708	715	656
15		714	726	761	733	754	725	694	650	669	688	668	641	639	661	681	680	686	685	686	687	690	701	696	696	692
16		688	687	697	688	688	698	691	624	603	660	668	658	677	680	681	687	639	688	689	688	688	687	688	686	678
17		686	686	687	697	699	660	558	667	643	678	683	684	680	679	678	677	677	672	678	680	686	695	692	687	675
18		686	688	689	696	698	690	686	553	580	652	670	689	685	679	673	671	675	680	681	680	689	697	695	682	674
19		680	680	683	681	697	633	689	624	523	462	529	643	665	661	668	670	666	677	689	700	716	719	717	700	657
20		695	692	686	679	686	695	651	686	621	638	621	643	618	602	620	621	653	670	679	689	687	696	704	708	664
21	D	751	754	715	597	707	708	659	407	422	657	697	663	521	511	543	604	649	670	700	716	698	697	688	690	643
22		687	705	699	697	667	670	688	682	658	574	595	661	662	680	678	677	675	669	667	667	673	681	688	693	671
23		697	696	686	678	675	676	672	638	601	634	525	647	649	650	667	667	679	685	684	687	688	688	689	688	664
24		693	687	686	689	695	697	687	674	669	651	679	681	680	678	680	683	636	686	687	688	687	695	688	686	684
25		678	677	678	686	699	706	699	696	490	621	686	679	679	679	675	674	674	673	674	675	681	683	683	680	672
26		677	678	680	688	689	697	688	678	669	668	678	677	672	678	677	677	678	678	678	677	680	685	688	689	680
27	D	696	699	708	743	743	682	639	652	582	667	637	577	641	657	632	651	671	696	693	686	678	699	716	735	674
28		750	721	685	685	681	677	678	677	677	676	675	670	671	679	684	673	669	670	677	677	678	678	678	676	682
29	Q	676	676	675	675	676	677	684	684	674	670	671	669	674	675	677	677	678	678	671	675	675	678	677	674	676
30		674	674	675	685	696	690	677	675	675	671	672	669	668	669	675	671	669	669	666	667	670	675	676	677	674
MEAN	A	693	693	690	688	693	684	676	648	627	648	646	649	652	658	660	664	671	677	680	683	687	693	695	692	673
MEAN	Q	677	677	677	677	679	676	680	664	659	678	678	676	677	677	676	677	677	676	673	676	678	682	684	681	676
MEAN	D	701	704	699	680	700	675	667	575	576	644	639	584	612	586	587	623	650	674	687	696	700	714	718	714	659

HORIZONTAL INTENSITY

TABLE 28 MEANOOK — H = 13000 PLUS TABULAR VALUES IN GAMMAS — OCTOBER 1970

DAY (HOUR UT)		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		289	281	289	289	288	288	298	295	294	290	289	292	290	290	280	279	270	267	252	235	250	269	292	299	281
2		300	290	286	286	287	288	289	289	290	286	288	289	289	290	279	280	265	247	240	249	256	278	281	282	279
3		290	289	300	301	296	290	290	289	289	297	295	291	289	291	278	267	258	269	256	248	257	278	270	299	282
4	D	297	312	309	426	321	319	252	208	246	238	106	137	239	238	266	278	269	250	256	268	277	280	281	292	265
5		290	291	287	297	290	290	239	249	287	249	288	289	289	290	288	281	270	258	255	247	265	268	279	282	276
6		287	285	288	290	289	298	297	289	280	286	277	278	288	288	287	278	267	261	256	255	268	278	277	283	280
7	Q	287	288	289	289	288	288	288	294	289	290	290	289	287	288	290	279	265	251	246	247	263	268	279	280	280
8	Q	285	289	288	288	289	289	289	291	291	292	293	293	292	291	289	284	267	256	254	259	267	278	286	285	283
9	Q	282	288	289	291	292	291	293	292	296	296	297	296	296	297	296	288	276	259	252	261	274	285	287	287	286
10		288	288	292	295	296	293	206	176	306	303	298	298	290	290	288	279	267	252	242	249	259	267	279	283	274
11		298	350	366	412	334	350	246	143	26	49	123	122	139	215	235	226	238	246	249	256	279	289	297	298	241
12		311	431	456	444	410	298	207	205	122	150	155	256	286	287	297	286	269	260	265	266	267	269	277	278	281
13		277	279	285	283	277	258	266	255	301	295	287	287	236	286	295	266	255	254	256	255	265	278	276	279	273
14		285	267	276	277	280	288	279	227	225	278	267	277	278	286	286	276	257	251	251	256	265	275	279	278	269
15	Q	276	278	288	286	286	287	282	279	281	282	288	287	291	294	288	287	268	255	248	256	267	266	276	279	278
16	D	283	287	287	287	287	287	289	290	289	291	165	-299	-240	122	294	234	103	135	144	201	263	257	255	238	198
17	D	250	257	265	260	257	249	151	30	-11	-70	34	-33	-76	-124	17	28	-54	92	121	165	289	420	511	481	146
18	D	512	566	563	481	330	247	226	156	97	206	277	248	225	266	262	227	242	258	254	247	247	264	257	266	289
19		278	278	277	269	287	275	265	224	82	267	246	238	246	245	267	268	255	259	262	256	246	258	264	267	253
20		276	275	276	276	280	287	226	213	247	143	214	257	243	277	286	285	279	273	263	256	259	266	267	277	258
21	Q	283	286	287	287	287	287	286	287	287	287	288	288	288	287	286	279	269	258	256	266	276	279	280	279	281
22		277	288	289	312	338	327	295	255	214	267	257	207	138	230	234	245	246	233	226	213	223	297	330	415	265
23	D	412	389	368	338	340	224	186	204	175	50	98	145	259	258	173	136	215	244	254	245	305	286	267	329	246
24		309	277	276	296	295	288	212	256	-3	274	237	204	234	259	254	278	274	263	253	256	262	264	277	276	253
25		283	277	276	276	286	286	289	245	285	287	277	277	267	247	274	278	258	259	259	264	266	270	272	277	272
26		286	285	281	284	287	288	287	288	289	286	278	267	286	286	289	288	295	276	267	266	269	277	276	278	281
27		279	288	296	295	294	295	295	293	289	296	297	296	295	269	295	292	236	277	267	269	279	277	278	277	287
28		289	295	287	307	334	328	329	317	299	295	289	291	287	288	277	285	234	278	266	244	255	264	244	286	288
29		275	284	287	286	288	298	296	298	297	287	289	288	287	276	289	286	265	250	233	228	229	277	283	286	278
30		276	285	287	296	288	288	286	286	285	267	286	277	287	286	284	269	259	256	255	248	257	267	277	286	277
31		287	291	290	295	295	296	295	294	290	287	297	290	288	288	285	276	274	261	264	263	267	277	279	279	284
MEAN	A	297	304	306	310	300	289	266	249	233	245	247	233	238	258	268	261	249	249	246	248	264	278	285	293	267
MEAN	Q	282	286	288	288	268	288	288	289	289	289	291	291	291	291	290	283	269	256	251	258	269	275	281	282	281
MEAN	D	351	362	358	359	307	265	221	177	159	143	136	40	81	152	203	181	155	196	206	225	276	301	314	321	229

DECLINATION

TABLE 29 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES OCTOBER 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		35.3	38.2	36.5	36.6	37.7	45.8	38.1	36.5	36.5	37.9	39.7	39.7	39.8	40.8	43.4	42.6	44.3	43.5	43.2	36.8	27.4	31.3	32.3	31.3	38.1
2		33.1	33.0	35.1	37.6	37.8	37.5	38.0	38.0	38.3	39.6	45.8	41.5	42.6	39.9	42.8	44.6	46.2	46.2	39.4	36.4	33.0	31.5	32.8	33.3	38.5
3		29.9	31.4	31.4	36.0	40.7	36.4	36.5	37.6	38.1	41.3	39.9	39.7	39.9	41.2	44.6	46.0	40.9	38.1	39.2	36.2	34.9	31.5	31.7	33.8	37.4
4	D	32.5	28.3	31.0	30.1	47.5	41.0	39.4	46.5	36.2	42.8	39.6	33.1	37.6	37.8	39.6	45.8	45.5	43.9	39.2	36.7	35.4	36.0	36.2	36.4	38.3
5		34.9	36.2	41.5	39.4	36.8	39.6	27.3	41.0	39.7	34.7	38.1	39.9	40.9	42.3	46.0	49.4	49.2	46.0	40.9	38.0	36.2	34.9	36.4	36.4	39.4
6		36.2	36.7	38.1	36.2	36.8	38.0	37.5	38.1	36.5	39.1	38.1	37.8	39.7	42.3	44.4	46.0	45.8	43.0	41.0	37.6	34.7	34.7	34.7	36.2	38.7
7	Q	36.4	37.5	37.7	37.7	37.9	37.5	37.7	37.9	36.4	38.0	39.5	39.8	40.0	40.8	42.7	45.1	45.3	43.5	41.2	37.5	35.0	35.1	35.0	36.1	38.8
8	Q	36.3	35.9	36.4	37.2	37.5	36.6	37.4	37.7	39.0	38.7	39.1	39.3	39.5	40.6	42.5	44.1	44.6	43.7	40.4	35.4	33.2	34.3	34.6	34.8	38.3
9	Q	35.9	35.9	36.3	36.4	36.4	36.7	37.5	37.9	39.1	39.3	39.5	40.8	39.5	41.1	42.9	44.3	45.6	43.0	39.3	34.6	34.0	34.6	35.9	36.6	38.5
10		36.3	36.3	36.4	36.6	36.3	35.0	21.8	33.0	44.0	40.3	40.1	39.8	40.8	41.1	44.0	45.7	47.2	42.7	42.5	31.4	29.2	29.3	29.8	28.5	37.0
11		26.6	24.7	26.6	36.1	35.4	35.0	24.8	39.5	58.5	63.5	57.2	45.7	59.6	54.9	45.9	39.3	37.7	34.6	34.3	30.0	32.7	35.3	33.5	31.1	39.3
12		31.9	31.6	30.3	28.8	41.1	38.0	49.6	50.6	46.6	44.9	52.2	49.3	43.0	43.7	44.1	45.3	44.6	42.9	41.1	39.5	38.5	38.2	38.0	38.2	41.3
13		37.6	36.5	37.6	37.4	37.3	47.3	45.6	36.3	37.9	38.1	39.4	39.7	35.2	42.6	43.1	39.7	36.3	38.2	33.9	34.7	34.2	35.8	37.8	37.8	38.3
14		36.3	36.8	36.3	38.1	42.8	36.5	37.3	40.2	41.3	40.8	41.0	42.9	42.8	42.6	43.4	44.4	44.5	41.8	39.4	35.2	34.4	34.5	36.2	37.1	39.4
15	Q	35.8	37.6	37.8	37.8	37.9	37.0	36.2	37.1	37.6	38.6	39.4	39.7	40.0	39.4	40.3	43.4	45.6	43.9	39.4	35.8	34.5	35.0	36.0	36.5	38.4
16	D	36.3	36.5	37.6	37.4	37.1	37.9	37.4	36.5	36.3	36.2	38.1	52.7	75.0	68.7	47.4	44.2	49.5	40.8	41.3	19.9	42.3	35.8	37.8	37.8	41.7
17	D	37.9	37.8	39.2	36.5	36.5	39.5	58.5	51.1	63.7	55.1	52.1	57.6	60.5	57.4	39.5	41.3	48.9	44.5	32.6	24.7	31.3	41.3	45.8	39.4	44.7
18	D	34.8	34.5	44.9	36.3	37.7	36.6	44.8	37.7	65.1	51.4	41.4	42.5	33.4	36.9	39.1	36.4	39.5	39.1	37.9	33.0	32.7	33.2	34.8	35.0	39.1
19		37.4	37.9	38.2	37.7	37.4	39.3	40.6	42.5	34.3	43.0	41.2	43.0	43.5	41.4	42.9	43.0	43.5	41.2	39.0	39.3	37.9	36.4	36.3	36.1	39.7
20		35.1	36.1	36.4	39.0	40.9	42.5	39.5	36.1	43.8	39.1	40.9	41.2	39.6	42.7	44.0	44.6	45.9	42.7	41.1	39.1	37.7	36.4	36.4	37.5	39.9
21	Q	37.5	37.7	37.7	37.7	37.9	37.9	37.9	37.7	37.9	38.2	39.1	39.5	39.6	40.9	42.9	45.3	45.6	42.9	38.2	36.1	34.8	34.8	35.9	36.3	38.7
22		36.4	34.2	34.5	30.3	35.8	37.7	39.5	34.8	41.1	47.2	47.5	49.1	47.8	63.5	52.7	44.3	37.5	31.4	32.7	34.0	31.1	31.6	36.7	32.9	39.3
23	D	33.0	31.8	40.7	41.3	37.6	49.7	45.8	45.7	43.1	48.9	41.7	47.5	44.4	41.3	34.9	28.3	30.6	34.4	35.5	30.1	32.6	33.1	30.9	29.6	38.0
24		34.7	35.2	37.6	38.1	37.8	41.5	36.5	39.7	49.2	47.9	46.3	47.3	47.5	41.0	39.6	43.1	44.6	43.0	39.9	39.4	37.0	38.0	38.3	38.1	40.9
25		38.0	37.5	38.0	41.0	37.8	38.0	38.3	31.7	39.4	41.0	39.9	42.5	43.9	39.7	41.0	44.1	43.1	42.5	39.4	36.4	36.0	36.5	36.8	37.0	39.1
26		36.7	36.5	36.8	38.0	38.0	37.8	37.6	37.6	38.0	37.8	41.3	43.0	44.6	42.6	43.9	45.7	44.6	42.1	38.3	36.2	36.4	36.7	37.2	36.5	39.3
27		36.4	37.3	37.2	37.8	38.0	38.0	38.0	38.3	37.8	39.4	39.6	40.5	40.9	41.7	44.4	46.0	44.6	43.9	39.6	38.3	37.8	36.5	36.4	38.0	39.4
28		35.0	31.6	36.3	31.6	29.7	36.1	38.4	38.1	38.2	38.4	40.2	41.1	41.6	41.6	44.7	39.3	37.6	37.6	38.4	33.1	34.8	35.5	39.3	39.8	37.4
29		39.7	39.3	38.5	38.2	38.1	39.8	34.8	39.5	38.1	41.3	41.4	41.4	43.4	47.9	44.7	46.1	48.0	42.7	39.7	34.8	29.8	31.3	34.5	35.2	39.5
30		36.6	38.1	46.3	39.3	41.4	38.1	38.1	37.9	38.1	37.7	39.5	38.2	41.0	41.3	43.1	45.9	46.3	46.3	41.3	38.1	36.6	36.0	36.3	36.5	39.9
31		36.5	36.8	36.9	37.7	37.7	38.1	36.1	36.9	36.6	33.2	38.4	39.7	41.1	41.3	42.9	43.1	44.2	42.2	39.5	38.1	36.5	36.1	36.6	37.7	38.5
MEAN	A	35.4	35.3	37.0	36.8	38.0	38.9	38.3	39.0	41.5	41.7	41.8	42.4	43.5	43.9	43.1	43.4	43.8	41.7	39.0	35.0	34.6	34.9	35.8	35.7	39.2
MEAN	Q	36.4	36.9	37.2	37.4	37.5	37.1	37.3	37.6	38.0	38.5	39.3	39.8	39.7	40.5	42.3	44.4	45.3	43.4	39.7	35.9	34.3	34.8	35.5	36.0	38.5
MEAN	D	34.9	33.8	38.7	36.3	39.3	41.0	45.2	43.5	48.9	46.9	42.6	46.7	50.2	48.4	40.1	39.2	42.8	40.6	37.3	28.9	34.9	35.9	37.1	35.6	40.4

VERTICAL INTENSITY

TABLE 30 MEANOOK

Z = 58000 PLUS TABULAR VALUES IN GAMMAS

OCTOBER 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TC 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TC 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		681	685	678	676	677	678	669	679	677	676	669	670	668	670	668	675	674	675	671	672	673	687	694	703	677
2		733	706	689	676	674	675	676	674	673	657	656	671	667	670	669	677	631	678	681	675	679	683	682	683	679
3		686	689	707	713	697	680	679	677	675	677	677	675	669	676	676	674	668	665	673	677	684	692	697	713	683
4	D	689	704	726	684	647	728	678	509	527	648	641	640	666	667	695	690	636	698	694	703	703	695	695	696	672
5		685	686	695	703	686	661	552	602	666	639	666	676	676	678	684	686	635	681	676	679	683	681	680	678	670
6		677	680	680	684	693	697	682	678	674	678	666	665	667	675	680	681	682	681	680	683	685	686	685	684	680
7	Q	682	678	677	677	675	675	676	659	656	673	675	674	668	670	675	675	676	676	670	668	677	682	683	677	674
8	Q	675	675	675	676	675	674	675	675	674	673	674	673	672	675	676	676	677	675	667	665	666	672	672	673	673
9	Q	674	674	673	672	673	674	675	675	670	671	667	666	667	669	675	675	674	674	671	671	672	676	675	674	672
10		672	672	672	672	680	675	610	567	671	685	678	678	671	671	671	671	671	671	666	665	674	687	704	715	670
11		827	802	813	765	756	731	694	685	708	707	595	597	563	577	572	584	609	548	671	693	691	683	701	707	678
12		732	789	832	734	620	714	587	562	657	582	640	630	672	676	689	687	640	642	688	694	694	692	685	684	676
13		678	678	678	678	679	681	684	626	675	686	677	668	600	637	665	661	659	667	673	677	686	687	686	686	670
14		690	693	694	694	695	684	677	628	583	657	653	646	648	665	676	679	631	682	680	681	685	690	690	693	673
15	Q	695	694	689	684	675	683	681	672	660	665	668	671	676	675	673	675	678	676	673	674	677	677	678	677	677
16	D	676	675	675	675	676	677	676	674	673	655	572	420	410	468	633	615	624	676	721	754	714	710	717	721	645
17	D	716	711	721	704	705	684	591	524	544	554	592	535	520	421	437	599	664	677	679	714	761	788	701	656	633
18	D	645	569	467	544	721	696	694	571	562	579	654	646	648	669	674	664	635	701	702	691	684	697	705	704	649
19		711	702	701	700	674	693	693	630	523	646	647	620	617	607	631	656	658	673	690	703	709	706	703	702	666
20		701	703	705	713	713	705	646	631	645	563	559	626	603	648	664	665	671	674	678	683	684	685	684	683	664
21	Q	682	681	679	679	679	680	680	678	676	676	675	675	674	677	679	678	678	676	678	677	681	680	679	682	678
22		683	693	710	746	769	743	711	626	502	589	644	635	597	573	579	571	532	605	639	666	701	744	750	760	659
23	D	762	768	751	710	667	610	636	645	648	628	565	580	618	634	636	603	634	675	712	733	751	748	705	743	673
24		730	701	702	724	715	686	673	675	598	648	628	579	609	657	672	682	632	693	695	705	704	694	694	692	677
25		693	688	686	690	683	683	657	580	646	671	664	663	657	655	663	672	673	685	690	691	692	691	684	683	672
26		684	683	683	683	684	683	681	678	675	663	639	630	645	655	663	668	674	678	681	682	682	682	683	683	673
27		681	679	680	682	681	681	683	680	669	672	674	673	672	671	674	677	678	676	677	675	679	679	681	681	677
28		682	690	689	710	742	728	709	711	695	691	683	681	672	674	673	679	676	680	691	694	710	709	701	708	695
29		694	685	680	675	679	690	667	700	699	683	685	672	668	654	680	676	674	679	683	700	708	718	734	730	688
30		711	711	731	721	728	699	683	680	681	654	671	674	675	681	682	684	633	695	690	690	689	688	687	680	691
31		681	678	676	676	678	682	683	682	675	643	681	680	673	674	675	677	678	679	682	683	683	682	681	676	677
MEAN	A	697	694	694	691	690	688	666	643	644	651	649	642	639	644	657	662	667	671	681	688	692	696	693	694	672
MEAN	Q	682	680	679	678	675	677	677	672	667	672	672	672	671	673	675	676	676	675	672	671	675	677	677	677	675
MEAN	D	698	685	668	663	683	679	655	585	591	613	605	564	573	572	615	634	662	685	701	719	723	728	705	704	655

HORIZONTAL INTENSITY

TABLE 31 MEANOOK H = 13000 PLUS TABULAR VALUES IN GAMMAS NOVEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	285	287	294	296	297	296	296	295	290	290	288	288	296	294	289	283	275	266	264	258	266	267	278	283	284
2		287	292	295	296	297	297	296	295	249	286	308	296	267	277	296	295	294	284	272	267	268	278	279	286	286
3		283	288	300	298	296	297	298	297	295	287	297	296	291	290	287	280	277	267	266	266	269	265	266	278	285
4		285	297	294	295	294	296	295	288	242	279	294	286	296	294	292	287	278	278	279	278	279	276	278	288	285
5		296	295	308	304	308	317	317	310	298	290	297	295	293	296	295	283	279	272	259	257	247	257	247	280	287
6		292	297	296	308	338	309	297	264	165	114	112	132	145	158	257	281	276	268	262	257	266	261	276	287	247
7	D	308	310	350	494	389	261	236	-31	-374	-434	-349	-291	79	-134	19	226	298	288	277	274	275	297	308	296	140
8		307	297	305	297	285	285	278	267	257	250	249	246	266	257	258	269	286	275	265	258	268	275	274	277	273
9		277	279	296	284	277	267	276	240	220	177	203	258	277	288	284	268	265	267	267	276	266	273	278	285	264
10		279	280	275	287	290	295	286	283	278	237	98	102	260	278	254	185	267	266	267	266	282	267	275	280	256
11	D	267	278	295	308	287	278	243	228	151	65	113	256	255	247	286	274	256	297	281	277	277	257	266	286	251
12		285	286	288	286	296	296	277	207	205	201	193	245	277	246	248	277	278	279	267	266	265	267	276	285	262
13		287	286	286	288	289	286	275	286	288	286	275	255	245	247	237	278	279	263	258	255	263	265	276	277	272
14		277	277	288	296	297	301	297	288	268	287	288	287	289	288	286	285	267	276	257	256	267	270	277	286	282
15	Q	292	296	296	297	296	296	295	293	290	287	289	286	299	304	299	293	279	270	253	258	267	277	287	296	287
16		295	298	298	298	298	298	297	296	295	293	279	297	308	310	309	310	296	278	275	277	276	278	287	294	293
17		289	287	290	295	298	308	307	297	297	289	281	296	297	308	307	297	299	275	259	260	266	275	286	288	289
18		293	295	296	297	296	288	286	268	287	296	297	295	266	287	288	295	286	290	277	266	268	287	265	316	287
19		408	516	513	495	532	410	359	298	326	266	254	268	268	274	275	277	276	268	261	262	265	271	269	277	329
20	Q	281	285	286	286	287	287	286	286	287	288	289	292	294	294	291	287	282	274	265	264	267	276	277	276	283
21	D	280	284	276	278	286	286	277	256	51	-394	-633	-488	-375	-170	60	141	265	264	247	275	278	285	287	292	109
22	D	278	271	294	327	308	296	285	238	212	211	152	215	206	216	244	236	243	247	238	256	274	277	296	287	254
23	D	294	315	306	294	283	273	255	100	49	-113	-179	-85	214	232	129	101	203	266	268	235	254	289	275	274	189
24		286	297	289	284	276	290	294	284	275	286	288	295	296	295	286	275	253	253	274	275	276	284	277	285	282
25		294	297	298	305	299	294	294	294	285	155	284	294	294	295	294	282	264	260	237	265	276	284	286	295	280
26		291	295	299	296	303	306	305	296	295	293	286	283	294	297	293	277	276	287	285	284	261	277	284	291	290
27		295	298	294	295	295	295	306	295	278	264	286	279	255	257	294	295	297	276	264	283	285	282	276	284	284
28		295	292	296	293	285	294	295	296	295	293	286	282	278	293	285	275	293	277	268	266	274	275	285	293	286
29	Q	296	300	301	299	299	297	296	295	296	297	295	294	299	298	298	295	298	278	273	274	277	283	286	295	292
30	Q	300	301	302	302	302	300	296	297	296	297	300	299	297	298	297	296	293	283	275	274	283	285	286	294	294
MEAN	A	293	299	304	309	306	297	290	264	232	197	191	212	244	247	261	267	274	273	265	266	270	275	279	287	267
MEAN	Q	291	294	296	296	296	295	294	293	292	292	292	292	297	298	295	291	283	274	266	266	272	278	283	289	288
MEAN	D	285	291	304	340	310	279	259	158	18	-133	-179	-79	76	78	147	195	251	273	262	263	271	281	286	287	189

DECLINATION

TABLE 32 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES NOVEMBER 1970

HOUR UT / DAY		0 TC 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TC 6	6 TO 7	7 TO 8	8 TC 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	37.5	37.4	38.0	38.2	38.0	38.0	38.0	38.0	37.8	38.8	39.0	39.8	40.1	41.1	41.7	43.8	44.8	42.7	39.8	38.3	36.9	36.4	36.7	37.5	39.1
2		36.9	37.2	37.8	38.2	38.0	37.8	38.0	38.3	33.2	41.4	43.2	42.8	39.3	43.8	44.9	44.0	44.8	43.2	40.3	39.6	38.5	36.7	36.9	35.1	39.6
3		34.9	35.1	35.1	34.9	35.1	36.7	38.5	39.6	41.1	41.2	40.1	39.9	41.2	41.1	41.5	43.3	43.2	39.9	33.7	33.3	33.7	34.8	34.8	36.4	37.9
4		36.6	33.5	36.4	38.2	38.3	37.8	38.3	36.9	34.8	43.0	44.8	46.0	43.2	41.2	43.0	45.9	45.7	41.5	39.8	38.0	35.1	35.1	34.6	34.8	39.3
5		35.4	35.1	33.3	36.2	36.6	38.3	38.2	39.8	38.3	39.4	39.8	39.6	39.9	41.2	42.8	43.0	43.3	44.3	41.5	38.6	38.0	35.7	34.9	35.4	38.7
6		36.8	39.7	36.8	36.2	40.5	41.8	39.5	41.6	35.7	51.3	51.1	49.2	45.0	34.1	38.1	39.7	43.6	41.6	39.5	38.6	37.9	37.6	36.3	36.7	40.4
7	D	38.6	65.3	44.5	35.4	36.7	33.3	28.3	27.6	9.0	77.2	70.3	61.0	54.2	65.0	40.7	40.5	42.8	41.0	38.6	41.0	41.5	38.1	38.3	39.9	43.7
8		39.9	39.1	41.3	43.3	36.8	38.3	38.1	37.5	38.1	41.3	42.9	41.5	39.9	38.4	39.5	40.2	42.0	42.8	41.2	38.7	38.7	38.4	38.3	38.3	39.8
9		38.5	38.4	38.2	38.5	38.5	45.1	41.7	38.2	41.7	40.0	41.4	41.7	42.9	41.4	41.9	40.6	38.5	37.1	36.8	38.2	38.7	38.7	38.7	38.5	39.7
10		37.6	38.0	41.4	39.8	38.0	43.4	38.5	38.2	38.2	38.0	60.9	59.1	50.0	45.0	41.3	33.7	32.2	36.1	39.5	37.1	36.9	38.0	38.5	37.1	40.7
11	D	37.1	44.5	40.0	41.7	38.7	37.1	42.2	41.7	41.1	36.8	41.6	39.8	41.4	38.4	36.8	41.9	40.1	39.8	39.8	38.8	39.6	38.7	38.2	38.4	39.8
12		38.4	38.4	39.8	39.8	44.5	38.2	39.8	32.2	34.7	44.3	41.6	35.3	38.5	40.6	35.5	38.2	41.3	43.2	41.7	40.0	39.6	38.5	38.4	38.4	39.2
13		38.2	37.7	38.2	41.3	37.2	40.1	39.8	38.5	37.9	38.5	36.9	36.8	40.0	38.7	35.8	40.6	41.6	38.4	32.4	33.5	35.1	35.1	35.0	36.4	37.7
14		36.9	37.2	39.3	38.7	40.0	40.0	38.0	38.2	34.8	36.8	38.2	40.0	40.0	40.3	41.4	42.9	39.0	37.1	36.8	35.5	35.5	36.6	38.2	38.4	38.3
15	Q	38.1	38.0	38.3	38.5	38.5	38.5	38.6	38.6	38.9	38.6	40.1	36.7	40.4	42.5	42.6	43.3	43.8	43.3	42.0	38.8	35.2	33.8	33.8	35.6	39.0
16		37.0	37.5	38.5	38.6	38.6	38.5	38.5	38.5	38.5	38.5	35.6	38.0	41.7	42.2	43.5	44.9	45.2	41.5	37.2	35.4	35.2	35.2	35.1	33.8	38.6
17		35.4	37.0	38.1	38.8	38.8	38.3	37.7	37.5	38.3	38.6	36.5	37.2	37.2	38.6	40.2	41.8	43.0	43.0	40.1	37.5	36.2	36.4	36.4	35.4	38.2
18		36.7	38.1	38.1	38.3	38.1	38.5	38.3	34.9	36.5	37.8	38.5	40.1	33.5	41.7	35.7	44.7	44.1	45.1	41.4	38.5	37.5	33.8	35.1	33.6	38.3
19		38.3	25.4	25.9	33.0	23.8	35.1	38.5	34.3	31.2	36.9	41.5	39.9	41.4	40.7	41.5	43.3	44.7	43.3	41.5	40.1	38.8	38.6	38.6	38.5	37.3
20	Q	38.3	38.5	38.5	38.5	38.5	38.5	38.3	38.3	38.5	38.6	38.8	39.1	39.9	40.1	40.6	43.0	43.1	42.0	41.0	38.6	38.5	38.3	38.5	38.1	39.3
21	D	38.1	38.3	40.1	44.6	40.2	38.6	39.4	42.0	43.6	91.6	48.3	17.2	48.3	54.7	32.3	41.8	39.9	40.4	41.0	41.5	42.0	44.4	42.8	41.8	43.0
22	D	41.7	43.0	44.9	49.4	39.6	38.6	37.0	36.7	25.6	44.7	39.7	41.2	47.8	38.5	33.0	38.0	32.7	35.6	33.3	33.5	31.7	32.2	35.1	36.7	37.9
23	D	38.0	38.7	40.0	41.4	39.8	41.7	41.7	41.6	59.6	63.0	56.1	59.5	44.6	49.6	28.9	29.0	28.4	30.3	36.9	34.8	33.5	36.4	38.4	38.8	41.3
24		40.1	40.0	40.0	40.3	40.1	41.3	39.8	38.4	38.5	36.9	38.5	39.8	39.8	40.0	40.3	43.7	40.6	38.4	34.0	32.1	37.1	36.6	38.2	38.4	38.9
25		37.2	35.3	36.9	38.0	38.4	39.6	39.3	40.6	40.9	31.8	43.2	42.4	45.0	44.6	41.6	41.1	43.0	40.3	27.1	30.3	32.9	36.9	38.2	36.8	38.4
26		38.1	38.1	38.3	38.4	39.9	38.4	36.7	36.7	38.1	38.7	38.4	38.1	40.2	41.2	41.6	43.1	41.3	40.0	37.5	36.8	35.4	35.2	36.3	37.8	38.5
27		38.4	38.6	39.5	38.4	38.1	38.6	38.4	37.0	36.3	40.0	42.9	43.1	48.1	37.9	40.8	43.1	43.4	41.2	36.5	35.5	32.9	36.5	36.0	36.2	39.1
28		38.3	38.1	38.4	38.7	42.0	42.3	38.6	38.1	37.3	38.3	39.9	38.6	37.3	40.2	41.8	36.8	41.3	41.6	39.9	37.0	36.7	35.8	36.5	36.8	38.8
29	Q	38.3	38.1	38.1	38.6	38.3	38.3	38.1	37.1	36.8	38.3	39.5	39.9	41.0	40.4	40.4	41.5	42.9	41.6	39.4	36.7	36.5	36.8	37.0	37.8	38.8
30	Q	38.0	38.2	38.2	38.3	38.5	38.2	38.3	38.0	38.2	38.3	38.6	39.6	39.8	40.1	40.1	41.1	42.7	41.5	39.6	36.9	36.4	36.4	36.6	36.6	38.7
MEAN	A	37.8	38.6	38.4	39.1	38.3	39.0	38.5	37.8	37.1	43.3	42.9	41.4	42.0	42.1	39.7	41.3	41.4	40.6	38.3	37.1	36.7	36.7	37.0	37.1	39.3
MEAN	Q	38.0	38.0	38.2	38.4	38.3	38.3	38.3	38.0	38.0	38.5	39.2	39.0	40.2	40.8	41.1	42.5	43.5	42.2	40.4	37.8	36.7	36.3	36.5	37.1	39.0
MEAN	D	38.7	45.9	41.9	42.5	39.0	37.9	37.7	37.9	35.8	62.7	51.2	43.7	47.3	49.2	34.3	38.3	36.8	37.4	37.9	37.9	37.7	38.0	38.5	39.1	41.1

VERTICAL INTENSITY

TABLE 33 MEANOOK — Z = 58000 PLUS TABULAR VALUES IN GAMMAS — NOVEMBER 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	675	674	675	674	674	674	673	674	673	673	672	665	674	674	676	679	630	678	679	680	680	678	675	674	675
2		674	673	674	673	673	673	673	672	575	589	662	662	619	616	661	674	679	675	675	677	677	675	674	674	660
3		674	679	683	692	698	702	699	686	670	663	679	675	671	671	671	665	662	661	660	663	672	681	687	692	677
4		700	710	713	705	693	684	680	673	626	663	674	656	676	681	681	680	630	679	673	672	674	675	678	688	680
5		690	685	691	700	708	733	711	708	644	661	681	674	673	672	671	670	679	682	676	677	678	690	680	693	684
6		697	701	693	718	700	655	707	656	492	512	474	493	531	591	605	652	659	662	670	682	691	689	689	684	639
7	D	693	745	786	747	502	558	678	753	908	943	891	958	699	653	577	628	699	701	708	711	727	718	710	726	726
8		758	719	718	710	701	701	693	679	660	642	644	650	675	672	671	672	632	689	689	697	694	692	692	691	687
9		688	685	687	685	689	698	679	645	603	555	594	650	664	680	676	674	676	681	687	695	697	691	688	687	669
10		689	693	702	698	700	674	689	682	676	605	482	508	584	632	634	622	673	676	688	699	705	699	692	699	658
11	D	697	747	727	726	670	641	625	618	539	490	583	643	644	660	673	679	686	708	690	707	700	709	699	705	665
12		697	690	690	697	680	679	673	567	595	585	596	640	660	638	667	661	638	694	690	690	690	690	691	690	664
13		685	683	684	685	686	681	655	670	681	677	663	636	623	613	614	642	653	660	662	671	683	690	696	692	666
14		701	708	699	692	686	669	670	673	643	663	677	675	679	676	676	679	669	669	673	679	687	689	681	680	679
15	Q	679	678	678	676	676	676	677	677	678	664	663	650	662	671	673	677	630	681	683	684	683	681	680	680	676
16		678	678	677	676	675	673	672	672	671	667	643	652	669	672	673	676	675	671	672	673	678	680	681	680	672
17		680	687	688	697	695	680	672	672	671	662	644	660	663	672	673	675	680	680	682	688	688	684	681	679	677
18		677	677	676	675	676	676	676	651	660	671	670	665	644	612	615	587	646	670	671	672	678	682	690	680	662
19		708	641	737	709	727	717	740	699	717	697	680	691	689	688	689	691	632	691	690	690	690	690	689	686	697
20	Q	681	680	680	679	678	677	677	678	679	679	678	679	676	676	678	680	630	681	681	681	682	681	680	680	679
21	D	680	679	682	706	705	690	670	548	322	39	249	312	596	794	481	626	678	681	697	706	705	702	693	692	597
22	D	694	702	709	716	660	681	691	642	556	624	538	623	622	625	620	627	660	689	716	730	739	734	729	726	669
23	D	719	716	699	709	707	699	688	586	594	447	561	588	697	634	613	579	606	692	707	707	696	709	708	714	657
24		712	709	698	692	690	679	681	676	669	679	675	680	679	679	678	674	660	647	655	671	682	695	691	690	681
25		696	696	708	695	695	688	682	679	681	594	651	661	665	676	676	672	672	671	655	672	679	688	691	694	677
26		689	689	689	687	690	690	683	680	680	678	672	671	675	679	673	674	630	681	679	682	685	690	691	693	682
27		691	690	689	690	691	686	692	681	644	605	643	643	612	634	646	679	630	679	680	683	685	684	688	694	670
28		697	690	687	686	685	659	680	680	679	678	672	660	644	660	654	666	663	672	679	681	684	681	680	680	675
29	Q	678	678	679	679	680	680	680	680	679	679	678	672	671	673	676	679	630	679	679	679	679	678	678	678	678
30	Q	677	675	675	676	676	676	677	676	675	675	676	678	676	674	676	679	630	680	679	680	680	681	680	679	677
MEAN	A	692	692	696	695	682	680	681	664	641	622	632	646	654	662	652	661	673	679	681	686	689	690	689	690	672
MEAN	Q	678	677	677	677	677	677	677	677	677	674	673	669	672	673	676	679	630	680	680	681	681	680	679	678	677
MEAN	D	697	718	721	721	649	654	670	629	584	508	564	625	652	673	593	628	666	694	703	712	713	714	708	713	663

HORIZONTAL INTENSITY

TABLE 34 MEANOOK H = 13000 PLUS TABULAR VALUES IN GAMMAS DECEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	297	304	304	302	305	305	304	302	301	299	302	304	304	304	302	298	233	283	274	271	273	277	288	297	295
2		305	306	306	306	305	305	304	301	302	304	304	304	305	305	307	306	302	292	282	271	272	282	285	293	298
3		296	291	293	302	304	300	294	285	276	296	304	305	305	304	305	304	294	285	276	273	272	274	283	292	292
4		296	302	302	300	301	302	295	286	294	302	305	304	302	305	309	310	305	293	284	277	274	264	274	286	295
5		286	284	283	283	286	291	288	273	253	262	304	299	306	305	304	278	294	288	273	263	264	273	280	288	284
6		293	294	291	293	293	294	290	260	211	232	233	293	295	272	257	283	282	295	292	282	274	274	275	284	277
7		290	292	293	292	292	293	303	291	284	285	283	273	244	261	284	306	310	305	295	283	274	282	282	277	286
8	D	304	367	333	355	378	308	244	46	189	245	67	161	180	158	282	310	301	289	272	251	252	263	277	284	255
9		285	283	285	287	291	297	293	284	282	282	243	269	303	292	294	300	298	291	284	281	273	274	281	284	285
10	Q	292	293	294	295	295	296	295	294	290	291	295	291	282	289	297	296	298	293	285	273	270	272	275	283	289
11	Q	291	291	292	292	291	293	295	292	291	292	293	299	300	302	302	303	302	294	285	281	277	281	282	290	292
12		292	298	293	292	293	292	291	290	289	282	292	286	284	292	303	300	234	289	281	279	280	281	281	292	290
13		303	302	294	300	303	303	302	298	294	293	294	297	300	300	300	299	297	290	282	281	280	283	291	290	295
14	D	309	312	327	333	431	404	231	-1140	-25	231	242	147	139	262	321	303	274	243	212	244	262	259	252	274	204
15	D	273	292	283	272	270	262	229	126	76	102	140	211	258	210	229	258	273	282	263	259	259	265	271	273	235
16		283	287	283	286	288	291	283	285	283	282	281	273	283	289	284	285	281	271	259	259	258	263	272	280	279
17	Q	282	291	291	292	291	290	283	282	280	279	274	271	283	291	284	290	284	280	271	270	262	269	275	283	281
18		291	291	292	290	290	284	284	283	286	291	290	291	292	291	293	294	232	282	271	263	263	276	284	293	286
19		294	293	293	291	292	291	285	282	251	232	306	303	303	303	304	305	303	295	282	280	272	280	291	291	288
20		296	292	288	290	282	279	262	229	158	76	160	261	302	293	302	311	303	295	282	272	272	277	283	291	265
21		293	292	291	290	290	284	283	274	270	258	284	293	293	304	303	303	298	291	281	278	278	273	280	290	286
22		290	300	293	291	291	290	282	284	290	283	291	292	297	303	305	306	304	298	285	282	283	287	291	298	292
23		303	306	303	310	303	302	300	292	291	292	282	283	304	303	303	295	302	292	282	282	283	285	291	296	295
24	D	305	323	355	395	356	322	302	293	302	294	292	290	289	282	282	293	296	283	272	270	280	273	282	289	301
25		291	292	293	293	293	292	292	292	292	292	292	293	294	296	292	282	278	277	279	274	268	280	289	293	288
26		303	303	302	298	297	296	299	291	292	291	291	291	291	291	292	292	290	284	283	274	282	286	286	298	292
27		303	303	303	293	298	303	303	291	292	292	290	300	291	284	297	296	304	302	285	279	274	260	272	304	292
28	D	304	310	321	338	315	302	303	289	280	231	243	273	220	260	293	291	244	242	219	231	278	286	290	302	278
29		303	303	299	293	293	293	293	283	235	282	291	289	284	284	299	299	303	292	282	291	292	294	293	280	290
30		290	292	326	385	362	292	290	290	283	282	280	292	292	291	293	291	267	264	283	282	284	283	283	292	295
31	Q	293	294	295	294	294	293	292	292	292	293	296	300	302	303	302	296	290	281	280	281	284	291	294	300	293
MEAN	A	295	300	300	304	306	298	287	227	258	268	269	279	282	285	294	296	292	285	275	272	273	276	282	289	283
MEAN	Q	291	295	295	295	295	296	294	293	291	291	292	293	294	298	297	297	293	286	279	275	273	278	283	291	290
MEAN	D	299	321	324	339	350	320	262	-77	164	233	197	216	217	235	282	291	278	268	248	251	266	269	274	284	255

DECLINATION

TABLE 35 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES DECEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	36.7	37.8	38.2	38.3	38.5	38.6	38.5	38.3	38.2	38.3	38.6	38.5	39.3	39.6	39.9	41.1	43.0	43.2	41.5	39.6	38.0	36.6	35.6	36.2	38.8
2		36.4	37.7	38.2	39.4	39.6	39.6	39.4	38.5	38.3	38.5	39.4	39.3	39.0	39.4	39.9	41.5	43.0	43.8	40.1	40.7	35.1	34.0	36.2	36.4	38.9
3		36.6	37.8	38.6	39.6	39.6	39.4	39.3	36.2	41.5	41.4	37.5	38.2	39.0	39.6	40.1	41.4	42.8	42.8	41.9	40.1	38.6	38.0	36.2	36.1	39.3
4		36.7	37.8	38.2	38.3	39.3	39.0	38.3	36.4	40.4	39.8	38.2	38.3	39.6	38.3	41.4	42.8	43.0	42.8	40.1	39.8	38.0	34.9	33.3	32.8	38.6
5		33.3	36.6	38.6	40.1	39.9	43.2	42.7	41.5	41.2	44.3	38.5	38.0	38.2	39.9	41.4	35.7	41.7	45.9	43.3	42.2	39.6	38.0	37.0	36.9	39.9
6		36.9	36.8	39.7	38.5	38.7	39.8	38.2	36.3	32.6	39.8	43.1	40.0	39.7	41.0	34.7	33.4	32.9	35.3	36.8	36.6	36.5	35.5	36.5	36.3	37.3
7		36.1	36.9	38.1	38.7	39.7	39.8	40.0	39.5	39.5	37.7	39.5	38.1	33.1	36.6	39.5	41.3	41.6	41.8	37.9	36.3	34.5	33.6	33.7	35.0	37.9
8	D	33.9	39.8	37.7	36.9	41.1	43.1	50.9	41.3	41.0	44.2	44.5	47.9	46.1	37.9	35.8	39.5	42.9	44.7	42.7	38.9	36.3	36.5	38.2	37.6	40.8
9		37.7	37.1	37.9	39.3	39.3	39.7	39.5	39.7	39.7	38.2	35.5	37.3	39.8	40.8	39.5	41.3	42.7	43.2	42.7	41.0	39.7	38.4	37.7	37.6	39.4
10	Q	37.9	37.9	38.1	38.2	38.4	38.2	38.1	38.1	38.2	41.4	41.3	40.8	36.5	38.4	41.1	41.0	40.2	42.2	41.4	39.7	38.2	36.8	37.1	37.7	39.0
11	Q	37.7	37.7	38.1	38.2	38.7	39.7	39.5	38.2	38.2	38.5	38.7	38.4	38.2	39.3	39.5	40.0	41.9	42.9	41.4	40.3	39.7	38.1	37.7	37.3	39.1
12		37.7	38.1	38.4	38.4	38.7	39.3	38.1	39.5	38.7	37.6	41.3	41.3	42.7	45.8	41.6	39.8	41.6	42.7	40.0	38.2	36.5	35.8	36.3	35.2	39.3
13		36.0	35.1	38.1	38.3	39.7	39.4	38.3	38.0	38.3	39.2	39.2	39.4	39.2	39.4	39.4	40.4	42.6	43.1	39.6	39.2	36.7	34.9	35.5	35.9	38.5
14	D	35.1	36.0	35.9	37.8	31.4	57.8	23.5	16.9	13.8	30.2	33.6	56.6	53.9	43.0	44.6	46.5	44.7	45.5	39.6	34.9	33.0	29.9	31.4	38.1	37.2
15	D	39.4	40.9	47.5	39.7	40.1	49.4	48.1	46.0	44.1	49.4	40.5	43.1	39.6	41.2	41.3	39.7	44.6	44.2	39.2	38.1	37.3	37.0	36.2	36.0	41.8
16		36.4	36.7	37.6	39.7	40.9	39.6	39.6	38.4	38.1	38.3	39.1	39.4	39.6	40.9	41.0	42.6	43.9	44.1	41.0	38.1	36.2	35.1	35.5	36.0	39.1
17	Q	35.4	36.8	39.2	40.1	40.9	39.9	39.6	38.9	39.1	39.2	39.4	37.0	38.0	39.2	38.1	42.5	43.6	43.4	42.6	41.0	39.4	38.0	37.0	37.5	39.4
18		38.0	38.1	38.3	39.4	39.4	39.6	38.4	39.4	39.2	38.1	38.0	39.2	38.4	38.3	39.4	41.7	44.2	44.6	43.9	41.5	39.6	37.6	36.2	36.4	39.5
19		37.2	38.0	38.0	38.0	39.4	39.2	42.6	41.0	44.7	51.5	41.0	39.4	39.1	39.4	39.6	40.9	43.4	43.1	42.8	39.7	36.5	36.4	34.7	35.1	40.0
20		38.0	39.4	39.7	39.6	39.7	40.9	43.1	49.7	56.0	60.3	42.8	46.3	39.7	36.2	36.7	42.5	43.0	43.1	42.6	39.6	36.2	36.5	36.8	37.8	41.9
21		37.6	37.6	38.0	39.2	40.9	39.7	39.6	42.8	41.3	41.2	42.6	39.4	36.8	37.8	39.4	40.9	42.6	43.1	41.5	39.9	38.1	36.7	36.0	36.4	39.5
22		36.4	37.3	38.0	39.6	42.5	40.9	36.7	38.3	44.4	38.3	39.4	39.6	38.3	38.1	41.0	41.5	41.2	41.2	40.2	38.1	36.8	36.5	37.6	36.7	39.1
23		37.8	37.6	42.1	39.9	38.0	38.3	39.6	39.2	39.4	39.6	40.9	41.2	41.2	42.6	42.5	43.4	44.1	43.3	41.3	39.6	38.0	37.6	36.5	34.6	39.9
24	D	39.2	38.0	33.1	30.9	36.0	36.5	38.4	40.9	41.3	42.3	39.4	39.4	39.2	39.7	39.4	38.1	43.3	42.8	41.2	39.1	37.2	35.7	36.5	36.5	38.5
25		37.3	38.0	38.8	38.9	39.2	39.4	39.2	39.2	39.2	38.3	39.4	39.6	39.2	39.4	39.6	41.3	42.5	44.4	41.5	38.1	36.0	36.4	35.4	36.5	39.0
26		37.2	37.9	37.9	38.0	38.0	42.4	40.4	39.5	41.2	41.1	40.3	39.6	39.6	39.3	39.6	41.9	44.0	43.5	42.7	39.1	35.9	34.8	35.6	36.3	39.4
27		37.2	36.3	37.2	37.9	39.1	39.1	38.7	37.9	38.0	42.9	43.0	42.7	39.1	41.1	44.0	47.4	45.1	41.9	37.7	36.3	36.3	31.9	28.0	31.4	38.8
28	D	34.3	34.2	31.6	32.9	36.6	39.5	39.5	39.3	39.8	41.6	46.2	42.9	38.0	46.2	49.0	46.2	40.0	40.8	36.4	31.7	32.7	33.0	32.9	32.1	38.2
29		36.3	40.8	41.1	41.1	40.6	42.5	39.0	41.1	37.7	40.9	39.6	40.0	39.6	40.6	40.9	46.1	48.0	46.4	39.8	37.4	36.4	35.1	36.6	33.2	40.0
30		37.9	39.5	40.8	37.7	41.6	39.5	37.9	36.4	36.1	38.3	39.3	39.3	38.3	38.0	38.0	40.0	39.5	36.6	39.8	39.1	36.4	36.6	37.9	37.9	38.4
31	Q	37.9	38.3	39.5	39.6	39.5	39.3	38.3	37.9	37.7	37.9	37.9	39.1	39.3	39.3	39.5	40.9	42.4	42.7	41.4	38.2	36.3	35.9	36.7	37.9	38.9
MEAN	A	36.8	37.7	38.4	38.5	39.2	40.7	39.4	38.8	39.3	40.9	39.9	40.6	39.6	39.9	40.2	41.4	42.6	42.9	40.8	38.8	37.0	35.9	35.8	36.0	39.2
MEAN	Q	37.1	37.7	38.6	38.9	39.2	39.1	38.8	38.3	38.3	39.1	39.2	38.8	38.2	39.2	39.6	41.1	42.2	42.9	41.7	39.8	38.3	37.1	36.8	37.3	39.1
MEAN	D	36.4	37.8	37.2	35.6	37.0	45.2	40.1	36.9	36.0	41.5	40.9	46.0	43.4	41.6	42.0	42.0	43.1	43.6	39.8	36.5	35.3	34.4	35.0	36.1	39.3

VERTICAL INTENSITY

TABLE 36 MEANOOK | Z = 58000 PLUS TABULAR VALUES IN GAMMAS | DECEMBER 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	678	676	675	675	675	676	674	674	674	673	674	676	676	676	676	679	630	682	684	682	681	679	678	679	677
2		679	678	677	676	676	676	674	673	674	673	673	674	675	673	674	673	675	672	668	670	673	674	675	679	674
3		681	679	687	680	676	675	673	623	612	643	670	676	674	673	673	676	676	676	677	678	679	679	678	679	671
4		678	678	676	676	674	674	672	653	650	659	668	670	668	669	671	672	673	672	670	671	671	673	682	691	671
5		697	695	695	694	702	699	675	651	576	580	640	661	671	670	666	663	630	681	679	680	682	683	682	680	670
6		679	679	681	679	679	678	670	623	551	556	563	649	666	642	606	631	634	643	653	664	670	671	673	679	647
7		685	682	680	686	691	690	662	670	669	653	646	650	614	593	623	635	650	651	654	661	669	679	681	687	661
8	D	709	744	760	773	773	716	613	592	607	621	520	557	555	584	680	688	631	690	686	690	687	688	695	692	667
9		690	692	691	690	690	672	679	676	668	656	614	626	671	661	673	678	679	679	680	679	679	678	679	678	673
10	Q	677	676	676	676	676	676	675	673	650	634	654	660	649	634	650	668	672	671	672	675	678	679	677	677	667
11	Q	676	675	676	676	676	672	669	670	663	661	668	670	671	671	672	673	676	677	678	676	675	674	673	672	672
12		673	673	673	673	672	674	675	670	653	615	645	655	633	633	649	664	671	672	673	677	678	675	674	677	664
13		679	680	681	682	680	678	675	674	673	672	670	671	671	672	672	672	673	672	672	672	671	671	673	676	674
14	D	679	681	691	692	735	643	575	502	746	719	756	773	691	707	681	700	632	690	700	717	716	707	708	716	692
15	D	703	719	720	700	698	660	625	576	562	564	547	602	671	661	671	660	655	671	667	679	690	698	697	694	658
16		699	701	701	699	698	697	698	695	689	689	688	681	680	685	684	686	637	688	690	692	689	690	692	692	691
17	Q	692	694	693	690	689	689	689	686	680	671	664	662	669	680	675	685	637	689	690	690	690	691	691	689	684
18		686	682	683	683	684	682	672	676	672	674	679	680	680	679	679	684	683	681	680	682	684	683	680	680	680
19		680	678	678	679	679	680	681	680	575	549	653	681	680	679	680	680	630	679	678	679	678	681	692	692	670
20		688	682	681	681	682	672	659	615	503	510	534	606	660	671	665	681	631	682	685	689	689	690	690	690	654
21		689	690	690	691	690	689	679	676	660	635	662	678	673	680	684	685	635	684	682	681	686	689	689	688	681
22		689	701	697	700	701	699	692	672	648	660	671	676	679	679	678	677	677	676	679	680	680	681	681	681	682
23		680	688	703	698	693	697	689	688	680	679	662	634	661	665	671	680	692	690	681	681	682	682	681	684	681
24	D	718	756	775	786	759	725	707	695	702	699	691	682	678	669	680	698	631	682	684	686	688	685	685	687	704
25		685	681	681	681	681	681	678	680	680	680	680	678	678	680	679	679	630	675	676	676	679	678	686	681	680
26		681	679	678	678	684	692	688	685	685	689	685	679	678	678	678	680	632	685	680	684	682	680	678	679	682
27		678	681	681	682	685	680	680	680	676	684	679	678	674	652	661	666	679	666	669	671	671	678	707	709	678
28	D	708	708	719	775	730	709	710	707	696	650	636	651	579	590	633	642	651	662	679	701	723	706	708	726	683
29		719	695	690	693	692	718	717	704	665	672	686	680	677	679	691	674	661	668	677	674	678	686	684	700	687
30		723	709	741	755	773	718	694	690	688	688	682	682	681	680	681	681	678	688	682	680	683	688	687	686	697
31	D	681	681	680	680	679	679	679	678	678	679	679	679	678	679	679	681	634	689	688	684	680	679	678	677	681
MEAN	A	689	691	694	696	696	686	674	661	652	648	653	664	663	663	669	674	676	677	678	681	683	683	685	687	676
MEAN	Q	681	681	680	679	679	678	677	676	669	664	668	670	669	668	670	677	630	682	682	681	681	680	679	679	676
MEAN	D	703	721	733	745	739	691	646	614	663	651	630	653	635	642	669	677	676	679	683	695	701	697	699	703	681

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY-ALL DAYS

TABLE 37 MEANOOK H = 13000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	265	264	264	300	305	326	332	323	288	297	293	295	296	321	287	279
1-2	267	270	270	296	303	329	333	321	289	304	299	300	298	322	290	284
2-3	269	271	279	288	288	321	334	319	289	306	304	300	297	315	291	286
3-4	272	270	278	297	285	313	334	297	291	310	309	304	297	307	294	289
4-5	272	273	279	286	286	301	313	285	292	300	306	306	292	296	289	289
5-6	269	273	273	279	287	289	283	273	293	289	297	298	284	283	284	284
6-7	265	271	266	247	281	269	233	270	290	266	290	287	269	263	267	278
7-8	255	268	248	235	266	251	223	261	257	249	264	227	250	250	247	253
8-9	256	266	224	209	269	239	217	240	231	233	232	258	240	241	224	253
9-10	257	265	203	191	258	235	216	233	240	245	197	268	234	235	220	247
10-11	255	257	176	187	243	230	209	243	234	247	191	269	228	231	211	243
11-12	250	252	202	196	252	237	214	231	245	233	212	279	234	233	219	248
12-13	255	255	231	194	253	228	236	248	258	238	244	282	243	241	230	259
13-14	258	259	230	186	246	246	229	271	262	258	247	285	248	248	234	262
14-15	261	265	230	234	256	260	249	268	272	268	261	294	260	258	251	270
15-16	262	266	242	236	262	262	260	271	262	261	267	296	262	264	250	273
16-17	256	260	251	239	257	264	272	257	258	249	274	292	261	263	249	271
17-18	249	251	244	238	250	260	271	249	251	249	273	285	256	258	246	265
18-19	248	243	232	241	248	259	263	247	248	246	265	275	251	254	242	258
19-20	247	242	230	248	254	261	264	252	256	248	266	272	253	258	245	257
20-21	249	246	235	258	259	270	270	262	264	264	270	273	260	265	255	260
21-22	252	253	241	273	273	282	283	278	278	278	275	276	270	279	268	264
22-23	258	257	255	278	282	296	292	292	288	285	279	282	279	290	276	269
23-24	262	259	267	293	297	311	314	302	289	293	287	289	289	306	285	274
MEANS	259	261	244	247	269	273	269	270	268	267	267	283	265	270	256	267

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION-ALL DAYS

TABLE 38 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	39.2	38.3	35.8	34.3	35.1	34.3	35.5	37.3	36.9	35.4	37.8	36.8	36.4	35.6	35.6	38.0
1-2	39.7	38.4	36.1	35.1	36.0	34.8	34.5	38.5	37.3	35.3	38.6	37.7	36.8	36.0	36.0	38.6
2-3	40.5	39.0	37.9	36.7	37.3	36.0	35.1	38.5	37.7	37.0	38.4	38.4	37.7	36.7	37.3	39.1
3-4	41.1	39.7	38.6	37.2	37.9	38.0	35.5	36.8	37.3	36.8	39.1	38.5	38.0	37.1	37.5	39.6
4-5	41.6	40.5	39.1	38.5	38.4	37.7	37.1	36.0	38.8	38.0	38.3	39.2	38.6	37.3	38.6	39.9
5-6	40.8	40.4	40.2	39.2	38.4	37.7	37.6	36.8	38.9	38.9	39.0	40.7	39.1	37.6	39.3	40.2
6-7	41.0	39.8	40.1	39.7	39.2	36.9	39.7	39.7	37.8	38.3	38.5	39.4	39.2	38.9	39.0	39.7
7-8	40.4	40.3	40.7	40.3	38.5	38.0	37.7	38.7	38.8	39.0	37.8	38.8	39.1	38.2	39.7	39.3
8-9	40.9	40.6	40.4	40.9	38.9	37.8	38.6	39.7	38.9	41.5	37.1	39.3	39.5	38.8	40.4	39.5
9-10	41.7	41.1	41.2	40.9	39.0	37.7	39.4	40.6	41.1	41.7	43.3	40.9	40.7	39.2	41.2	41.7
10-11	41.3	42.3	42.6	44.0	40.0	38.8	40.3	40.5	42.3	41.8	42.9	39.9	41.4	39.9	42.7	41.6
11-12	42.5	43.1	44.1	43.1	42.2	42.4	42.1	43.5	42.1	42.4	41.4	40.6	42.5	42.6	42.9	41.9
12-13	42.2	42.3	42.9	44.2	44.1	44.4	43.3	42.9	43.1	43.5	42.0	39.6	42.9	43.7	43.4	41.5
13-14	42.6	42.0	43.1	45.7	48.0	47.9	47.5	45.5	44.7	43.9	42.1	39.9	44.4	47.2	44.3	41.7
14-15	42.4	42.3	43.7	47.1	50.1	49.7	48.7	48.1	45.7	43.1	39.7	40.2	45.1	49.1	44.9	41.2
15-16	43.3	43.2	44.5	47.9	50.5	49.5	50.0	48.2	46.2	43.4	41.3	41.4	45.8	49.6	45.5	42.3
16-17	44.1	43.8	45.7	48.4	48.9	49.0	49.2	47.9	44.9	43.8	41.4	42.6	45.8	48.7	45.7	43.0
17-18	43.1	43.3	47.1	45.8	45.6	46.6	46.6	45.1	42.5	41.7	40.6	42.9	44.2	46.0	44.3	42.5
18-19	41.7	40.9	44.0	41.6	39.6	41.9	42.4	39.9	37.7	39.0	38.3	40.8	40.7	41.0	40.6	40.4
19-20	39.7	38.9	40.0	38.5	35.9	37.8	37.4	35.2	34.3	35.0	37.1	38.8	37.4	36.6	37.0	38.6
20-21	38.4	37.7	37.5	37.2	33.3	34.3	34.7	32.2	32.4	34.6	36.7	37.0	35.5	33.6	35.5	37.4
21-22	38.0	37.6	35.7	35.5	32.4	33.5	33.6	31.9	32.9	34.9	36.7	35.9	34.9	32.8	34.7	37.0
22-23	38.2	37.8	35.3	34.1	32.3	33.3	34.1	32.4	34.1	35.8	37.0	35.8	35.0	33.0	34.8	37.2
23-24	38.7	38.2	35.5	34.1	33.6	33.7	34.5	33.4	35.4	35.7	37.1	36.0	35.5	33.8	35.2	37.5
MEANS	41.0	40.5	40.5	40.4	39.8	39.7	39.8	39.5	39.2	39.2	39.3	39.2	39.8	39.7	39.8	40.0

MEAN VALLES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY-ALL CAYS

TABLE 39 MEANCOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEE	MAR	APR	MAY	JUN	JUL	AUG	SEF	OCT	NOV	DEC	YEAR	SUMMER	EGUINOX	WINTER
0-1	674	671	699	696	703	706	705	707	693	697	692	689	694	705	696	681
1-2	675	672	699	693	698	706	710	705	693	694	692	691	694	705	695	682
2-3	676	672	697	696	689	708	712	703	690	694	696	694	694	703	694	684
3-4	675	671	691	693	688	699	705	692	688	691	695	696	690	696	691	684
4-5	673	672	700	690	688	691	692	689	693	690	682	696	688	690	693	681
5-6	672	672	692	683	681	687	667	672	684	688	680	686	680	677	687	677
6-7	665	669	682	662	672	675	650	676	676	666	681	674	671	669	672	672
7-8	656	664	673	661	658	651	665	669	648	643	664	661	659	661	656	661
8-9	647	658	650	640	653	645	653	656	627	644	641	652	647	652	640	650
9-10	655	657	642	631	640	645	653	648	648	651	622	648	645	646	643	645
10-11	652	644	623	634	629	629	646	665	646	649	632	653	642	642	638	645
11-12	648	636	629	643	640	643	640	652	649	642	646	664	644	644	641	648
12-13	645	643	637	641	662	640	658	654	652	639	654	663	649	653	642	651
13-14	647	644	652	623	657	633	645	663	658	644	662	663	649	649	644	654
14-15	650	650	654	667	655	643	649	670	660	657	652	669	656	654	659	655
15-16	653	659	659	675	660	649	660	668	664	662	661	674	662	659	665	662
16-17	658	662	678	678	668	658	667	668	671	667	673	676	669	665	674	667
17-18	661	662	685	679	671	664	673	673	677	671	679	677	673	670	678	670
18-19	664	664	693	683	672	667	676	677	680	681	681	678	676	673	684	672
19-20	665	669	689	684	676	672	678	679	683	688	686	681	679	676	686	675
20-21	667	670	688	686	680	679	687	684	687	692	689	683	683	682	688	677
21-22	668	673	690	692	688	690	696	690	693	696	690	683	687	691	693	679
22-23	670	672	697	699	693	698	709	696	695	693	689	685	691	699	696	679
23-24	672	673	702	696	700	703	713	701	692	694	690	687	694	704	696	681
MEANS	662	662	675	672	672	670	675	677	673	672	672	676	672	674	673	668

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY-QUIET DAYS

TABLE 40 MEANCOK H = 13000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	265	264	261	275	282	298	291	300	281	282	291	291	282	293	275	278
1-2	265	268	266	278	283	299	287	299	286	286	294	295	284	292	279	280
2-3	267	270	269	278	283	298	294	295	286	288	296	295	285	293	280	282
3-4	267	272	271	276	281	295	291	289	291	288	296	295	284	289	282	283
4-5	267	273	273	279	281	291	291	291	292	288	296	295	285	288	283	283
5-6	265	272	272	280	282	288	289	289	291	288	295	296	284	287	283	282
6-7	267	269	273	281	282	287	288	290	288	288	294	294	284	287	283	281
7-8	266	269	274	281	282	285	288	292	272	289	293	293	282	287	279	280
8-9	264	269	274	281	287	281	287	292	272	289	292	291	282	287	279	279
9-10	263	270	275	285	287	283	283	290	294	289	292	291	283	286	286	279
10-11	264	271	273	284	287	282	277	287	292	291	292	292	283	283	285	280
11-12	264	272	275	277	288	288	283	291	291	291	292	293	284	288	283	280
12-13	266	273	278	274	289	292	293	296	291	291	297	294	286	292	283	282
13-14	266	272	280	279	289	292	299	296	289	291	298	298	287	294	285	283
14-15	263	269	279	278	286	288	291	294	283	290	295	297	284	290	282	281
15-16	264	264	274	271	275	280	293	289	274	283	291	297	280	284	276	279
16-17	258	256	266	256	260	273	282	275	264	269	283	293	270	272	264	273
17-18	251	247	254	243	249	260	268	265	258	256	274	286	259	260	253	265
18-19	250	239	241	241	240	258	260	257	251	251	266	279	253	254	246	258
19-20	252	241	238	244	246	258	257	257	257	258	266	275	254	254	249	258
20-21	255	246	239	250	250	259	257	265	265	269	272	273	258	258	256	262
21-22	258	251	241	254	263	263	259	268	277	275	278	278	264	263	262	266
22-23	261	257	245	262	274	275	277	277	287	281	283	283	272	276	269	271
23-24	263	262	255	273	280	283	290	291	286	282	289	291	279	286	274	276
MEANS	262	263	264	270	275	281	282	285	280	281	288	290	277	281	274	276

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION-QUIET DAYS

TABLE 41 MEANOOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	39.7	38.6	35.8	34.5	35.4	34.1	35.0	35.2	36.6	36.4	38.0	37.1	36.4	34.9	35.8	38.4
1-2	40.2	38.5	36.6	35.8	36.3	35.2	36.0	36.4	36.4	36.9	38.0	37.7	37.0	36.0	36.4	38.6
2-3	40.9	38.8	37.2	35.7	37.4	37.2	37.1	37.0	36.6	37.2	38.2	38.6	37.7	37.2	36.7	39.1
3-4	40.9	39.5	38.1	36.3	38.3	37.3	38.3	37.5	36.8	37.4	38.4	38.9	38.1	37.9	37.1	39.4
4-5	41.0	39.8	38.8	35.3	39.0	37.4	37.9	36.9	38.9	37.5	38.3	39.2	38.3	37.8	37.6	39.6
5-6	40.9	39.7	39.1	37.5	38.9	37.5	38.8	36.8	39.4	37.1	38.3	39.1	38.6	38.0	38.3	39.5
6-7	40.3	39.6	39.2	37.4	38.9	36.8	38.1	36.7	37.4	37.3	38.3	38.8	38.2	37.6	37.8	39.2
7-8	39.9	39.6	40.1	38.0	38.4	37.2	37.4	37.5	36.7	37.6	38.0	38.3	38.2	37.6	38.1	38.9
8-9	39.5	39.2	40.7	38.2	39.2	37.2	38.3	37.6	37.7	38.0	38.0	38.3	38.5	38.1	38.7	38.8
9-10	39.9	40.3	40.5	39.5	39.0	37.2	38.0	38.2	39.5	38.5	38.5	39.1	39.0	38.1	39.5	39.4
10-11	40.7	40.4	40.5	39.9	38.7	38.5	38.2	37.7	39.5	39.3	39.2	39.2	39.3	38.3	39.8	39.9
11-12	40.8	40.9	39.7	40.4	40.1	41.4	40.0	39.5	40.1	39.8	39.0	38.8	40.1	40.3	40.0	39.9
12-13	41.1	41.1	41.1	41.7	42.9	44.0	42.6	41.9	41.5	39.7	40.2	38.2	41.3	42.9	41.0	40.2
13-14	41.9	41.5	42.1	44.2	45.8	46.7	45.1	44.3	43.4	40.5	40.8	39.2	43.0	45.5	42.6	40.8
14-15	41.9	42.0	44.1	46.8	48.0	48.6	46.8	46.4	45.2	42.3	41.1	39.6	44.4	47.5	44.6	41.1
15-16	43.0	43.5	45.6	48.2	49.0	49.5	48.3	47.6	46.3	44.4	42.5	41.1	45.8	48.6	46.1	42.5
16-17	43.5	44.1	46.2	49.0	49.3	49.3	48.0	47.3	45.5	45.3	43.5	42.2	46.1	48.5	46.5	43.3
17-18	43.1	43.6	46.5	46.8	45.6	47.8	46.4	45.2	43.1	43.4	42.2	42.9	44.7	46.3	45.0	43.0
18-19	41.9	41.0	43.8	40.4	41.1	42.4	41.8	40.6	38.6	39.7	40.4	41.7	41.1	41.5	40.6	41.2
19-20	40.4	38.2	40.6	36.7	36.2	37.4	38.0	35.5	34.4	35.9	37.8	39.8	37.6	36.8	36.9	39.0
20-21	38.5	36.9	37.5	34.2	33.2	33.8	34.8	32.7	33.1	34.3	36.7	38.3	35.3	33.6	34.8	37.6
21-22	38.7	36.7	35.5	32.4	32.6	32.5	32.5	31.5	32.6	34.8	36.3	37.1	34.4	32.2	33.8	37.2
22-23	39.0	37.4	35.0	31.7	32.4	32.2	32.9	32.1	34.1	35.5	36.5	36.8	34.6	32.4	34.1	37.4
23-24	39.3	38.1	35.5	31.5	32.8	33.4	33.4	34.0	35.1	36.0	37.1	37.3	35.3	33.4	34.5	38.0
MEANS	40.7	39.9	40.0	38.8	39.5	39.3	39.3	38.6	38.7	38.5	39.0	39.1	39.3	39.2	39.0	39.7

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY-QUIET DAYS

TABLE 42 MEANCOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	665	667	681	680	681	686	695	691	677	682	678	681	680	688	680	673
1-2	665	666	680	681	677	689	686	686	677	680	677	681	679	684	680	672
2-3	666	665	681	680	675	690	683	687	677	679	677	680	678	684	679	672
3-4	665	665	681	680	674	684	684	684	677	678	677	679	677	682	679	672
4-5	666	664	679	681	675	682	685	682	679	675	677	679	677	681	679	672
5-6	666	665	677	680	674	679	671	681	676	677	677	678	675	676	677	672
6-7	666	663	676	675	672	675	674	680	680	677	677	677	674	675	677	671
7-8	665	663	674	671	668	672	675	679	664	672	677	676	671	673	670	670
8-9	663	659	675	665	668	664	669	675	659	667	677	669	667	669	667	667
9-10	663	660	674	663	667	664	650	671	678	672	674	664	667	663	672	665
10-11	661	662	671	669	670	659	646	670	678	672	673	668	666	661	672	666
11-12	662	663	670	668	672	671	658	678	676	672	669	670	669	670	671	666
12-13	660	663	671	663	673	670	674	681	677	671	672	669	670	675	671	666
13-14	661	664	673	664	674	668	681	679	677	673	673	668	671	676	672	666
14-15	658	663	675	669	673	666	682	677	676	675	676	670	672	674	674	667
15-16	658	664	676	671	672	663	680	676	677	676	679	677	672	672	675	670
16-17	659	664	677	673	671	661	673	677	677	676	680	680	672	670	676	671
17-18	662	663	677	673	666	658	671	674	676	675	680	682	671	667	675	672
18-19	663	661	683	669	662	657	668	669	673	672	680	682	670	664	674	672
19-20	664	664	670	668	660	659	667	666	676	671	681	681	669	663	671	673
20-21	664	667	672	670	661	661	669	671	678	675	681	681	671	666	674	673
21-22	664	668	673	674	666	664	672	677	682	677	680	680	673	670	677	673
22-23	664	667	675	677	674	671	684	681	684	677	679	679	676	678	678	672
23-24	664	668	676	681	679	677	696	683	681	677	678	679	678	684	678	672
MEANS	663	664	676	673	671	670	675	678	676	675	677	676	673	674	675	670

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY-DISTURBED DAYS

TABLE 43 MEANOOK H = 13000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	280	268	283	368	364	393	278	428	287	351	285	299	324	366	322	283
1-2	276	280	296	354	361	399	346	430	298	362	291	321	335	384	328	292
2-3	287	280	338	303	304	362	399	420	295	358	304	324	331	371	324	299
3-4	294	268	321	320	297	382	449	317	297	359	340	339	332	361	324	310
4-5	290	271	311	250	305	336	359	236	305	307	310	350	303	309	293	305
5-6	280	274	268	257	289	284	248	199	313	265	279	320	273	255	276	288
6-7	259	273	228	204	276	246	81	180	305	221	259	262	233	196	240	263
7-8	215	270	162	165	199	153	27	132	167	177	158	-77	146	128	168	141
8-9	226	268	111	105	243	106	134	47	91	159	18	164	139	132	116	169
9-10	233	254	74	12	229	62	58	22	145	143	-133	233	111	93	94	147
10-11	216	226	-75	15	147	49	9	41	96	136	-179	197	73	62	43	115
11-12	180	196	17	85	144	75	-11	-34	109	40	-79	216	78	44	63	128
12-13	197	205	114	70	132	19	53	88	163	81	76	217	118	73	107	174
13-14	226	245	78	-28	90	79	-2	209	153	152	78	235	126	94	89	196
14-15	236	268	62	86	156	158	80	197	222	203	147	282	175	148	143	233
15-16	240	272	151	111	209	208	133	254	209	181	195	291	205	201	163	250
16-17	240	250	200	156	247	247	235	224	238	155	251	278	227	238	187	255
17-18	240	250	208	197	252	264	290	226	246	196	273	268	242	258	212	257
18-19	243	240	203	231	258	272	276	251	249	206	262	248	245	264	222	248
19-20	236	239	207	266	267	282	279	267	254	225	263	251	253	274	238	247
20-21	238	244	232	305	268	295	281	269	262	276	271	266	267	278	269	255
21-22	244	254	246	353	296	325	321	287	288	301	281	269	289	307	297	262
22-23	258	257	283	328	307	343	299	303	304	314	286	274	296	313	307	269
23-24	264	260	313	339	348	362	291	331	309	321	287	284	309	333	321	274
MEANS	246	255	193	202	249	238	205	222	234	229	189	255	226	228	214	236

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION-DISTURBED DAYS

TABLE 44 MEANCOK D = 23.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	37.1	36.4	34.6	34.8	35.4	32.8	36.7	44.0	36.6	34.9	38.7	36.4	36.5	37.2	35.2	37.1
1-2	38.5	37.7	34.1	35.0	34.8	33.7	32.3	46.4	37.7	33.8	45.9	37.8	37.3	36.8	35.1	40.0
2-3	39.6	38.3	39.9	39.2	36.9	33.5	28.8	43.9	37.8	38.7	41.9	37.2	38.0	35.8	38.9	39.2
3-4	40.6	39.6	40.4	38.4	36.7	38.5	28.4	32.4	37.3	36.3	42.5	35.6	37.2	34.0	38.1	39.6
4-5	46.3	40.7	38.1	39.1	38.1	35.5	32.5	27.8	37.4	39.3	39.0	37.0	37.6	33.5	38.5	40.7
5-6	42.3	40.8	40.8	42.1	39.5	34.9	29.1	30.9	39.6	41.0	37.9	45.2	38.7	33.6	40.9	41.6
6-7	42.5	40.1	37.7	44.2	40.7	36.1	43.8	48.5	37.2	45.2	37.7	40.1	41.2	42.3	41.1	40.1
7-8	40.4	40.5	40.4	39.2	38.9	36.6	34.4	41.4	45.9	43.5	37.9	36.9	39.7	37.8	42.2	38.9
8-9	42.1	42.8	42.8	40.2	38.0	37.7	38.2	45.4	43.6	48.9	35.8	36.0	41.0	39.8	43.9	39.2
9-10	45.0	41.7	47.0	38.6	37.2	37.2	45.6	48.5	41.9	46.9	62.7	41.5	44.5	42.1	43.6	47.7
10-11	42.5	45.5	47.9	50.0	43.9	39.8	49.3	51.3	46.3	42.6	51.2	40.9	45.9	46.1	46.7	45.0
11-12	45.8	48.1	52.6	49.6	49.1	51.8	51.0	64.7	47.3	46.7	43.7	46.0	49.7	54.2	49.0	45.9
12-13	45.8	44.5	44.7	52.3	49.4	49.0	48.7	48.4	48.0	50.2	47.3	43.4	47.6	48.9	48.8	45.2
13-14	44.0	40.9	44.3	48.0	54.2	52.3	56.7	46.9	51.2	48.4	49.2	41.6	48.1	52.5	48.0	43.9
14-15	44.1	42.8	47.3	43.2	52.6	52.0	49.1	50.6	47.9	40.1	34.3	42.0	45.5	51.1	44.6	40.8
15-16	42.0	42.8	37.8	46.1	52.4	48.0	54.0	49.0	45.8	39.2	38.3	42.0	44.8	50.9	42.2	41.3
16-17	42.6	41.2	38.6	50.1	47.2	48.0	52.0	49.1	41.8	42.8	36.8	43.1	44.4	49.1	43.3	40.9
17-18	41.0	41.3	46.9	46.1	45.3	47.3	45.8	47.6	39.7	40.6	37.4	43.6	43.5	46.5	43.3	40.8
18-19	40.9	39.8	40.6	40.8	38.0	41.4	43.7	38.7	34.6	37.3	37.9	39.8	39.5	40.4	38.3	39.6
19-20	38.8	38.8	35.3	39.3	36.7	39.6	36.7	36.1	32.7	28.9	37.9	36.5	36.5	37.3	34.1	38.0
20-21	38.4	37.4	37.1	43.9	33.7	38.8	34.9	33.0	30.6	34.9	37.7	35.3	36.3	35.1	36.6	37.2
21-22	37.1	37.6	35.4	42.3	33.1	38.8	36.2	34.1	31.6	35.9	38.0	34.4	36.2	35.6	36.3	36.8
22-23	36.9	37.9	35.6	37.5	32.9	37.3	38.7	34.8	33.1	37.1	38.5	35.0	36.3	35.9	35.8	37.1
23-24	38.5	38.1	36.6	37.1	33.9	36.4	39.1	35.8	34.3	35.6	39.1	36.1	36.7	36.3	35.9	37.9
MEANS	41.4	40.6	40.7	42.4	40.8	40.7	41.1	42.9	40.0	40.4	41.1	39.3	40.9	41.4	40.9	40.6

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY-DISTURBED DAYS

TABLE 45 MEANOOK Z = 58000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	692	673	722	692	723	731	730	750	701	698	697	703	709	734	703	691
1-2	698	681	739	670	723	719	745	743	704	685	718	721	712	733	700	704
2-3	705	683	718	672	699	730	728	740	699	668	721	733	708	724	689	710
3-4	707	679	698	644	699	723	718	669	680	663	721	745	696	702	671	713
4-5	691	683	734	646	701	707	646	671	700	683	649	739	687	681	691	690
5-6	689	685	704	661	684	712	623	642	675	679	654	691	675	665	680	679
6-7	660	680	679	636	662	692	667	678	667	655	670	646	666	675	659	664
7-8	625	673	708	666	648	646	721	640	575	585	629	614	644	664	633	635
8-9	595	663	643	636	672	653	695	633	576	591	584	663	633	663	611	626
9-10	637	657	674	624	651	636	699	646	644	613	508	651	637	658	639	613
10-11	621	620	608	643	578	559	629	691	639	605	564	630	616	614	624	609
11-12	603	570	594	632	615	579	589	582	584	564	625	653	599	591	593	613
12-13	584	600	592	665	682	598	656	599	612	573	652	635	621	634	610	618
13-14	602	618	630	560	637	540	587	634	586	572	673	642	607	599	587	634
14-15	613	642	608	713	621	569	569	671	587	615	593	669	623	608	631	629
15-16	617	654	619	719	618	594	609	674	623	634	628	677	639	624	649	644
16-17	641	648	686	697	652	641	649	658	650	662	666	676	661	650	674	658
17-18	652	654	700	690	674	668	676	678	674	685	694	679	677	674	688	670
18-19	664	664	737	708	677	680	691	699	687	701	703	683	691	687	708	679
19-20	672	670	725	713	689	695	700	698	696	719	712	695	699	695	713	687
20-21	682	673	705	701	701	715	716	695	700	723	713	701	702	707	707	692
21-22	682	680	696	703	725	739	741	704	714	728	714	697	710	727	710	693
22-23	686	679	721	711	731	746	758	714	718	705	708	699	715	737	714	693
23-24	696	685	747	667	743	736	725	734	714	704	713	703	714	735	708	699
MEANS	655	659	683	670	675	667	678	677	659	655	663	681	668	674	666	664

THREE-HOUR RANGE INDICES, MEANOOK, 1970

Table 46

	January D	January H	January K	February D	February H	February K
1	0110 2312	1211 2322	1212 2322	1300 0112	1211 0212	1311 0212
2	1453 4323	1466 6433	1466 6433	2324 4222	1225 5223	2335 5223
3	1332 2101	2232 2212	2343 2212	2101 1100	2112 2112	2113 2112
4	0001 0011	0022 1111	0022 1111	0012 3221	1124 4322	1124 4322
5	0102 1120	0012 2112	0112 2122	1300 2222	2311 3212	2311 3222
6	1001 1110	2111 1111	2111 1111	0120 0000	1131 0111	1131 0111
7	0100 0122	1111 1221	1111 1222	0000 0010	1000 1221	1000 1221
8	0112 1210	1102 1211	1112 1211	0000 0100	0000 1211	0000 1211
9	2232 1210	2232 1111	2232 1211	0020 0110	0110 1211	0120 1211
10	2100 1110	2111 1211	2111 1211	0020 1220	0110 1212	0120 1222
11	0110 1011	1111 1211	1111 1211	0010 0110	1011 0112	1021 0112
12	1121 0111	2211 1222	2221 1222	0000 0111	1000 1111	1000 1111
13	0010 1101	1111 2111	1111 2111	0110 2120	1111 2211	1111 2221
14	0211 1210	1221 1212	1221 1212	0213 3210	1214 2211	1224 3221
15	1110 0111	2111 2221	2111 2221	0233 1111	1134 1221	1234 1221
16	2234 4412	2135 4323	2235 4433	0021 1100	1012 2111	1022 2111
17	2421 0111	3431 1111	3431 1111	0002 1232	1002 1332	1002 1332
18	0221 0110	1333 1211	1333 1211	1222 1221	2332 3221	2332 3221
19	0001 1211	1111 2212	1111 2212	0011 1111	1121 1212	1121 1212
20	1002 2121	2111 3222	2112 3222	0000 0110	1001 1111	1001 1111
21	0031 2100	1222 2222	1232 2222	0010 0010	1111 1211	1111 1211
22	0000 0111	2111 1211	2111 1211	0000 0121	1101 1111	1101 1121
23	0121 1111	1121 1211	1121 2211	0000 0010	1100 1221	1100 1221
24	0023 1111	1134 2111	1134 2111	0020 1331	1120 2421	1120 2431
25	0000 0110	1110 0111	1110 0111	0010 0110	0111 0111	0111 0111
26	0110 0111	1111 0211	1111 0211	0132 4210	1133 5411	1143 5411
27	0011 1221	1211 1232	1221 1232	0122 0221	0132 2222	0133 2222
28	1000 1101	2000 1201	2001 1211	3233 2221	3224 3323	3234 3323
29	1300 0310	2511 0111	2511 1311			
30	0142 1332	2243 1222	2243 1332			
31	2100 0110	2101 1221	2111 1221			

	March D	March H	March K	April D	April H	April K
1	1345 4421	3367 5523	3367 5523	1110 2022	3211 1213	3211 2223
2	2335 2121	3346 3212	3356 3222	0111 1221	2221 3212	2222 3222
3	0022 1322	2154 3322	2154 3323	1352 2121	2474 3222	2474 3222
4	1134 4321	2145 5332	2245 5433	1032 3221	2152 3212	2153 3222
5	1021 1132	2132 2243	2132 2243	0013 2222	1134 3322	1134 3322
6	3143 1222	3254 2335	4264 2335	2345 3231	2467 4323	2567 4333
7	4345 3443	5456 5545	5456 5545	1333 2220	2254 2223	2354 2223
8	2356 7865	3578 8887	3578 8887	2213 2121	3224 2222	3234 2222
9	3443 3421	5545 6533	5545 6533	1234 4221	2256 7313	2266 7323
10	1011 1120	2232 1312	2233 2322	0000 2122	1000 1222	1000 2222
11	0000 0120	1000 2322	1000 2322	3234 2110	2334 2211	3335 3211
12	1033 2120	1135 1211	1135 3221	0130 1120	2231 2211	2242 2221
13	0023 2222	1125 3222	1135 3222	1011 2220	1111 2211	1111 2221
14	0000 1110	1111 0212	1111 1212	0001 2120	1001 1211	1001 2221
15	1122 0220	0122 2211	1133 2221	0021 1121	1021 1323	1032 1323
16	0001 1110	0011 1311	0011 1311	2340 1222	3441 2224	3451 2234
17	0000 2111	1111 1222	1111 2222	5435 2232	5566 4334	5566 4334
18	0003 2221	2113 2212	2123 2222	1105 5322	2126 6333	2126 6333
19	1020 2121	2111 1222	2121 2222	2466 3311	4667 5322	4677 5322
20	0000 2110	1111 2221	1121 2221	0313 5322	2323 6423	2323 6423
21	1100 0010	1111 1211	1111 1211	2367 7655	3476 8776	3477 8776
22	0021 2020	1112 1211	1122 2221	4645 2221	6766 2222	6766 2222
23	0022 1120	1012 1112	1022 1122	2233 3231	3224 5233	3234 5333
24	0000 1020	1011 0212	1011 1222	2332 3321	4443 4423	4443 4423
25	0000 1120	1011 1222	1111 1222	2323 2231	3354 4223	3354 4233
26	1100 1120	1111 1112	1111 1122	2111 2122	4211 3224	4211 3224
27	0013 2222	1025 3223	1025 3223	2331 2121	4443 2212	4443 2222
28	2436 3221	3577 4323	3577 4423	2131 2120	2131 1222	2131 2222
29	1440 2232	3553 4323	3553 4333	1121 2221	1122 2212	1133 2222
30	2154 4231	3355 4322	3355 5332	2353 2321	3465 3223	3465 3323
31	0256 5532	2377 7634	2377 7634			

THREE-HOUR RANGE INDICES, MEANOOK, 1970

Table 46

Day	May D	May H	May K	June D	June H	June K
1	1241 2232	2351 3223	2351 3233	2424 3321	3556 5432	3556 5432
2	2232 2231	3232 2222	3242 2232	2211 2221	4321 2223	4321 2223
3	1111 3332	2112 3333	2113 3333	1332 2231	3254 4233	3354 4233
4	1022 2221	2122 1223	2133 2223	3122 1121	3232 3222	3232 3322
5	1114 3221	2225 3223	2225 4223	1223 1221	3233 1212	3233 1222
6	1011 2221	2111 1222	2111 2222	1112 1121	2112 0211	2123 1221
7	2102 2221	3212 2322	3212 2322	0111 1223	0111 1235	0112 1235
8	1001 2221	2011 1322	2011 2322	3352 3221	4572 3213	4572 3223
9	1111 2220	2110 1212	2121 2222	2012 2221	2110 1122	2112 2222
10	1111 2120	1110 1212	1111 2222	1022 2221	2222 2113	2222 2223
11	0111 2121	1010 0223	1111 2223	2011 2121	2111 1212	2111 2222
12	2213 3232	4214 2333	4314 3333	1112 2131	2112 1212	2133 2232
13	2201 2121	3311 2212	3321 2222	1023 4220	1144 5222	1144 5222
14	1331 2232	2353 2334	2453 2334	2211 2231	3301 1324	3311 2334
15	3133 2221	4234 2222	4245 2222	2233 4221	3355 5334	3365 5334
16	1132 2221	2131 2223	2133 2223	2322 2221	3421 2222	3422 2222
17	1311 3221	3533 3222	3533 3222	1012 3232	2122 3333	2122 3333
18	1112 2120	2221 1111	2222 2121	3147 6322	3257 6534	3257 7534
19	1133 2221	1225 2322	1235 2322	2232 1121	3332 2223	3333 2223
20	1323 3211	3424 3123	3434 4223	2555 3312	4566 3444	4566 3444
21	2112 2232	3213 2223	3213 2233	4333 3212	5555 3322	5555 3322
22	1111 3221	3213 2222	3223 3222	1002 1221	2102 1212	2102 1222
23	1022 2131	2222 2223	2232 2233	2121 1121	2211 1212	2221 1222
24	2012 3221	2212 2212	2213 3222	1001 2221	2111 1323	2111 2323
25	2231 2211	3232 2222	3232 2322	2211 2120	3212 2212	3212 2212
26	0011 1121	1001 1212	1011 1222	1242 2232	2344 3333	2354 3333
27	1221 2222	2133 3224	2233 3234	2364 5321	3376 7332	3376 7332
28	4216 7432	6337 7635	6337 7635	2323 2121	3215 3222	3325 3222
29	2353 2222	5465 2233	5465 2233	1221 2222	1221 2332	1221 2332
30	1334 2311	3346 2322	3356 2322	1031 2220	1132 2212	1153 2222
31	1122 2221	1222 3322	1233 3322			

Day	July D	July H	July K	August D	August H	August K
1	1332 3221	2243 3322	2343 4322	1112 2221	3212 1223	3213 2223
2	1253 2221	2276 4223	2276 4223	2112 2121	2212 1212	2212 2222
3	1335 2223	2467 2326	2467 2326	0111 2121	1102 2212	1112 2222
4	4443 2120	7564 1121	7575 2121	0011 1131	1111 1212	1111 1232
5	1531 2221	3553 3324	3553 3324	1111 1121	2211 1212	2211 1222
6	2343 3120	3565 4111	3565 4121	1012 1221	1112 1332	1113 1332
7	1011 1121	1111 1223	1121 1223	2111 2232	3111 2233	3111 2233
8	1211 1123	1321 3125	1321 3125	2257 4232	3476 7243	3477 7243
9	3646 7633	4866 7747	4867 8747	4333 3221	5555 3222	6555 3222
10	4111 3442	7222 3543	7222 3543	0132 2221	3234 4222	3234 4222
11	2131 3221	3223 3223	3233 3223	1322 2231	3234 3213	3344 3233
12	3222 2231	4354 3223	4354 3233	2422 2032	3522 2222	3533 2232
13	3322 2221	3222 1223	3322 2223	1122 2232	2222 2332	2222 2332
14	2232 1131	2332 1222	2343 1232	1121 1221	2211 1332	2221 1332
15	1113 1121	2212 2212	2223 2222	1121 1131	2211 1333	2221 1333
16	1011 2220	3101 3212	3111 3222	1221 2224	3222 2325	3322 2325
17	1001 1221	2101 2222	2101 2223	4666 4433	5877 6544	5877 6544
18	1202 2120	2202 1112	2302 2122	4655 5322	6766 6544	6766 6544
19	1102 2221	2102 1213	2103 2223	3333 2221	5325 3222	5435 3222
20	2111 1131	1101 0224	2111 1234	0022 2121	1132 2212	1132 2222
21	2324 4332	3526 6443	3526 6443	1012 2121	1112 1211	1112 2221
22	1233 2222	3244 1325	3255 2325	1112 3221	1113 5122	1113 5222
23	2231 2121	5232 2222	5242 2222	0232 2221	2443 2222	2543 2222
24	3452 3333	5562 3325	5562 4335	1101 2022	1111 1221	1111 2222
25	5685 5224	7887 6446	7887 6446	1222 2222	1223 3323	1233 4323
26	5454 3222	6666 5223	6666 5223	1346 5321	2465 5323	2466 5323
27	1333 2222	2534 3323	2544 3323	2322 2212	3433 4413	3433 4423
28	1011 2221	2111 2223	2111 2223	0121 2222	2232 3233	2232 3333
29	2576 8431	3786 7732	3787 8732	2333 3221	3334 2222	3334 3222
30	1322 2222	2312 2223	2322 2223	1321 2221	2221 1221	2321 2221
31	2433 2222	3545 2234	3545 2234	0234 3332	1255 3332	1255 3332

THREE-HOUR RANGE INDICES, MEANOOK, 1970

Table 46

	September D	September H	September K	October D	October H	October K
1	0055 3332	1167 4233	1167 4333	1321 2231	2111 1233	2321 2233
2	2114 2332	3227 3332	3227 3332	2002 2231	2112 2323	3113 2333
3	0334 4321	1445 5423	1445 5423	1312 2322	2211 2223	2312 2323
4	1142 3321	2243 3223	2243 3323	4343 2321	3655 4332	4655 4332
5	1211 2222	2211 2322	2211 2322	2232 2221	2243 1222	2343 2222
6	1100 1232	1211 2232	1211 2232	1121 2121	1122 1122	1122 2122
7	1011 2222	2012 3322	2012 3322	0021 1120	1121 1222	1121 1222
8	0032 2131	1133 3222	1143 3232	0010 1121	1000 0221	1010 1221
9	0121 2221	1111 1211	1121 2221	0010 1121	1010 0221	1010 1221
10	2311 1210	2311 1221	2321 1221	0151 1221	1061 1222	1161 1222
11	0000 1121	1100 1222	1100 1222	3254 3222	3365 4232	4365 4332
12	1332 1211	2252 1221	2352 1221	3453 1110	5555 2211	5555 2211
13	0346 5322	2316 6324	2356 6334	0331 3211	1241 4221	1341 4221
14	3124 4322	3236 4423	3246 5423	0231 1221	2232 1221	2242 2221
15	3322 2211	3332 2322	3333 2322	1111 1110	1111 1221	1121 1221
16	1332 2121	2242 2222	2342 2222	0006 4442	1118 6555	1118 6555
17	0341 2221	1342 1221	1442 2221	1244 5434	2255 5554	2355 5554
18	0241 1121	2242 1222	2252 1222	5553 2221	5664 3322	6664 3322
19	0333 2232	1455 3323	1555 3333	0242 1110	2373 2222	2373 2222
20	1444 2222	2345 3223	2445 3323	0243 1110	1345 3111	1345 3111
21	3342 3221	3365 4333	3365 4333	0000 1110	0000 0221	0000 1221
22	3423 2211	2333 2322	3434 2322	1232 4323	2345 4225	2355 4335
23	1033 1221	2135 2221	2135 2221	3435 3332	3656 4543	3656 4543
24	1221 1120	1222 1221	1222 1221	2453 2110	3564 3222	3564 3222
25	0343 1121	1353 1221	1364 1221	1231 2120	1231 3321	1241 3321
26	0221 1221	1222 1221	1222 1221	0102 1110	1112 1111	1112 1111
27	1354 2221	2465 3323	2465 3323	0011 1111	1010 1211	1010 1211
28	2100 1222	3212 2222	3212 2222	1221 2222	2331 2123	2331 2223
29	0020 1112	2111 0213	2121 1213	1222 2232	2222 2223	2232 2233
30	0211 1221	2221 2222	2221 2222	3201 1110	2112 2221	3312 2221
31				0122 1110	1122 1111	1123 1111

	November D	November H	November K	December D	December H	December K
1	0001 0100	1011 1111	1011 1111	0000 0110	1010 1211	1010 1211
2	0022 2111	0033 2101	0044 3111	0000 1121	1000 1221	1000 1221
3	0122 1201	1122 1112	1122 1222	1022 0111	1132 0211	1133 0211
4	1032 1211	2132 1112	2132 1212	0021 1111	0021 1212	0021 1212
5	1332 2121	2232 1223	2342 2223	2233 1310	1233 1211	2233 1311
6	1353 3211	1354 5212	1354 5212	1142 2200	1143 3211	1244 3211
7	4566 5322	5687 6533	5687 6533	1111 3122	1022 3122	1154 3222
8	2212 1110	3223 2211	3223 2211	4344 3321	5466 5222	5466 5322
9	0232 2210	1244 3222	1244 3222	1212 1110	1223 2111	3444 4211
10	1324 3321	2315 4532	2325 4532	0011 2110	1122 2111	1223 2111
11	3434 2311	2356 3322	3456 3322	0110 0110	0110 0111	0122 2111
12	1343 2210	1254 4211	1354 4311	1100 0110	1110 0210	1111 0210
13	2222 2211	1232 3212	2232 3222	0011 2111	1022 1211	1032 2211
14	1121 0210	2232 1221	2232 1221	2575 4333	3596 5454	3596 5454
15	0002 1121	0002 1212	0002 1222	3333 2220	3255 4321	3455 4321
16	0002 2210	1002 1211	1002 2211	1110 1120	1112 1211	1112 1221
17	1101 1110	1212 1211	1212 1211	1001 1110	1111 1111	1111 2111
18	0021 3323	1121 4415	1121 4425	0010 0111	0110 0212	0111 0212
19	4532 0110	5542 1111	5542 1111	0033 0121	1134 0122	1144 0122
20	0000 1110	1010 1211	1010 1211	1234 2120	1135 3220	1255 3220
21	2248 7321	1167 7532	2268 8532	0122 1110	1132 1101	1133 1111
22	2444 3222	2445 3332	2455 3432	2131 1010	1121 1201	2132 1211
23	3345 4321	2357 5532	3357 5532	2211 1111	1112 1111	2213 2211
24	0111 1221	1232 2322	1232 2322	3322 1211	3421 1211	4422 1211
25	1113 2321	1225 2332	2225 2332	0000 1120	1000 1111	1000 1121
26	1211 1211	1112 2222	1212 2222	0210 0121	1111 0111	1211 0121
27	1122 3211	2123 3222	2133 3222	0102 1212	0112 2213	0112 2213
28	1321 2211	1312 2211	1322 2211	2212 2221	2324 4343	2324 4343
29	0110 0111	1111 1111	1111 1111	2131 0322	2141 2222	3142 2322
30	0010 0011	1000 0110	1010 0111	2411 1321	3411 2311	3411 2321
31				0000 0110	1101 1211	1101 1211

PUBLICATIONS of the EARTH PHYSICS BRANCH

VOLUME 44 – NO. 7

record of observations at st. john's magnetic observatory 1970

G. A. BROWN

DEPARTMENT OF ENERGY, MINES AND RESOURCES

OTTAWA, CANADA 1973

record of observations at st. john's magnetic observatory 1970

G. A. BROWN

Geographic Coordinates 47°35.6′N; 52°41′W
Geomagnetic Coordinates 58.7′N; 21.4°E
Officer in Charge: G.A. Brown

Introduction

The magnetic observatory at St. John's, Newfoundland, began operation on August 1, 1968.

The observatory is operated by
The Division of Geomagnetism
Earth Physics Branch
Department of Energy, Mines and Resources
Ottawa, Canada.

Copies of the magnetograms may be obtained from the above address, or from
World Data Center A, Geomagnetism
NOAA
Boulder, Colorado 80302
U.S.A.

A description of the location, buildings and equipment is given in the 1968-1969 St. John's report.

Variometers

A set of Ruska photographic variometers records the horizontal intensity H, the declination D, and the vertical intensity Z of the geomagnetic field, with a paper speed of 20 mm per hour. The Ruska recorder drum is driven by a 100-volt synchronous motor, with power and time marks supplied by a Sprengnether crystal clock. A floating battery supply prevents loss of trace due to electrical power failures.

The scale values of the Ruska variometers were checked regularly using the Helmholtz coils provided. The accuracy of the scale value calibrations was improved by use of a digital ammeter. For convenience, the calibrating controls were located in the office building. In May 1970 the D suspension fibre was replaced. The scale values adopted for 1970 are listed with the adopted baselines.

A three-component fluxgate magnetometer (Serson, 1957) with its sensor in the variometer building provides a visible record of H, D, and Z on a chart recorder in the office building. Paper speed is 20 mm per hour. Whenever one of the traces goes off-scale during a large magnetic disturbance, the scale value is automatically changed, by means of relays, from 4γ/mm to 8γ/mm. In December 1970 the sensitivity was changed to 16γ/mm and 32γ/mm.

Digital magnetometer

In December 1969, a digitally recording magnetometer system was installed in the variometer-absolute building. It records values of D, H, Z and F once per minute, on digital magnetic tape, in a format which can be read directly by a computer.

The elements D, H, and Z are derived from three fluxgate sensors mounted inside a Helmholtz coil system. One pair of coils continuously nulls H, and the second pair Z, so that the fluxgate operates in essentially zero field. A proton precession magnetometer with its sensor 3 m from the fluxgates, measures F.

Voltages proportional to the absolute values of the magnetic north, magnetic east, and vertical components are sampled in quick succession by a digital voltmeter each minute. Then follows a measurement of F by the proton magnetometer. The four readings are recorded on digital magnetic tape, together with the date, time and station identification. The variations in D, H, and Z are also recorded continuously by a strip-chart recorder.

Absolute instruments

A portable fluxgate magnetometer (Serson and Hannaford, 1956) is used to determine the declination and inclination. A Barringer nuclear proton precession magnetometer (4257.60 cps/oersted) is the primary standard of total intensity (F). A set of three quartz horizontal magnetometers Nos. 680, 681, 682 is the standard for horizontal intensity. A second portable (D, I) fluxgate was used for comparisons and for the St. John's magnetic repeat station program.

Absolute observations and baseline values

A series of absolute observations is made once a week, and simultaneous readings are taken from the digital magnetometer (AMOS) for comparison and baseline control. Baseline values for vertical intensity are computed by the formula $Z = F \sin I$.

In the 3 or 4 days following the change of the D suspension fibre, May 3, the D baseline drifted appreciably. D baseline values adopted for these days may be in error by as much as 4 minutes.

Following are the adopted baselines and scale values for 1970:

St. John's 1970

	H Baselines γ	H Scale Values γ/mm
Jan.	17362 to 17356	6.30
Feb. 1, 2	17362 to 17356	6.30
3-28	17445 to 17442	
Mar.	17442 to 17439	6.30
Apr.	17439 to 17436	6.30
May	17435 to 17431	6.30
June	17431 to 17427	6.30
July	17426 to 17419	6.30
Aug.	17419 to 17414	6.30
Sept.	17414 to 17412	6.30
Oct.	17412 to 17405	6.50
Nov.	17404 to 17393	6.50
Dec.	17393 to 17388	6.50

St. John's 1970

	D Baselines γ	D Scale Values mins./mm
Jan.	332°53.7′ to 332°51.6	0.98
Feb.	332°51.5′ to 332°49.6	0.98
Mar.	332°49.5	0.98
Apr. 1-17	332°49.6′ to 332°49.7	0.98
18-30	332°49.6′ to 332°49.0	
* May 1	332°49.0	0.98
2-31	333°05.6	
June 1-3 (1500)	333°05.6	0.94
3(1500)-30	332°50.6′ to 332°51.9	
July	332°51.9′ to 332°52.7	0.94
Aug.	332°52.7′ to 332°52.8	0.94
Sept.	332°52.8′ to 332°53.1	0.94
Oct.	332°53.1′ to 332°54.0	0.97
Nov.	332°54.1′ to 332°55.3	0.97
Dec.	332°55.3′ to 332°56.5	0.97

*D suspension fibre replaced. Baseline changes May 1(1700); May 2 (1221); May 3(1221).

St. John's 1970

	Z Baselines γ 50,600γ+	Z Scale Values γ/mm
Jan.	27γ to 23γ	7.90
Feb.	23 to 20	7.90
Mar. 1-20	20 to 19	7.90
21-31	20	
Apr. 1-7	21	7.90
8-18	22	
19-30	21 to 20	
May 1-26	19 to 17	7.90
27-31	18	
June	18 to 19	7.90
July	20	7.90
Aug.	20 to 21	7.90
Sept. 1-21	22 to 23	7.90
22-30	22 to 21	
Oct.	21 to 19	8.00
Nov.	20	8.00
Dec.	21	8.00

Notes on the tables

Universal Time (U.T.) is used throughout.

Tables 1-36 contain the mean values of H, D, Z for intervals of 60 minutes centred on the half hour. Tables 37-45 contain mean values of the magnetic element for the month, for the year, and for summer, equinox, and winter for all days, for international quiet days and for international disturbed days. Table 46 lists three-hour range indices and K-indices for St. John's. Lower limit of K9 is 750γ. The K-indices are sent monthly to the International Association of Geomagnetism and Aeronomy. Copies of three-hour indices and magnetograms were supplied on request to a number of scientific institutions.

Mean annual values

Year	D		H	Z	X	Y	I(North)		F
	°	'	γ	γ	γ	γ	°	'	γ
1968.8	333	02.2	17436	50769	15541	−7906	71	02.7	53680
1969	333	09.9	17503	50777	15619	−7901	70	58.8	53709
1970	333	16.7	17598	50788	15719	−7913	70	53.3	53750

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HORIZONTAL INTENSITY

TABLE 1 ST JOHN S — H = 17000 PLUS TABULAR VALUES IN GAMMAS — JANUARY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		570	569	569	568	566	569	565	570	574	574	571	565	556	551	549	552	551	552	559	574	576	581	581	577	566
2	D	570	564	557	552	532	557	562	555	572	592	577	563	533	538	536	526	538	552	557	545	539	546	551	543	552
3		550	557	560	556	557	557	557	552	556	559	562	557	545	537	539	542	545	546	554	558	559	556	559	564	554
4	Q	564	564	564	563	562	563	562	564	564	559	558	557	554	552	552	557	563	562	565	569	569	564	557	564	561
5		562	563	563	563	563	563	569	573	570	563	557	559	558	554	553	563	570	570	569	569	573	572	570	567	565
6		561	563	564	563	562	561	563	563	562	564	563	559	554	547	551	561	569	570	563	563	563	563	568	570	562
7		568	568	563	567	563	564	566	567	569	570	570	568	563	559	559	569	576	575	563	553	561	565	563	567	566
8		569	568	566	563	563	562	563	565	564	564	565	564	563	563	562	566	574	569	570	566	569	570	573	570	566
9	D	549	555	551	555	549	548	552	554	558	562	562	557	550	544	545	552	559	566	562	564	567	567	562	559	556
10		554	557	568	562	562	562	563	567	567	568	567	557	554	549	550	555	560	561	562	568	569	569	571	570	562
11	Q	569	568	567	563	562	562	562	567	568	568	563	561	552	542	537	543	551	561	568	569	574	574	574	569	562
12		576	560	558	561	557	558	562	565	568	568	566	558	555	554	552	557	562	565	569	574	575	567	573	572	564
13	Q	568	569	567	567	566	562	562	568	569	568	566	556	548	538	531	539	548	566	571	573	574	573	572	566	562
14		565	566	561	564	559	553	561	561	563	564	561	552	541	530	529	537	548	561	568	574	574	578	580	577	560
15		571	573	567	566	562	565	568	572	569	572	569	562	554	547	544	552	559	568	573	576	578	578	575	571	566
16	D	568	569	561	559	558	554	553	552	572	579	559	543	534	517	506	510	523	529	542	549	542	542	535	520	545
17	D	517	523	518	523	535	531	542	554	554	555	554	546	534	528	516	517	524	534	542	552	552	561	561	561	539
18		555	554	556	555	554	553	552	553	555	555	554	553	548	546	541	544	546	553	555	560	565	566	566	568	554
19		571	567	567	567	566	570	570	572	570	567	565	561	555	547	539	531	536	544	547	558	560	554	558	559	558
20		560	558	560	561	565	566	567	572	573	572	571	560	547	529	527	532	541	547	559	567	553	555	560	565	557
21		566	565	565	566	566	565	563	567	572	570	572	565	554	540	535	543	548	551	559	565	562	560	565	565	560
22		567	563	560	561	560	562	563	566	567	566	565	560	553	541	529	529	534	546	558	561	560	559	561	565	557
23		564	560	559	555	553	557	557	561	564	566	565	559	551	540	538	538	540	552	558	564	564	566	559	560	556
24		565	559	563	563	564	564	564	565	570	571	559	559	552	545	538	538	540	547	555	564	563	552	558	556	557
25	Q	558	559	559	560	563	559	559	562	564	564	560	554	545	540	535	540	547	554	559	565	570	571	572	576	558
26	Q	576	577	576	571	572	578	577	578	576	576	572	566	560	550	542	541	547	558	565	566	569	570	569	571	567
27		567	567	565	564	565	566	566	566	565	567	566	564	559	551	545	547	554	562	566	572	571	567	571	570	563
28		565	570	570	571	570	570	571	573	573	571	570	568	558	549	545	546	553	563	568	563	568	570	566	558	565
29		556	559	559	563	565	566	570	570	569	572	565	558	550	544	539	544	551	558	570	575	577	578	577	575	563
30	D	558	566	571	570	571	569	556	577	579	580	577	571	566	558	546	539	532	551	566	568	574	577	571	569	565
31		570	559	552	553	562	564	564	564	564	563	562	557	550	546	547	556	558	565	565	564	570	571	573	575	561
MEAN	A	563	563	561	561	560	561	562	565	567	568	565	559	552	544	541	544	550	557	561	565	566	566	566	565	560
MEAN	Q	567	567	566	565	565	565	565	568	568	567	564	559	552	545	539	544	551	560	566	568	571	570	569	569	562
MEAN	D	552	555	551	552	549	552	553	559	567	574	566	556	544	537	530	529	535	547	554	556	555	558	556	558	551

DECLINATION

TABLE 2 ST JOHN S — D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES — JANUARY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		14.3	14.3	14.3	13.9	14.3	16.3	16.0	14.5	15.2	15.0	15.2	15.4	15.3	12.3	11.4	9.4	7.3	7.1	8.5	10.5	11.4	12.0	12.2	13.6	12.9
2	D	10.6	12.5	13.5	16.4	13.2	17.2	17.6	15.1	13.5	14.0	13.3	11.3	5.7	2.1	3.9	4.4	7.2	9.4	11.3	14.1	15.4	11.9	15.6	19.0	12.0
3		15.4	15.2	14.6	12.2	13.4	13.5	14.4	12.3	11.0	11.6	12.5	13.4	13.1	12.1	9.5	8.1	7.6	8.3	9.2	9.8	10.5	11.4	12.9	12.8	11.9
4	Q	12.3	12.1	12.2	12.3	13.0	13.3	13.2	13.4	13.0	12.2	12.0	12.1	11.6	11.4	11.5	10.2	8.9	9.8	10.8	11.3	11.4	11.4	13.0	13.3	11.9
5		13.2	13.1	13.7	13.2	13.6	14.0	14.2	14.1	14.2	13.9	13.4	14.5	14.0	12.1	10.4	9.6	10.3	11.7	12.9	13.2	13.1	13.2	13.0	15.6	13.1
6		11.2	12.1	13.1	13.4	14.4	14.5	14.2	14.3	14.1	13.4	12.7	12.2	10.6	9.6	9.4	8.6	9.2	10.2	11.4	11.3	11.8	13.3	13.5	13.5	12.2
7		13.4	13.3	14.0	13.2	14.0	14.5	14.4	14.3	14.0	13.6	13.1	13.0	12.4	11.3	10.5	9.8	9.2	8.2	7.6	6.6	7.4	8.4	9.6	10.6	11.5
8		9.6	10.4	11.1	10.9	11.6	12.0	12.2	12.9	13.1	13.3	13.1	13.4	13.1	11.4	9.9	9.8	9.3	9.6	9.5	9.4	10.2	11.1	11.5	11.2	11.2
9	D	12.0	9.2	10.6	9.9	10.2	10.6	11.4	12.4	11.5	14.4	15.1	14.3	12.4	10.5	9.4	8.3	8.2	8.2	10.3	12.3	12.5	12.8	13.9	16.1	11.5
10		15.1	13.4	15.9	12.9	13.1	13.4	14.0	14.4	15.2	15.0	15.4	15.3	15.3	13.1	11.5	10.5	9.4	9.5	11.2	12.4	13.3	14.3	15.1	15.4	13.5
11	Q	15.5	15.2	14.3	13.3	13.3	13.1	14.1	14.6	14.4	15.3	15.2	15.1	14.3	12.3	9.5	8.6	8.4	9.5	10.9	11.4	11.4	11.3	11.2	10.5	12.6
12		15.3	10.9	11.4	10.6	10.9	11.7	11.8	11.1	11.1	12.2	12.3	11.5	10.2	8.6	7.2	6.1	5.4	6.6	8.5	10.2	10.6	11.2	12.4	13.5	10.5
13	Q	14.1	13.3	13.4	13.4	13.9	14.4	14.2	14.3	15.1	15.3	15.2	15.1	14.2	12.3	9.1	6.5	7.6	9.3	11.8	14.0	14.6	15.1	15.0	15.4	13.2
14		16.0	15.4	15.6	16.0	15.1	15.2	17.0	17.2	17.1	16.9	16.4	17.3	16.3	14.4	11.5	10.1	10.4	11.2	13.1	14.1	14.2	14.3	14.4	16.0	14.8
15		15.7	15.1	15.4	15.1	16.4	15.1	16.0	16.1	16.1	15.5	15.4	16.0	15.0	12.6	10.7	8.9	7.9	9.2	11.6	13.4	13.6	13.3	13.2	13.2	13.8
16	D	13.7	14.5	15.4	16.7	15.5	14.2	14.7	14.8	14.1	13.6	9.8	9.1	7.4	4.6	2.5	1.5	.4	-.1	4.6	5.2	5.5	6.1	9.4	9.6	9.3
17	D	16.1	14.9	15.2	13.0	12.7	16.1	14.9	11.5	12.2	11.1	10.8	11.1	10.9	9.5	8.2	6.3	4.9	4.3	5.5	5.6	7.2	8.3	9.4	10.0	10.4
18		9.6	13.0	11.1	11.5	11.5	12.1	10.4	13.1	12.1	11.1	11.1	11.6	11.8	10.1	8.4	7.9	5.5	5.8	6.4	7.9	8.5	8.8	9.2	10.2	9.9
19		10.1	10.1	10.4	10.9	10.7	10.3	10.9	10.7	10.2	9.9	10.0	11.2	10.9	9.2	7.9	6.5	5.8	5.3	6.1	7.1	7.8	10.0	9.8	9.8	9.2
20		10.1	9.9	10.2	9.9	9.0	10.0	10.5	11.0	11.1	10.9	11.1	12.9	11.8	9.4	5.1	4.9	4.3	6.6	8.1	9.6	11.0	12.3	13.1	14.5	9.9
21		14.0	13.3	12.6	12.7	12.6	12.0	11.8	12.9	13.1	12.4	12.6	13.4	14.7	12.7	11.0	10.1	9.0	10.0	11.5	12.5	13.3	14.2	14.0	15.3	12.6
22		17.4	15.0	15.4	15.5	15.2	15.3	15.5	15.9	16.1	15.6	15.4	15.6	14.6	13.8	12.2	11.0	9.5	10.3	11.8	13.6	14.5	15.1	15.5	16.2	14.4
23		16.0	15.6	19.2	18.8	16.3	15.7	15.0	14.4	15.6	16.3	15.6	16.1	16.7	14.4	12.7	10.8	10.5	10.2	10.5	12.1	12.8	12.9	13.3	14.3	14.4
24		15.6	15.2	15.1	15.1	14.9	15.0	16.1	15.9	17.5	16.9	14.9	15.4	16.1	13.9	12.2	10.7	10.2	10.4	12.1	14.4	14.9	17.1	16.8	17.6	14.8
25	Q	17.3	17.1	16.1	15.7	14.9	14.3	14.6	14.2	13.1	13.0	13.1	13.5	12.9	11.1	9.1	7.2	6.3	7.2	8.7	10.0	10.4	10.9	10.9	10.9	12.2
26	Q	10.9	10.1	10.4	10.0	9.2	9.5	9.9	10.1	9.9	10.4	10.6	10.9	10.8	9.8	8.3	5.8	4.7	5.6	7.8	9.3	10.1	10.8	11.1	11.8	9.5
27		11.8	11.7	12.6	12.6	12.3	12.6	12.7	12.8	12.7	13.9	14.6	15.3	13.9	12.5	9.9	8.4	6.7	5.8	6.9	7.7	7.6	8.9	11.5	12.7	11.2
28		12.1	12.4	12.3	11.9	11.9	12.1	12.6	12.9	13.4	13.4	13.8	13.7	13.3	11.8	10.1	8.6	6.5	6.7	7.5	8.7	9.6	10.6	11.3	13.6	11.3
29		13.0	12.8	13.1	12.7	12.6	12.6	12.5	15.4	13.1	13.4	13.2	13.2	12.3	11.2	10.8	10.7	10.6	11.3	12.3	12.6	13.3	14.3	15.1	16.2	12.8
30	D	17.5	17.0	16.4	16.5	16.9	17.2	14.4	17.6	19.0	18.3	17.6	18.2	18.3	17.2	15.7	13.4	10.6	9.7	9.6	11.9	15.3	16.3	18.2	20.9	16.0
31		22.1	23.6	23.5	20.7	18.2	17.2	16.9	16.6	16.3	16.8	16.3	16.2	15.9	15.0	13.4	11.4	9.4	9.7	11.1	12.2	13.2	14.2	15.1	15.3	15.8
MEAN	A	13.9	13.6	13.9	13.6	13.4	13.7	13.8	13.9	13.8	13.8	13.6	13.8	13.1	11.4	9.8	8.5	7.8	8.3	9.7	10.8	11.5	12.1	12.9	13.8	12.3
MEAN	Q	14.0	13.6	13.3	13.0	12.9	12.9	13.2	13.3	13.1	13.2	13.2	13.3	12.8	11.4	9.5	7.7	7.2	8.3	10.0	11.2	11.6	11.9	12.3	12.4	11.9
MEAN	D	14.0	13.6	14.2	14.5	13.7	15.1	14.6	14.3	14.1	14.3	13.3	12.8	10.9	8.8	7.9	6.8	6.3	6.3	8.3	9.8	11.2	11.1	13.3	15.1	11.8

VERTICAL INTENSITY

TABLE 3 ST JOHN S   Z = 50500 PLUS TABULAR VALUES IN GAMMAS   JANUARY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		287	290	291	291	287	278	283	286	283	285	285	283	281	285	292	291	294	294	292	291	285	287	287	286	287
2	D	295	292	289	261	260	268	283	254	216	269	276	278	283	292	288	289	302	317	310	301	301	306	282	288	283
3		294	292	293	293	295	293	286	290	283	284	282	284	283	282	286	290	298	301	299	294	291	285	283	286	290
4	Q	285	287	288	291	290	292	289	286	284	284	283	285	284	284	285	288	292	292	292	290	287	285	280	283	287
5		284	284	284	286	287	290	290	286	283	278	277	275	274	275	282	289	290	286	284	284	286	284	283	277	283
6		288	285	284	285	283	285	290	286	285	287	284	278	278	281	283	288	292	293	286	290	287	284	284	283	285
7		282	282	282	285	284	286	286	285	287	286	285	283	278	275	276	282	286	292	292	294	293	297	286	284	285
8		279	276	278	282	281	285	286	288	286	284	283	278	276	269	276	282	285	286	290	280	285	284	283	284	282
9	D	276	283	282	283	264	283	287	282	275	268	279	277	273	276	282	284	286	289	285	284	286	290	286	282	282
10		285	287	273	280	277	281	282	284	283	285	284	282	275	276	276	281	284	286	289	286	284	285	284	283	282
11	Q	283	283	282	281	281	283	283	283	285	283	285	283	282	281	285	283	284	283	283	281	283	285	290	293	284
12		270	278	284	282	283	282	282	282	277	278	277	281	283	283	289	292	289	286	285	284	283	285	290	285	283
13	Q	287	286	284	283	281	281	282	283	281	281	284	282	277	281	292	300	300	299	289	281	279	282	284	283	285
14		284	287	285	283	276	283	283	282	283	283	284	281	281	289	295	298	300	299	292	285	281	283	287	286	286
15		292	291	291	292	289	294	285	283	281	282	281	278	277	282	286	295	300	300	293	284	282	284	285	285	287
16	D	290	285	272	284	289	286	283	274	262	262	275	259	266	276	289	307	323	345	331	323	320	322	315	300	293
17	D	276	292	281	277	270	285	299	300	285	291	290	289	283	285	291	296	299	305	307	306	293	295	289	287	291
18		287	276	289	291	292	291	283	279	291	290	266	283	277	281	289	292	292	298	299	291	292	290	289	284	288
19		283	283	283	283	284	285	287	287	285	284	282	276	276	277	284	291	294	292	292	296	291	282	291	291	286
20		285	283	281	285	286	289	290	289	287	283	277	269	264	268	284	285	285	289	292	299	292	290	285	283	284
21		280	281	282	280	282	283	288	284	282	281	279	276	266	267	280	282	288	289	290	289	288	283	290	282	282
22		274	282	280	280	283	283	284	284	284	283	282	275	277	274	276	282	290	291	291	289	289	288	289	288	283
23		284	282	269	275	254	288	288	286	283	283	284	282	276	277	277	283	288	289	290	290	289	289	288	284	284
24		282	280	281	282	282	283	282	283	273	274	276	276	273	273	282	284	288	290	290	289	291	284	296	288	283
25	Q	285	284	283	282	280	281	283	286	285	288	288	283	276	280	283	284	286	290	288	284	284	286	289	289	285
26	Q	284	283	279	280	282	283	282	284	284	284	284	282	281	277	284	288	292	297	291	284	281	283	282	284	284
27		282	281	275	276	279	280	281	280	281	275	279	275	274	271	279	281	298	290	290	290	289	288	284	284	281
28		290	287	283	282	281	281	280	281	281	281	280	282	278	279	284	287	290	290	289	287	282	281	281	275	283
29		287	284	282	282	281	279	271	260	279	275	281	281	280	281	282	283	287	289	288	281	281	281	281	276	281
30	D	277	287	284	283	277	272	267	268	273	277	278	273	273	274	275	279	283	298	304	284	291	287	291	282	281
31		280	272	275	288	293	293	290	288	286	283	284	283	282	285	288	291	295	292	290	289	289	287	284	287	286
MEAN	A	284	284	282	283	283	284	284	282	280	281	282	279	277	279	284	288	292	295	293	290	288	288	287	285	285
MEAN	Q	285	285	283	283	283	284	284	284	284	284	285	283	280	281	285	289	291	292	288	284	283	284	285	286	285
MEAN	D	283	288	282	278	276	279	284	276	262	273	280	275	276	281	285	291	299	311	307	299	298	300	293	288	286

HORIZONTAL INTENSITY

TABLE 4 ST JOHN S   H = 17000 PLUS TABULAR VALUES IN GAMMAS   FEBRUARY 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		571	577	576	569	575	571	575	572	573	571	570	565	558	556	551	548	551	558	568	575	584	588	584	564	569
2	D	570	572	571	570	565	563	563	563	570	571	575	556	557	560	561	557	556	558	554	545	543	559	556	539	561
3		552	553	565	565	560	560	563	565	565	565	563	558	551	546	540	538	545	554	561	565	566	567	570	571	559
4	D	568	568	566	565	567	565	565	565	564	558	566	561	551	534	548	556	550	544	553	557	559	565	567	564	559
5		562	561	558	558	552	558	564	565	565	564	560	558	552	540	542	558	558	557	558	558	564	565	563	563	559
6		561	564	564	565	565	563	563	564	563	565	564	558	552	546	545	550	557	565	568	564	568	570	570	570	562
7	Q	570	570	570	570	570	571	570	571	569	565	559	553	545	540	541	545	552	562	568	572	573	575	577	577	564
8	Q	576	576	575	574	576	572	572	574	575	572	569	561	552	551	553	559	565	566	571	572	577	577	576	577	570
9		577	575	576	577	572	571	571	574	573	574	571	565	554	546	546	552	558	570	577	580	584	582	583	584	571
10		583	580	577	576	576	576	575	573	576	574	569	563	551	542	543	545	556	564	564	567	568	571	571	576	567
11	Q	576	576	575	573	572	571	575	576	575	575	565	552	541	537	539	539	540	552	562	567	572	576	576	576	564
12		576	576	576	576	577	576	576	576	576	576	570	564	559	551	552	556	561	564	567	576	577	581	581	581	571
13		581	582	582	583	581	576	576	579	583	581	576	576	577	576	577	572	570	571	574	576	578	583	583	583	578
14	D	583	581	576	574	557	561	571	574	575	574	565	564	563	554	544	545	551	555	564	573	577	577	577	576	567
15		577	576	569	569	570	569	562	569	574	576	571	570	570	564	559	554	553	552	557	561	571	581	583	578	568
16		577	576	576	576	576	577	577	580	583	531	573	564	558	557	556	562	564	569	570	570	571	573	569	571	571
17		576	576	576	575	576	576	577	578	581	578	577	576	564	550	545	541	544	560	570	568	557	558	557	564	567
18		564	563	566	568	567	566	567	563	565	564	563	556	544	532	520	536	549	556	563	570	569	571	563	563	559
19		568	570	569	570	570	571	575	572	572	572	568	556	539	531	526	528	536	550	564	575	575	575	575	576	562
20		575	576	575	575	575	575	575	575	575	571	567	558	549	545	544	547	550	561	568	569	570	575	577	580	567
21	Q	580	578	580	578	578	580	580	576	579	575	569	563	556	550	546	544	547	556	568	569	575	580	580	582	570
22	Q	581	582	580	582	581	581	582	582	581	578	575	564	551	544	537	538	545	558	569	572	572	575	578	581	569
23		581	582	582	582	582	581	582	582	582	582	575	566	555	544	543	545	551	562	570	577	587	588	587	582	573
24	D	587	583	581	583	577	582	585	588	589	583	581	575	566	558	556	553	545	574	573	580	582	585	587	587	577
25		589	589	587	589	589	594	594	594	591	587	575	563	544	538	531	531	541	556	575	584	587	589	589	588	575
26		587	581	575	576	576	575	575	574	572	583	582	569	543	531	532	520	535	542	549	557	563	569	570	575	563
27		574	572	572	573	574	574	573	569	570	575	574	573	567	550	543	539	543	548	556	579	579	571	569	561	566
28	D	549	559	552	557	562	562	562	562	563	564	555	549	550	554	550	537	549	550	560	574	575	584	581	580	560
MEAN	A	574	574	573	573	572	572	573	573	574	573	570	563	554	548	545	546	551	558	565	570	572	575	575	574	567
MEAN	Q	577	576	576	575	575	575	576	576	576	573	567	559	549	544	543	545	550	559	568	570	574	577	577	579	567
MEAN	D	571	573	569	570	565	566	569	571	572	570	568	561	558	552	552	550	550	556	561	565	567	574	573	569	565

DECLINATION

TABLE 5 ST JOHN S   D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES   FEBRUARY 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TC 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		15.3	16.4	15.6	13.5	12.4	12.4	11.4	11.2	11.1	11.1	11.2	11.3	11.2	9.6	7.9	6.3	5.3	6.0	8.0	10.1	11.4	12.3	11.7	10.2	10.9
2	D	11.9	14.1	15.7	16.5	13.6	18.0	17.9	18.0	15.7	15.8	14.7	12.6	10.7	11.9	11.7	10.2	9.0	7.8	9.2	10.0	14.5	17.3	13.5	22.8	13.9
3		17.7	17.5	16.7	15.8	16.6	17.0	16.7	16.9	17.2	17.4	17.8	16.9	16.4	15.8	14.7	13.8	13.9	14.5	15.1	15.8	16.4	17.2	17.8	18.2	16.4
4	D	18.2	18.4	18.3	18.9	18.7	19.4	20.4	21.2	23.1	22.1	21.2	21.3	19.2	14.2	12.9	15.4	15.6	16.3	16.7	18.2	17.8	22.2	21.3	20.7	18.8
5		21.3	21.7	22.7	24.3	19.4	20.4	21.9	22.4	21.9	22.1	20.5	20.3	20.5	19.1	15.6	16.8	17.3	18.6	19.1	19.4	19.3	20.3	23.0	22.7	20.4
6		20.2	20.0	19.2	18.2	17.6	18.2	18.2	19.2	19.1	18.7	18.2	17.8	17.1	15.9	14.5	13.3	13.5	14.5	15.1	15.4	15.9	16.7	17.3	17.6	17.1
7	Q	17.8	17.7	17.3	17.6	17.9	18.1	19.0	19.4	20.2	21.0	20.6	19.9	19.0	17.1	15.8	15.0	15.3	16.3	17.1	17.2	16.7	17.0	16.6	16.2	17.7
8	Q	16.1	15.9	15.8	15.7	15.1	15.6	15.9	16.6	17.1	17.0	16.8	17.1	17.1	15.2	12.9	11.1	10.8	11.5	12.7	14.2	14.0	14.1	14.9	15.3	14.9
9		15.2	15.0	15.5	15.3	14.9	15.1	14.8	15.9	17.6	17.1	16.7	17.2	17.7	16.3	12.9	9.9	8.8	9.1	11.8	13.8	14.9	15.8	16.4	16.9	14.8
10		17.2	17.0	16.9	16.7	16.7	16.0	16.7	17.2	17.7	18.7	18.4	18.6	18.6	16.8	14.4	9.7	6.9	7.7	10.2	12.8	13.2	14.5	15.5	16.5	15.2
11	Q	16.5	16.6	16.7	16.5	16.1	16.0	16.3	16.7	16.8	17.0	17.3	17.9	17.8	16.4	14.4	12.0	10.8	11.4	12.4	13.7	14.3	15.4	15.8	16.5	15.5
12		16.8	17.0	17.2	17.3	17.3	17.1	17.2	17.5	18.1	18.5	18.4	18.6	18.1	16.5	14.5	13.3	13.1	13.5	15.5	16.8	17.1	17.8	18.4	18.8	16.9
13		19.1	19.3	19.3	20.0	20.2	19.3	19.7	20.0	19.9	20.0	20.2	19.6	20.2	18.6	16.2	15.3	14.5	14.6	15.3	15.7	15.8	16.2	16.3	16.4	18.0
14	D	16.2	16.4	17.3	20.8	20.0	18.7	18.1	17.8	16.9	16.8	14.9	8.9	12.8	12.4	11.6	9.2	8.0	8.5	8.3	11.2	13.0	13.2	13.1	13.1	14.1
15		13.1	12.8	13.9	15.1	12.3	12.9	15.1	13.9	13.9	12.4	10.3	9.4	11.8	10.3	9.6	8.4	6.7	6.4	7.1	7.2	9.1	10.2	11.1	11.2	11.0
16		11.8	12.0	12.1	12.6	12.2	12.3	12.8	12.2	13.8	15.1	14.9	14.2	14.3	12.9	11.9	11.7	12.3	13.0	15.1	16.1	16.8	17.9	17.9	18.0	13.9
17		18.7	19.0	19.2	19.1	19.0	18.4	17.2	16.4	15.5	15.0	13.0	13.3	14.5	13.1	10.8	8.8	6.9	2.4	4.0	7.5	8.6	10.6	13.1	13.0	13.2
18		12.5	13.2	14.2	13.2	9.7	14.6	15.2	16.0	16.1	15.3	15.4	15.0	14.9	13.5	11.0	8.9	8.1	8.2	9.8	11.5	12.9	13.1	15.1	14.6	13.0
19		14.2	15.3	14.1	14.1	14.2	14.4	14.7	14.2	14.4	14.6	15.2	15.5	15.7	14.5	12.8	10.4	9.0	9.3	10.6	12.0	13.0	13.7	14.0	14.2	13.5
20		14.4	15.0	15.2	15.7	16.1	16.4	16.5	16.8	16.9	17.0	17.0	17:0	17.4	15.4	12.5	9.6	9.1	8.3	9.5	11.8	13.0	13.1	13.1	13.2	14.2
21	Q	13.2	13.1	13.1	13.1	12.8	12.9	12.4	12.2	12.9	13.1	13.5	14.0	13.9	12.9	11.2	9.2	8.0	7.2	7.7	9.7	11.1	11.3	11.3	12.0	11.8
22	Q	12.1	12.1	11.6	11.2	10.2	9.7	9.2	9.2	9.2	9.2	10.1	11.2	11.7	11.1	8.6	6.0	5.3	5.2	6.3	7.6	9.0	9.5	10.1	10.3	9.4
23		10.4	10.9	11.1	11.3	11.8	12.2	13.1	13.9	14.7	15.3	16.1	17.2	17.0	15.4	13.3	11.7	11.2	11.3	12.3	13.8	15.1	15.9	16.1	16.2	13.6
24	D	16.4	16.3	16.6	18.6	17.9	16.9	16.7	15.4	16.6	17.3	17.5	18.0	17.7	16.1	12.4	8.7	3.3	1.9	6.6	9.6	11.1	12.3	13.1	13.0	13.8
25		13.3	13.7	13.8	12.9	12.8	13.0	14.0	14.1	14.4	14.1	14.6	15.0	14.2	12.4	10.0	7.7	5.9	6.5	8.2	10.2	11.7	12.6	12.9	13.0	12.1
26		13.0	13.6	14.9	15.2	15.4	15.9	17.1	18.5	21.0	23.7	21.9	21.0	22.1	17.7	14.7	13.8	12.7	13.1	14.6	17.5	19.4	20.2	20.1	20.3	17.4
27		20.4	19.6	19.4	19.1	19.3	20.1	21.8	22.2	23.0	23.0	21.6	22.1	23.2	21.0	17.9	14.5	12.1	12.3	14.4	16.1	17.7	18.2	16.4	18.3	18.9
28	D	24.7	26.2	24.2	20.5	20.2	21.0	23.4	24.3	23.6	23.1	22.4	21.4	21.0	16.5	13.6	11.7	9.2	8.0	9.2	13.3	16.6	17.5	18.0	18.8	18.7
MEAN	A	16.0	16.3	16.3	16.4	15.7	16.1	16.6	16.8	17.1	17.2	16.8	16.5	16.6	14.9	12.9	11.2	10.1	10.1	11.5	13.2	14.3	15.2	15.5	16.0	15.0
MEAN	Q	15.1	15.1	14.9	14.8	14.4	14.5	14.6	14.8	15.2	15.5	15.7	16.0	15.9	14.5	12.6	10.6	10.0	10.3	11.2	12.5	13.0	13.4	13.7	14.1	13.9
MEAN	D	17.5	18.3	18.4	19.1	18.1	18.8	19.3	19.3	19.2	19.0	18.2	16.4	16.3	14.2	12.4	11.0	9.0	8.5	10.0	12.5	14.6	16.5	15.8	17.7	15.8

VERTICAL INTENSITY

TABLE 6 ST JOHN S   Z = 50500 PLUS TABULAR VALUES IN GAMMAS   FEBRUARY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		315	324	317	300	293	290	283	283	281	281	282	287	281	268	252	281	288	290	289	284	283	282	287	297	288
2	D	297	288	286	284	271	274	279	286	288	278	273	273	282	281	282	288	292	301	302	309	295	296	304	279	287
3		297	301	301	294	285	292	296	289	289	286	283	286	282	280	282	292	301	303	297	294	291	289	287	288	291
4	D	286	287	289	288	292	290	289	288	277	281	290	278	278	283	289	296	294	301	310	304	308	297	292	295	291
5		289	288	286	282	304	292	302	296	297	293	293	286	278	276	292	297	298	296	297	295	300	297	287	292	292
6		296	294	293	295	295	291	294	296	295	296	294	289	287	288	289	296	300	297	296	292	298	297	295	291	294
7	Q	287	286	287	288	288	287	292	293	292	290	291	292	291	292	296	302	305	303	301	297	295	296	295	293	293
8	Q	293	289	287	285	288	288	289	292	293	294	295	289	287	288	291	296	300	302	301	296	294	294	295	292	292
9		290	287	286	282	285	286	287	287	287	291	293	287	281	276	279	291	300	303	296	288	287	288	291	290	288
10		288	287	287	286	285	286	285	287	287	287	287	285	281	281	287	292	304	311	302	294	293	294	293	293	290
11	Q	292	291	290	288	287	287	286	286	287	287	286	285	281	285	288	295	300	297	300	296	294	294	292	292	290
12		290	290	288	287	287	286	286	286	285	284	286	282	279	280	285	286	293	293	290	287	286	287	287	288	287
13		287	288	288	287	286	285	284	285	284	284	279	282	278	280	290	282	293	286	287	287	287	287	286	285	285
14	D	286	285	280	258	276	289	293	291	287	284	282	292	271	272	281	294	298	302	294	292	287	287	286	287	286
15		287	288	286	285	285	276	269	281	280	284	285	286	276	270	272	278	297	295	297	295	295	289	285	284	284
16		286	286	286	286	287	287	286	285	272	269	271	271	268	270	276	284	295	287	289	285	287	286	286	285	282
17		284	284	284	286	286	286	287	287	286	280	284	272	261	260	269	275	298	308	318	313	302	302	287	293	287
18		287	285	284	286	268	273	285	278	284	284	281	278	273	272	278	295	294	295	295	299	293	294	286	293	285
19		286	281	287	287	288	288	289	287	287	287	284	278	273	276	278	286	295	303	302	298	290	288	287	286	287
20		284	281	281	282	284	286	286	288	287	286	284	277	270	278	282	286	292	294	294	294	294	293	287	287	286
21	Q	286	285	280	280	281	282	284	286	286	284	279	278	278	278	279	284	286	293	295	291	291	287	287	286	284
22	Q	280	279	278	278	278	279	282	286	285	285	280	274	270	270	276	287	291	295	293	292	288	287	287	286	283
23		284	280	278	278	278	279	280	282	284	284	279	272	265	262	265	276	290	287	288	287	287	286	284	282	280
24	D	280	279	278	269	276	280	280	280	276	278	276	273	269	261	256	273	292	318	294	287	289	289	287	287	280
25		286	284	281	284	281	280	276	279	279	283	279	277	274	279	282	290	299	301	299	294	286	286	287	288	285
26		287	284	281	280	279	278	269	261	257	257	264	268	256	276	290	291	301	302	300	295	293	294	295	294	281
27		294	293	291	291	287	280	278	278	276	279	283	278	274	278	284	293	308	310	306	310	309	315	324	326	294
28	D	300	286	281	310	302	295	281	272	284	287	285	282	279	287	282	294	302	310	312	314	296	302	299	302	293
MEAN	A	289	288	286	285	285	285	285	285	284	284	283	281	276	277	280	288	295	299	298	295	293	292	291	291	287
MEAN	Q	288	286	284	284	284	284	287	289	289	288	286	284	281	283	286	293	296	298	298	294	292	292	291	290	289
MEAN	D	290	285	283	282	284	285	285	283	282	282	281	280	276	277	278	289	296	307	302	302	295	294	294	290	287

HORIZONTAL INTENSITY

TABLE 7 ST JOHN S — H = 17000 PLUS TABULAR VALUES IN GAMMAS — MARCH 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		557	565	573	561	563	563	569	548	553	550	541	557	548	511	502	516	530	542	555	569	580	570	574	572	553
2		566	569	546	555	557	555	551	562	550	553	562	549	550	541	529	525	543	550	569	576	582	579	581	574	557
3		569	574	575	574	574	573	574	573	562	567	569	567	555	543	537	540	543	550	562	580	578	581	574	572	565
4		574	572	562	567	571	569	568	571	566	555	562	537	519	516	506	518	532	560	568	563	564	569	580	572	556
5		568	569	575	574	574	574	574	574	579	579	580	568	555	542	536	543	562	586	587	600	587	568	569	564	570
6	D	561	566	569	566	568	567	566	566	557	567	555	566	561	544	539	545	548	565	573	586	578	560	541	513	559
7	D	537	534	498	527	542	556	558	554	542	555	561	536	544	523	501	483	517	568	561	548	571	567	574	567	543
8	D	553	554	546	529	506	490	498	490	503	467	490	510	517	492	214	423	547	564	745	964	932	900	731	508	570
9	D	359	447	386	339	464	495	493	498	504	503	493	491	485	461	473	479	492	555	523	529	524	528	536	536	483
10		529	536	537	536	538	537	542	542	542	542	541	535	523	511	502	501	510	529	542	548	548	549	551	549	534
11		553	554	554	554	555	554	555	554	554	554	551	543	530	517	505	504	510	521	539	554	559	560	562	559	544
12		561	561	560	560	556	559	561	559	561	561	556	563	554	535	517	513	522	540	555	567	568	570	573	571	554
13		567	567	566	567	567	567	567	566	572	572	560	561	552	526	514	514	522	536	550	565	552	565	572	572	556
14		571	567	566	566	568	568	570	572	573	571	565	558	547	535	528	529	539	548	561	569	572	572	573	573	561
15		572	570	572	567	560	560	560	570	568	567	564	558	548	536	529	532	545	562	570	574	572	574	574	574	562
16	Q	574	573	572	569	569	565	565	566	566	566	565	559	549	535	528	546	553	562	572	578	579	579	580	584	565
17		584	583	582	580	580	582	580	584	584	580	575	566	555	550	549	553	557	569	572	579	577	584	579	575	573
18		573	579	580	579	579	579	579	579	579	581	577	565	560	556	552	553	552	566	575	577	580	572	569	572	571
19		574	575	577	578	578	579	579	579	580	579	573	566	555	546	541	541	547	559	567	577	582	573	573	577	569
20		579	580	579	579	579	579	579	579	579	576	572	566	559	554	548	550	553	563	572	572	578	579	577	578	571
21	Q	577	574	573	572	573	574	573	573	575	575	572	566	553	543	539	540	546	558	567	579	580	584	584	584	568
22	Q	585	564	584	584	584	582	582	581	580	577	571	559	551	541	536	540	545	557	572	581	586	585	587	588	572
23		586	585	584	585	585	585	585	585	584	584	584	574	562	548	541	541	548	565	580	580	584	584	586	588	576
24	Q	585	584	584	583	583	583	583	583	584	583	577	566	556	549	546	549	554	566	583	591	594	590	590	589	576
25	Q	590	590	589	584	585	585	586	587	585	584	578	567	557	547	545	549	553	566	578	589	590	588	590	590	577
26		590	590	591	585	578	578	583	585	584	583	579	572	565	558	547	544	547	564	576	584	590	589	590	589	577
27		586	588	586	585	585	584	585	598	603	591	584	596	575	554	542	535	546	565	583	595	591	595	578	566	579
28		570	571	569	582	565	566	578	579	588	576	562	540	560	534	520	521	534	551	564	578	581	583	567	559	563
29		552	571	559	539	557	567	564	559	579	578	570	559	540	532	521	513	531	541	577	571	578	576	583	588	559
30		565	578	578	576	571	568	571	561	561	576	566	548	542	545	532	521	516	540	569	580	590	578	578	578	562
31	D	581	583	579	578	573	583	568	511	552	578	531	577	554	534	482	529	552	559	562	565	571	579	572	553	559
MEAN	A	563	568	564	561	564	565	566	564	566	566	561	556	548	534	516	526	539	556	572	586	587	585	579	569	561
MEAN	Q	582	581	580	579	579	578	578	578	578	577	573	563	553	543	539	545	550	562	574	583	586	585	586	587	572
MEAN	D	518	537	515	508	530	538	537	524	531	534	526	536	532	511	442	492	531	562	593	638	635	627	591	536	543

DECLINATION

TABLE 8 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES MARCH 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		20.5	20.7	20.9	21.4	21.6	21.3	22.5	29.0	28.4	22.9	19.8	17.5	21.1	19.0	12.3	7.7	9.3	10.1	10.9	13.2	15.5	16.9	17.7	16.9	18.2
2		19.7	17.9	24.7	21.8	22.6	29.8	21.8	20.9	21.8	15.3	18.1	16.7	20.7	20.2	17.4	13.8	11.2	9.3	11.3	13.8	15.7	16.7	16.9	18.4	18.2
3		18.9	18.7	18.9	18.7	18.1	18.7	19.0	19.4	19.7	17.9	19.8	19.9	21.1	20.8	18.7	15.5	12.2	10.0	11.4	11.8	12.7	17.8	16.0	15.6	17.1
4		16.3	15.8	19.0	19.0	16.9	17.1	18.9	16.9	18.2	16.7	17.1	17.8	15.9	14.0	12.9	9.9	6.5	7.3	6.0	7.2	8.5	11.2	13.7	15.8	14.1
5		17.1	15.7	15.1	15.0	15.0	15.4	15.9	16.7	18.6	17.7	17.4	17.9	18.7	17.8	15.9	11.9	7.1	4.9	3.5	4.4	7.0	8.0	8.7	9.2	13.1
6	D	13.8	17.2	14.2	14.1	12.9	13.6	14.8	14.2	12.3	13.8	11.4	12.7	16.0	14.1	10.2	8.1	6.9	7.3	8.1	7.7	8.2	11.1	14.3	20.7	12.4
7	D	21.4	19.7	11.3	17.9	18.8	14.4	14.1	15.0	10.9	10.3	7.1	15.0	15.7	16.2	14.5	8.0	6.0	2.5	3.3	7.0	7.1	11.1	12.3	16.8	12.3
8	D	17.1	16.2	16.0	21.8	29.5	30.5	26.9	9.3	6.0	-2.6	.9	4.0	12.8	17.7	33.3	19.4	11.1	9.0	11.1	16.5	-18.8	-18.1	10.3	12.0	12.2
9	D	11.8	15.7	9.1	17.9	15.1	12.6	12.3	12.1	12.8	13.2	13.0	15.7	16.1	16.7	14.4	12.9	8.9	12.0	7.1	8.3	12.1	15.4	16.9	19.8	13.4
10		17.2	15.3	15.8	14.9	14.7	14.9	15.1	15.0	14.0	15.7	17.2	19.0	20.4	18.9	16.0	12.8	9.5	8.1	8.5	10.8	13.7	14.3	14.1	13.9	14.6
11		13.8	13.9	14.0	14.0	14.0	13.8	13.6	13.7	13.9	14.1	15.0	17.0	18.0	17.7	14.3	10.9	8.2	7.0	8.0	10.3	13.3	15.0	15.7	15.2	13.5
12		15.8	16.7	16.6	18.1	16.6	16.5	16.0	16.3	17.0	16.0	14.0	16.9	19.1	20.0	17.7	13.8	10.0	8.1	8.7	10.9	12.8	13.8	14.1	14.3	15.0
13		14.1	14.2	14.1	14.1	14.0	13.7	12.9	12.5	14.9	16.0	13.8	14.2	18.0	15.8	12.0	8.7	6.9	6.2	6.1	7.2	10.2	11.8	13.0	13.3	12.4
14		13.7	14.1	15.9	14.3	14.1	14.9	14.8	15.0	15.7	15.9	16.7	18.6	19.7	18.9	16.2	14.1	12.0	10.9	12.0	13.7	15.2	16.4	16.6	17.1	15.3
15		17.2	18.8	17.5	18.7	20.1	20.7	18.9	18.7	19.0	18.8	18.2	20.4	21.0	19.6	16.3	12.8	12.0	12.1	12.9	13.6	14.8	15.7	16.4	16.1	17.1
16	Q	16.1	16.9	18.6	19.0	19.0	19.4	19.4	19.5	19.1	19.3	19.1	20.6	20.8	19.0	16.6	14.0	12.0	11.8	12.6	14.1	15.8	16.1	16.2	16.4	17.1
17		16.6	16.5	16.6	16.8	16.9	17.3	17.7	18.7	19.0	18.9	19.7	20.3	21.2	18.0	15.2	13.2	10.2	10.8	11.7	14.0	16.2	16.7	16.7	16.5	16.5
18		17.4	16.8	16.1	16.2	16.3	16.5	16.8	17.0	17.0	18.2	19.0	17.5	16.2	16.5	15.2	12.7	10.3	11.2	12.7	14.9	16.1	16.9	20.0	16.6	16.0
19		15.5	15.0	14.7	14.1	14.0	14.4	14.8	14.0	14.8	16.0	17.0	17.9	16.5	14.7	12.2	10.7	8.4	8.3	9.4	11.4	13.2	14.0	13.8	14.2	13.7
20		14.9	14.2	14.2	14.3	14.5	14.6	14.8	15.1	15.3	15.8	17.1	17.6	16.5	13.8	12.0	8.9	7.1	6.6	8.3	11.0	13.9	14.5	15.0	16.6	13.6
21	Q	16.3	16.3	17.3	18.7	17.7	16.9	16.9	16.9	17.0	17.4	18.0	19.0	19.0	17.7	15.1	11.1	7.8	7.3	9.1	12.2	14.3	14.8	14.9	15.0	15.3
22	Q	15.0	15.0	15.1	15.5	16.1	16.6	16.9	16.8	18.0	19.7	21.1	21.6	20.5	18.9	16.8	12.9	11.3	10.6	11.8	14.0	16.1	16.5	16.1	16.0	16.2
23		15.5	15.0	14.8	14.9	14.7	15.0	15.1	15.8	14.9	14.8	15.5	17.9	17.9	15.8	13.1	10.0	7.2	6.3	7.1	9.9	11.6	12.6	12.8	12.6	13.4
24	Q	12.2	12.3	12.9	13.2	13.6	14.0	14.3	15.1	15.9	16.4	17.6	18.4	18.6	17.1	14.4	11.6	8.8	8.2	10.1	12.9	15.0	15.3	15.8	16.1	14.2
25	Q	16.1	16.5	16.9	18.0	17.7	17.8	17.9	17.7	18.9	19.1	19.7	21.0	20.7	19.0	16.0	13.3	11.9	11.4	13.0	15.2	16.8	17.4	17.5	17.6	17.0
26		17.3	17.1	18.1	19.2	19.4	19.8	19.6	19.9	20.1	20.0	20.4	21.3	20.9	19.2	17.9	14.1	11.1	10.1	10.2	12.0	14.0	15.3	16.0	16.2	17.0
27		16.1	16.0	15.9	15.6	15.3	15.2	15.4	16.6	18.7	19.1	21.9	20.0	19.8	16.2	12.1	7.2	5.3	5.5	7.0	10.1	13.0	14.9	19.0	18.4	14.8
28		17.8	17.9	17.3	17.8	21.7	12.4	21.1	22.4	20.8	14.4	9.2	12.9	13.1	12.3	9.4	8.0	7.9	8.1	9.4	11.1	14.3	16.2	20.5	21.0	14.9
29		23.8	20.3	19.8	17.0	20.3	19.6	18.7	13.6	15.1	16.9	17.2	16.7	16.6	15.2	12.9	8.3	6.2	5.6	6.3	8.6	11.3	13.4	15.3	19.4	15.0
30		23.2	19.3	17.8	17.0	16.9	17.9	19.9	21.0	16.2	18.7	20.3	20.2	17.1	18.0	16.8	13.7	8.7	8.2	9.0	11.2	14.1	18.2	17.8	18.0	16.6
31	D	18.0	18.3	19.4	19.0	21.2	20.0	28.4	24.7	27.1	31.7	20.1	9.7	18.8	19.2	10.4	1.2	-.3	-.4	2.5	7.2	11.2	13.2	12.8	21.1	15.6
MEAN	A	16.8	16.6	16.4	17.0	17.4	17.3	17.6	17.1	17.1	16.7	16.5	17.4	18.3	17.4	15.1	11.3	8.8	8.2	9.0	11.2	12.1	13.6	15.4	16.3	15.0
MEAN	Q	15.1	15.4	16.2	16.9	16.8	17.0	17.1	17.2	17.8	18.4	19.1	20.1	19.9	18.4	15.8	12.6	10.4	9.9	11.3	13.7	15.6	16.0	16.1	16.2	15.9
MEAN	D	16.4	17.4	14.0	18.2	19.5	18.2	19.3	15.1	13.8	13.3	10.5	11.4	15.9	16.8	16.5	9.9	6.5	6.1	6.4	9.8	4.0	6.5	13.3	18.1	13.2

VERTICAL INTENSITY

TABLE 9 ST JOHN S   Z = 50500 PLUS TABULAR VALUES IN GAMMAS   MARCH 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		321	310	302	295	295	288	278	207	219	232	260	270	270	263	296	321	310	313	318	310	310	302	303	311	288
2		310	292	265	303	278	241	295	302	278	263	262	289	285	284	284	290	302	307	307	302	300	294	295	294	288
3		296	297	295	295	294	293	287	292	286	295	287	285	276	279	285	292	302	315	321	324	316	318	304	300	297
4		296	298	285	294	300	293	287	295	284	280	278	264	278	278	281	303	318	333	334	325	323	319	303	278	297
5		294	298	299	294	292	293	292	287	278	290	286	276	271	268	270	284	301	318	335	342	340	335	317	329	299
6	D	324	307	271	289	301	295	294	293	269	264	276	279	270	268	279	287	239	332	335	355	373	378	345	247	301
7	D	259	299	192	247	272	318	309	294	264	255	251	238	283	270	286	317	334	354	366	365	333	301	298	305	292
8	D	294	285	229	167	105	81	102	128	174	183	222	246	260	268	76	255	405	343	500	446	127	414	261	324	246
9	D	286	275	176	122	264	325	334	333	332	332	332	324	324	309	326	330	358	377	349	354	334	329	332	304	311
10		301	318	309	309	309	310	311	314	311	314	308	309	301	301	304	309	320	332	335	333	332	325	317	313	314
11		315	311	309	306	303	305	305	308	309	309	307	301	294	292	294	309	316	319	324	325	318	317	317	314	309
12		309	304	301	291	295	296	300	294	294	308	301	294	291	285	290	301	310	319	322	317	309	308	306	305	302
13		303	302	301	302	301	301	295	290	293	293	298	294	281	285	293	303	309	310	317	324	309	310	305	301	301
14		302	300	294	301	300	300	298	298	294	294	294	288	282	284	286	293	299	305	307	302	301	301	301	300	297
15		300	294	299	291	280	279	295	299	297	298	294	269	285	286	299	307	312	313	309	305	301	300	299	298	297
16	Q	296	294	298	298	297	299	298	295	293	292	293	288	285	290	303	301	301	310	309	308	301	301	299	296	298
17		294	293	295	297	299	297	295	293	292	290	286	285	279	294	294	293	305	312	312	309	299	300	297	294	296
18		286	293	296	295	297	296	296	294	294	290	285	279	279	279	283	286	296	305	309	305	305	299	295	303	294
19		300	299	294	294	295	297	296	294	288	285	283	279	279	283	287	293	302	309	309	308	309	301	302	298	295
20		294	297	296	297	297	296	298	298	298	296	297	286	284	291	294	298	301	309	309	308	303	301	298	293	297
21	Q	294	294	292	287	296	301	301	302	301	298	294	286	280	285	285	286	295	302	302	299	295	294	290	287	293
22	Q	286	284	285	286	286	287	288	291	286	285	281	278	277	276	278	286	291	299	302	301	294	291	289	287	287
23		285	284	284	284	285	284	287	286	286	285	276	272	269	273	277	281	294	302	300	297	296	294	294	289	286
24	Q	286	285	280	282	283	284	285	286	286	286	281	276	272	276	279	289	295	299	295	293	287	286	288	286	285
25	Q	285	284	280	278	280	280	285	280	283	285	283	276	274	271	276	282	287	294	298	295	293	291	290	288	284
26		287	285	278	274	271	276	284	285	285	286	284	278	277	276	272	281	290	299	294	300	297	294	294	292	285
27		290	287	285	284	280	279	280	280	276	273	276	272	258	260	269	276	286	296	304	306	305	311	301	302	285
28		303	289	227	216	235	250	239	268	280	278	257	275	284	276	292	300	324	326	322	325	319	318	315	308	284
29		295	291	261	221	233	280	286	275	279	279	276	277	276	280	285	302	311	318	331	320	318	305	307	315	288
30		287	307	300	294	292	278	254	264	277	276	265	269	278	280	284	289	310	318	321	316	317	303	297	294	290
31	D	294	293	286	272	261	286	216	136	144	202	201	234	231	253	279	321	310	306	302	286	294	300	299	280	262
MEAN	A	296	295	279	276	280	283	283	279	278	280	280	279	279	280	280	296	309	316	322	320	305	311	302	298	292
MEAN	Q	289	288	287	266	288	290	291	291	290	289	286	281	278	260	284	289	294	301	301	299	294	292	291	289	290
MEAN	D	291	292	231	220	241	261	251	237	237	247	257	264	274	274	249	302	341	343	370	361	292	345	307	292	282

HORIZONTAL INTENSITY

TABLE 10 ST JOHN S H = 17000 PLUS TABULAR VALUES IN GAMMAS APRIL 1970

HOUR UT / DAY		0 TC 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		569	566	565	571	566	568	571	571	571	570	565	559	552	545	542	540	546	552	562	567	572	572	585	585	564
2		583	581	578	576	576	573	577	578	574	571	567	559	542	526	520	532	552	567	576	577	582	580	583	590	567
3		590	587	578	583	570	553	558	574	587	582	577	575	562	546	539	545	558	567	581	593	594	590	589	589	574
4		583	585	575	574	578	582	584	593	584	583	583	577	558	545	533	536	548	564	577	590	589	591	594	592	575
5		591	590	589	589	589	588	589	590	589	585	589	587	583	559	551	545	557	571	569	604	600	601	601	602	585
6	D	601	594	582	587	584	572	570	596	583	580	538	553	560	546	530	529	551	561	583	587	593	596	583	589	573
7		589	594	590	585	584	589	587	583	568	582	577	559	539	528	526	533	544	564	577	589	588	589	590	594	573
8		583	575	583	583	589	581	584	588	585	578	575	570	548	527	533	539	544	560	575	587	589	593	589	589	573
9		589	589	589	589	584	587	594	588	584	608	602	571	533	533	546	547	545	558	572	584	590	608	594	592	578
10	Q	594	594	591	589	588	586	589	589	590	589	583	572	558	547	545	552	564	588	602	606	603	601	602	590	584
11		588	578	579	585	589	584	584	589	591	584	588	584	577	560	558	582	539	615	613	606	597	592	587	582	587
12		578	575	574	562	562	557	553	554	551	555	563	559	543	539	544	548	564	582	591	602	601	596	597	596	569
13	Q	594	594	590	590	589	589	591	589	588	583	572	558	545	539	546	563	581	600	599	597	596	599	602	602	583
14	Q	601	597	595	594	594	593	594	595	595	539	580	562	549	538	543	554	566	577	588	592	595	596	595	599	582
15	Q	600	600	597	596	596	595	598	600	595	595	590	579	559	547	550	563	579	601	596	596	606	598	601	613	590
16		600	586	581	582	586	574	567	576	576	574	563	550	538	531	535	554	576	596	605	624	645	612	580	570	578
17	D	561	552	555	540	539	557	570	569	563	540	547	559	538	513	526	551	569	596	626	607	623	606	576	569	565
18		576	581	582	579	580	581	582	582	576	557	544	539	501	508	551	562	560	569	582	585	594	588	583	570	567
19		570	576	557	557	540	557	550	535	569	545	557	564	562	550	554	559	574	584	588	595	588	582	581	583	566
20	D	586	583	582	579	574	575	575	576	581	578	572	559	534	532	563	564	530	595	591	603	607	594	588	577	577
21	D	576	582	581	588	576	561	577	557	539	516	456	469	445	433	487	516	637	697	701	753	876	703	595	460	578
22	D	508	485	479	455	416	430	544	551	549	529	541	546	532	524	525	542	556	570	581	580	575	574	575	580	531
23		581	575	568	568	569	570	565	563	564	551	543	538	514	527	546	562	570	592	607	605	601	594	594	580	569
24		568	573	560	557	562	543	549	555	563	550	556	550	541	538	537	531	536	568	569	583	592	582	580	588	561
25		600	579	575	575	566	568	563	570	568	566	561	532	528	529	537	543	557	574	595	613	584	594	599	590	569
26		582	582	580	575	571	578	575	575	574	569	561	543	531	531	548	563	578	592	612	610	613	600	587	592	576
27		580	570	580	575	574	561	566	575	580	580	571	562	550	548	554	561	575	591	594	588	588	587	588	588	574
28	Q	588	600	582	580	575	580	575	581	582	581	575	568	559	556	556	563	530	594	604	600	599	592	592	593	581
29		594	594	587	582	581	581	580	579	580	574	575	568	554	551	556	568	530	588	600	588	596	605	592	585	581
30		597	595	582	582	568	578	587	582	575	586	594	582	563	556	549	556	530	587	600	604	603	588	600	594	583
MEAN	A	583	580	576	574	570	570	575	576	576	571	565	558	543	535	541	550	567	584	595	601	606	597	590	584	574
MEAN	Q	595	597	591	590	588	589	589	591	590	587	580	568	554	545	548	559	574	592	598	598	600	597	598	599	584
MEAN	D	566	559	556	550	538	539	567	570	563	549	531	537	522	509	526	540	579	604	616	626	655	614	583	555	565

DECLINATION

TABLE 11 ST JOHN S — D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES — APRIL 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		13.4	13.0	12.4	11.4	12.7	13.0	13.0	12.8	12.1	13.4	15.1	16.5	16.8	15.7	12.9	9.4	7.2	7.0	7.8	9.5	11.3	11.9	12.8	12.2	12.2
2		12.4	12.6	12.9	13.1	13.4	14.1	14.4	15.9	15.3	15.6	17.2	18.1	19.1	16.8	13.3	9.1	7.0	6.5	7.0	9.0	10.9	13.0	14.2	14.3	13.1
3		12.2	12.0	12.1	12.2	13.8	14.7	13.1	15.2	15.2	16.1	16.0	15.4	16.7	14.0	11.8	10.8	7.0	6.8	8.0	10.0	12.2	13.6	13.9	14.0	12.8
4		14.1	15.3	19.7	17.7	16.8	17.4	17.8	16.8	18.0	19.0	22.1	22.5	21.7	18.7	17.0	12.1	9.6	9.1	10.1	12.1	14.3	15.5	15.5	15.5	16.2
5		15.4	15.2	15.3	15.4	16.0	16.2	16.8	17.0	17.1	15.7	14.5	15.4	16.7	19.5	14.2	10.9	7.3	7.1	10.0	13.2	15.3	16.4	16.5	16.7	14.7
6	D	16.7	16.8	18.1	20.2	20.2	18.9	17.2	24.3	18.5	17.9	10.4	10.1	12.0	12.1	11.6	7.1	5.3	5.4	6.5	9.5	12.6	15.0	17.5	14.3	14.1
7		14.1	16.2	14.2	12.9	12.4	12.3	12.2	14.0	10.1	13.2	17.1	18.3	17.1	15.3	12.1	9.7	7.9	7.1	7.7	10.2	12.7	14.1	14.4	15.3	13.0
8		18.0	18.3	15.2	14.9	16.2	17.0	16.3	16.6	16.2	13.4	14.4	20.1	20.0	18.1	13.4	10.3	7.3	6.6	8.3	10.7	13.2	15.5	17.3	17.7	14.8
9		16.4	16.2	16.4	16.5	13.1	15.4	19.8	19.9	13.2	16.4	21.1	20.1	20.3	11.7	11.6	8.8	6.5	6.6	9.0	12.2	15.2	17.1	17.2	17.2	14.9
10	Q	18.3	17.2	17.3	17.1	17.4	18.0	18.6	19.1	19.3	20.2	21.7	22.8	22.0	19.1	14.7	11.2	8.4	7.5	10.1	13.2	16.0	18.9	20.7	20.0	17.0
11		20.6	21.5	20.3	21.4	22.0	21.6	21.7	21.1	18.1	19.4	20.4	22.7	21.8	21.1	15.3	11.7	9.3	10.0	12.3	14.6	16.3	17.3	18.4	18.7	18.2
12		19.3	19.6	20.9	21.1	21.8	23.2	25.2	25.8	25.1	25.9	26.1	26.0	27.1	24.3	19.2	11.1	9.1	9.8	11.5	13.7	15.9	16.9	16.8	17.0	19.7
13	Q	16.5	16.2	16.2	16.5	17.1	17.5	17.9	18.2	19.2	20.7	22.7	24.3	21.6	18.9	15.2	12.7	11.7	12.0	13.0	14.7	15.5	15.4	15.3	15.7	16.9
14	Q	16.1	15.9	16.1	16.2	16.5	17.0	17.6	18.0	19.0	20.6	22.2	23.2	21.7	18.8	14.7	11.8	9.7	10.8	13.0	15.0	16.2	16.0	15.5	15.2	16.5
15	Q	15.0	15.2	15.0	15.0	16.0	16.3	16.7	17.2	17.8	18.9	20.5	21.1	19.7	16.0	11.5	8.7	6.5	6.9	9.3	12.3	15.2	16.3	15.1	13.9	14.8
16		10.5	13.6	15.2	19.1	19.4	21.8	18.9	18.3	20.0	20.6	22.0	21.3	19.1	16.7	14.0	11.3	10.3	11.5	14.0	16.9	18.0	20.0	21.1	20.8	17.3
17	D	18.8	15.2	19.3	17.2	20.6	21.5	19.8	20.8	21.7	19.1	19.9	19.8	22.0	19.1	14.4	11.8	11.6	12.3	16.0	18.5	19.1	20.2	20.3	17.6	18.2
18		17.1	17.2	17.9	18.0	18.1	18.5	19.0	19.4	20.7	20.2	18.5	21.9	20.9	8.0	7.7	11.3	10.2	10.1	12.1	15.3	17.0	18.7	26.7	25.6	17.1
19		22.9	21.0	24.7	26.5	20.5	19.1	17.5	23.9	25.8	22.2	16.0	17.9	14.8	15.2	13.1	11.2	10.4	13.7	16.9	19.7	20.9	21.3	20.1	19.1	19.0
20	D	18.6	19.4	20.9	22.1	18.5	21.8	22.8	22.4	23.0	24.5	24.0	22.9	18.7	14.3	11.8	12.0	10.1	10.9	13.5	17.8	19.1	20.1	21.0	21.7	18.8
21	D	20.9	19.4	22.0	19.0	20.1	22.0	21.5	12.7	12.8	8.1	5.2	11.0	8.3	4.3	6.2	12.5	18.9	17.8	16.6	15.2	15.0	16.9	16.0	14.0	14.9
22	D	19.7	17.6	17.4	10.4	11.3	19.0	20.6	21.4	21.2	19.0	19.9	21.2	18.8	15.1	11.1	9.5	8.4	9.2	11.8	13.9	15.0	14.9	14.8	14.7	15.7
23		14.3	13.1	14.6	16.8	16.6	15.7	17.7	20.4	20.7	21.7	21.3	19.9	15.7	8.1	5.4	5.9	5.8	5.8	8.0	10.0	11.1	13.0	14.6	17.5	13.9
24		16.7	16.5	18.3	20.0	17.1	17.7	18.5	21.6	23.3	25.4	25.6	24.6	19.2	16.0	12.7	8.6	7.1	7.7	9.7	12.2	15.8	17.8	17.7	17.5	17.0
25		23.3	22.0	20.2	17.7	16.0	20.5	19.2	21.7	24.4	24.5	24.7	24.8	19.8	17.0	12.8	10.2	7.9	9.9	12.8	15.1	17.8	19.7	19.8	18.8	18.4
26		19.9	22.4	20.8	22.5	20.6	19.6	20.8	21.5	23.5	25.5	27.5	27.9	26.6	20.6	15.7	13.1	11.7	11.9	13.8	15.6	17.4	17.6	18.6	22.0	19.9
27		23.3	21.3	21.2	23.4	20.4	19.4	19.7	22.7	24.3	26.2	27.2	25.3	23.2	19.7	16.6	14.5	13.4	13.7	15.2	16.6	18.7	19.6	19.5	19.5	20.2
28	Q	20.6	25.2	24.2	24.4	23.6	23.2	22.7	21.7	23.5	26.0	26.4	26.3	24.6	21.4	19.4	17.3	15.8	15.4	16.3	18.3	19.7	20.0	19.4	19.2	21.4
29		19.5	19.9	21.7	22.4	23.1	22.9	23.6	23.4	23.9	24.1	25.8	26.4	25.3	20.3	17.5	15.6	13.4	12.3	12.8	14.8	16.6	17.6	17.7	17.5	19.9
30		17.5	18.5	25.7	25.3	25.8	22.3	21.7	23.2	21.3	26.9	27.1	23.2	21.8	18.8	14.5	8.5	7.0	9.3	11.5	13.7	15.3	16.2	17.1	18.3	18.8
MEAN	A	17.4	17.5	18.2	18.2	17.9	18.6	18.8	19.6	19.5	20.0	20.4	21.0	19.8	16.5	13.4	11.0	9.4	9.7	11.5	13.8	15.6	16.9	17.5	17.4	16.6
MEAN	Q	17.3	17.9	17.7	17.8	18.1	18.4	18.7	18.9	19.8	21.3	22.7	23.5	21.9	18.8	15.1	12.4	10.4	10.5	12.4	14.7	16.5	17.3	17.2	16.8	17.3
MEAN	D	18.9	17.7	19.5	17.8	18.1	20.6	20.4	20.3	19.5	17.7	15.9	17.0	16.0	13.0	11.0	10.6	10.8	11.1	12.9	15.0	16.2	17.4	17.9	16.5	16.3

VERTICAL INTENSITY

TABLE 12 ST JOHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS APRIL 1970

HOUR UT DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TC 6	6 TO 7	7 TO 8	8 TC 9	9 TO 10	10 TO 11	11 TO 12	12 TC 13	13 TO 14	14 TC 15	15 TO 16	16 TO 17	17 TC 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		304	295	295	293	287	294	293	294	294	287	286	281	277	275	285	296	306	310	311	303	297	294	296	291	293
2		288	289	288	292	293	294	291	287	287	285	281	281	277	283	290	310	317	321	319	307	300	293	287	287	294
3		288	288	288	286	271	264	255	292	285	277	278	279	271	281	287	295	311	315	315	310	301	290	287	287	288
4		286	281	270	287	295	294	295	285	279	287	277	277	272	286	281	298	309	319	314	309	296	295	288	287	290
5		285	284	285	286	287	287	289	293	288	285	273	274	274	255	279	285	302	306	309	307	298	295	289	288	288
6	D	287	285	277	263	253	271	206	222	287	282	262	272	271	272	278	303	314	319	319	310	304	304	296	297	281
7		290	287	273	286	286	278	263	280	270	277	279	277	279	281	288	301	303	311	307	302	295	294	295	294	287
8		278	281	292	288	272	267	291	289	290	288	286	277	274	280	295	304	303	307	305	304	301	297	296	296	290
9		296	290	287	278	270	268	264	275	282	250	264	266	252	299	289	298	304	311	310	304	303	310	302	301	286
10	Q	294	295	289	287	288	288	288	289	290	290	286	281	281	286	297	314	322	323	317	304	294	295	297	302	296
11		300	289	272	274	273	283	286	288	274	270	266	271	278	267	289	291	299	306	304	300	301	307	308	308	288
12		310	310	305	304	297	289	269	274	286	299	298	294	292	295	301	292	298	302	300	300	297	289	290	293	295
13	Q	292	293	291	289	288	289	288	286	282	280	272	272	276	282	289	296	297	302	296	292	288	287	289	289	288
14	Q	289	290	289	289	289	288	288	286	282	281	278	274	275	280	282	293	298	302	302	296	291	289	290	294	288
15	Q	291	290	292	288	288	286	287	286	283	281	276	271	270	274	280	286	302	320	319	312	304	292	294	298	290
16		304	300	303	289	302	269	297	296	293	295	289	287	288	294	302	314	320	317	310	323	360	362	344	320	307
17	D	310	190	287	238	241	302	327	312	296	272	282	297	279	284	312	331	327	335	360	335	346	331	291	301	299
18		297	295	292	295	296	296	296	296	289	280	257	248	255	296	296	293	311	312	312	310	309	315	302	287	293
19		301	288	263	247	263	255	216	126	220	233	263	266	288	283	288	300	312	306	308	307	299	300	301	296	272
20	D	295	289	280	248	262	281	297	303	301	294	289	281	277	293	296	307	326	337	326	318	312	297	303	301	297
21	D	294	255	287	293	238	192	230	194	161	198	179	213	247	280	341	400	508	502	494	483	352	287	345	175	298
22	D	225	256	218	203	263	174	247	309	298	303	302	302	303	306	313	319	320	323	313	311	311	311	311	310	285
23		311	304	293	301	299	289	266	285	303	295	296	293	288	315	312	316	321	334	358	355	356	339	337	320	312
24		317	303	277	272	283	262	263	270	293	288	288	286	289	296	304	305	321	332	325	321	326	319	311	311	298
25		267	271	287	287	250	270	276	282	265	267	280	276	294	292	302	307	314	310	317	326	311	319	318	317	292
26		276	278	298	291	310	306	308	300	295	295	287	283	287	297	315	317	315	318	328	342	351	347	332	309	308
27		254	300	301	286	304	294	259	295	303	302	296	295	294	303	311	315	318	321	318	309	302	301	302	303	300
28	Q	300	281	280	287	291	287	291	299	293	292	288	287	296	301	302	311	318	318	315	303	300	300	302	302	298
29		301	302	296	293	290	291	292	296	300	298	286	284	279	296	303	312	318	319	324	312	310	315	312	310	301
30		303	286	255	229	243	310	308	294	265	215	254	271	277	280	295	333	340	328	326	315	309	303	309	310	290
MEAN	A	291	285	284	278	279	277	278	279	281	278	277	277	279	287	297	308	319	323	323	318	311	306	304	296	293
MEAN	Q	293	290	288	288	289	288	288	289	286	285	280	277	280	285	290	300	307	313	310	301	295	293	294	297	292
MEAN	D	282	255	270	249	251	244	262	268	269	270	263	273	275	287	308	332	359	363	362	351	325	306	309	277	292

HORIZONTAL INTENSITY

TABLE 13 ST JOHN S H = 17000 PLUS TABULAR VALUES IN GAMMAS MAY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		591	595	598	593	593	591	586	581	587	586	581	574	547	541	549	559	577	595	605	606	597	630	591	597	585
2		591	599	600	599	598	598	597	592	591	588	581	569	557	556	559	572	589	601	611	601	593	601	598	597	589
3		594	593	598	594	593	593	592	591	588	587	582	572	564	555	554	575	582	596	595	597	622	615	601	597	589
4		595	598	599	596	597	595	594	598	593	591	581	569	562	554	557	567	579	599	613	618	618	603	600	605	591
5		600	599	597	597	597	597	594	594	597	584	550	569	572	549	541	556	575	586	601	607	603	610	603	598	586
6		587	593	593	591	591	591	591	591	591	586	580	572	565	556	567	575	593	612	621	622	618	612	610	606	592
7		606	606	602	604	599	598	594	593	593	592	581	563	550	548	553	562	580	599	606	612	616	616	612	606	591
8	Q	603	603	602	602	601	599	598	597	597	592	578	564	555	549	559	573	582	599	611	622	609	612	604	599	592
9	Q	602	598	599	597	601	596	590	591	593	590	578	565	554	549	551	561	579	592	605	609	610	610	609	605	589
10	Q	603	603	603	603	603	600	597	595	597	596	586	573	558	549	554	564	577	592	604	610	615	613	609	608	592
11	Q	609	609	606	606	605	605	605	605	605	603	596	583	566	557	554	562	578	593	609	623	629	629	630	624	600
12	D	610	617	603	610	604	604	604	603	598	590	566	586	571	567	566	578	590	619	596	612	655	655	610	592	600
13		586	593	592	578	578	578	580	585	587	583	573	565	561	561	565	577	593	602	612	619	612	615	614	603	588
14		605	597	598	598	596	592	593	585	584	600	598	583	562	559	552	558	571	598	634	636	627	598	604	617	593
15		598	587	585	585	590	581	585	584	578	580	592	580	559	552	548	548	562	592	595	605	611	605	609	603	584
16		603	599	598	597	598	597	593	590	585	593	593	584	571	565	562	578	593	615	617	621	627	612	609	608	596
17		612	609	607	609	609	599	586	599	602	600	592	567	567	554	572	578	585	595	602	611	615	615	612	610	596
18		611	609	605	597	598	597	600	604	605	599	592	583	568	568	567	573	590	608	623	628	624	615	605	605	599
19		609	609	610	605	602	592	591	592	596	580	592	594	580	569	568	579	587	599	613	622	624	625	615	612	599
20	D	617	615	609	606	596	579	587	592	590	580	574	565	554	553	562	566	583	612	616	636	624	617	610	605	594
21		591	592	592	589	589	591	590	589	589	578	570	566	558	551	555	565	585	609	623	622	610	602	609	613	589
22		611	603	603	598	597	596	596	597	604	601	590	570	555	541	540	557	584	609	623	626	620	610	601	602	593
23		599	598	602	597	596	596	594	594	589	591	583	573	572	564	564	569	580	603	609	614	622	623	617	609	594
24		608	598	597	602	599	596	596	596	596	587	576	573	567	552	548	563	582	601	608	621	618	616	616	616	593
25		610	605	596	603	603	600	601	603	601	596	578	560	546	538	549	558	577	590	607	620	622	620	616	608	592
26	Q	602	597	597	598	596	597	596	597	601	600	591	581	571	562	564	571	584	596	613	622	628	628	628	617	597
27	D	619	610	614	611	603	608	613	610	603	603	601	571	563	559	572	584	580	603	616	628	654	645	635	608	605
28	D	577	566	575	601	602	598	600	596	584	547	514	476	457	438	482	515	540	544	552	578	583	590	596	607	555
29	D	607	598	601	604	606	598	583	564	586	596	590	584	575	573	571	569	590	607	620	651	633	610	614	614	598
30		606	606	601	607	606	606	601	606	601	582	593	596	582	581	581	577	602	620	615	619	614	609	606	607	601
31		607	607	608	612	608	603	606	600	600	600	602	596	570	570	577	594	602	612	614	622	624	621	619	619	604
MEAN	A	602	600	600	600	598	596	595	594	594	590	582	572	560	553	557	567	583	600	609	617	619	616	610	607	592
MEAN	Q	604	602	601	601	601	599	597	597	598	596	586	573	561	553	556	566	582	594	608	617	618	618	616	611	594
MEAN	D	606	601	600	606	602	597	597	593	592	583	569	557	544	538	551	562	579	597	600	621	630	623	613	605	590

DECLINATION

TABLE 14 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES MAY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		18.5	18.2	17.6	18.3	18.4	19.5	16.1	18.0	20.0	23.0	23.2	22.6	22.4	16.6	12.4	12.0	10.2	10.1	11.6	14.1	14.6	17.1	17.2	19.1	17.1
2		19.8	16.6	16.3	15.8	14.7	16.7	17.7	16.3	15.4	19.3	20.8	22.1	21.1	16.2	13.1	10.0	8.6	8.4	11.0	12.9	13.8	14.3	15.9	16.7	15.6
3		22.0	21.0	20.4	20.4	20.6	21.0	21.5	21.9	22.9	24.9	26.4	26.1	21.4	20.7	16.6	11.3	11.8	12.1	14.0	17.1	20.5	21.0	22.9	24.4	20.1
4		21.6	19.2	19.0	19.0	19.0	20.0	19.6	20.0	21.0	22.6	23.7	23.9	22.1	18.2	12.8	9.5	6.3	5.9	8.5	11.4	14.3	15.7	16.1	16.7	16.9
5		16.2	16.6	16.1	15.2	16.3	17.4	18.0	19.3	20.6	22.6	20.0	15.8	17.5	18.0	11.9	7.8	6.4	6.3	9.1	12.7	14.4	15.6	15.6	17.6	15.3
6		17.1	14.8	14.3	14.4	15.0	15.5	15.6	15.9	17.1	18.1	19.1	18.3	18.5	17.3	13.1	9.8	8.7	10.4	12.8	14.8	15.7	16.1	15.2	14.6	15.1
7		15.1	14.7	15.4	15.8	16.5	17.5	17.5	18.1	19.4	21.5	23.5	24.0	22.5	18.9	14.5	11.3	9.2	9.5	11.3	14.1	16.7	17.7	18.1	18.1	16.7
8	Q	16.7	19.0	18.8	18.7	19.1	19.6	20.2	20.6	21.6	23.3	24.9	24.7	22.8	19.5	14.4	9.7	7.4	8.2	11.1	13.6	16.0	17.7	18.4	18.5	17.7
9	Q	17.7	17.6	18.2	17.6	17.3	17.5	17.6	17.7	19.1	21.0	22.9	23.4	22.3	19.6	13.9	9.0	6.7	7.4	10.3	13.2	15.6	17.5	18.1	17.7	16.6
10	Q	17.4	17.1	17.1	17.5	17.0	17.1	17.0	17.7	19.6	23.0	25.0	25.1	23.5	20.3	15.1	10.3	8.2	9.3	11.8	14.4	16.7	17.6	16.9	16.6	17.1
11	Q	16.7	16.7	17.1	16.7	16.7	16.7	17.1	17.4	19.0	22.0	24.4	25.5	25.2	22.0	17.7	13.1	9.3	9.1	11.2	13.2	16.1	17.7	17.6	19.1	17.4
12	D	20.2	19.7	19.3	18.3	20.4	21.3	20.2	21.3	24.2	26.3	29.9	25.5	25.2	19.4	12.8	8.2	5.8	6.3	7.5	10.0	12.2	17.3	17.5	16.5	17.7
13		15.6	15.9	21.7	21.4	22.6	20.1	19.4	19.5	20.5	22.4	24.2	24.2	22.1	18.2	14.2	10.8	10.2	10.8	11.7	12.5	13.7	14.6	15.3	15.6	17.4
14		15.2	17.6	17.3	16.7	17.3	18.4	18.4	18.4	20.5	22.6	25.2	24.9	23.8	18.6	15.2	12.7	9.7	8.8	11.6	11.7	12.4	15.6	15.5	18.4	16.9
15		11.7	18.4	16.9	16.3	16.5	16.5	17.0	18.4	19.0	16.9	18.1	22.1	21.4	18.1	14.7	9.6	7.7	7.4	9.3	11.5	14.7	15.0	14.4	14.2	15.2
16		14.4	14.2	14.1	14.1	13.6	13.7	14.7	16.6	16.6	19.3	21.6	21.4	19.4	14.3	8.3	4.4	3.4	4.5	6.4	8.7	11.3	13.1	13.3	15.1	13.2
17		17.5	16.2	15.8	15.7	14.7	21.3	22.1	20.0	21.2	23.0	24.0	23.2	18.1	15.2	8.9	8.6	7.6	8.4	11.2	12.6	14.6	16.6	16.6	17.3	16.3
18		17.2	15.9	17.8	17.9	15.3	16.3	17.1	18.2	22.1	23.3	24.3	23.3	20.5	16.3	12.2	9.3	8.5	9.5	11.4	14.1	16.5	18.0	17.6	17.2	16.7
19		17.3	17.6	18.1	18.5	19.2	19.4	16.6	20.1	24.1	23.3	23.1	25.0	24.6	21.2	17.3	15.1	12.8	13.5	14.8	17.3	19.0	20.6	20.2	21.4	19.2
20	D	21.0	21.4	21.6	18.8	20.3	21.3	22.1	22.2	24.4	25.2	23.9	23.4	20.3	14.5	11.2	9.0	7.8	8.5	10.8	14.4	16.5	19.2	18.2	18.1	18.1
21		19.6	18.0	18.2	17.3	17.5	18.1	18.6	19.4	22.1	24.1	24.2	24.3	24.0	19.3	13.8	10.4	8.3	7.3	10.2	13.3	16.4	16.3	15.6	17.2	17.2
22		16.5	15.2	14.6	14.5	13.4	12.8	13.4	14.2	18.1	21.1	22.5	22.1	18.2	14.4	9.7	6.4	4.6	4.6	7.7	11.0	14.3	16.1	16.2	15.3	14.0
23		14.6	14.6	15.5	15.6	15.5	16.1	16.7	18.0	18.4	22.4	25.5	26.5	23.4	20.1	15.3	10.4	7.8	7.6	9.4	12.3	15.2	16.5	18.7	17.5	16.4
24		17.2	15.6	15.4	15.4	15.7	16.1	16.4	17.7	19.6	22.5	24.8	22.9	21.2	20.4	14.0	9.4	8.7	8.6	9.4	11.5	14.2	15.9	16.7	17.9	16.1
25		17.6	18.2	17.6	15.4	18.4	18.1	13.1	14.5	16.5	18.5	22.1	22.4	17.5	13.6	9.6	5.8	4.4	3.5	5.3	8.4	10.7	12.7	13.6	13.5	13.8
26	Q	12.8	12.3	12.5	12.7	13.2	13.5	14.3	15.5	17.5	21.1	23.0	22.9	21.5	19.6	16.3	12.3	9.4	9.1	10.1	12.4	15.3	17.2	17.6	17.1	15.4
27	D	17.1	16.5	16.6	18.7	19.5	19.1	22.9	25.2	27.9	28.9	29.4	33.4	31.1	28.1	22.1	21.8	18.4	15.5	16.1	18.1	19.2	20.2	26.0	27.0	22.5
28	D	26.0	29.3	24.0	24.3	23.6	23.0	24.4	27.3	29.1	35.2	20.4	24.9	29.3	24.1	18.6	19.7	19.6	19.5	22.4	25.5	27.0	23.0	19.5	17.3	24.0
29	D	21.1	17.5	16.7	13.7	9.7	11.4	10.4	8.7	17.8	20.1	18.0	17.6	16.6	11.7	7.7	4.8	4.3	4.7	6.6	7.7	10.1	9.7	9.2	9.5	11.9
30		11.5	10.5	10.7	10.5	10.3	13.6	14.2	15.3	15.2	10.7	16.5	20.0	19.1	15.1	10.3	8.2	5.4	7.2	8.4	12.1	12.7	14.4	14.3	14.2	12.5
31		13.6	13.7	14.3	14.2	14.3	14.1	13.4	14.3	14.3	16.0	18.1	19.3	19.4	14.1	11.7	8.9	7.4	6.9	8.6	10.6	13.1	15.2	15.5	14.6	13.6
MEAN	A	17.8	17.6	17.6	17.3	17.4	18.0	18.1	18.9	20.7	22.6	23.5	23.8	22.4	18.7	14.1	10.9	9.1	9.2	11.2	13.7	15.8	17.2	17.4	17.8	17.1
MEAN	Q	16.2	16.5	16.7	16.6	16.7	16.9	17.2	17.8	19.4	22.1	24.1	24.3	23.1	20.2	15.5	10.9	8.2	8.6	10.9	13.4	15.9	17.5	17.7	17.8	16.8
MEAN	D	21.1	20.9	19.6	18.8	18.7	19.2	20.0	20.9	24.7	27.1	24.3	25.0	24.5	19.6	14.5	12.7	11.2	10.9	12.7	15.1	17.0	17.9	18.1	17.7	18.8

VERTICAL INTENSITY

TABLE 15 ST JOHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS MAY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		301	300	295	291	289	282	265	285	284	285	284	279	271	298	314	318	327	324	319	314	305	329	307	294	298
2		285	295	286	286	270	286	290	292	282	278	276	271	272	291	295	310	320	331	322	313	301	301	295	290	293
3		290	292	294	293	294	295	295	294	293	287	283	279	277	275	289	308	299	306	300	296	311	309	308	294	294
4		295	295	290	290	293	291	295	295	294	288	279	275	282	284	305	312	332	339	330	314	307	295	293	293	299
5		290	287	287	290	286	290	291	290	295	290	272	275	271	270	293	309	317	317	314	306	302	303	300	293	293
6		293	290	289	286	286	289	291	295	297	294	290	286	282	283	297	305	313	321	316	308	301	298	294	293	296
7		287	285	282	282	278	282	285	285	287	282	282	278	278	286	293	294	300	301	302	299	294	293	292	290	288
8	Q	289	284	283	283	283	282	282	285	289	285	282	282	282	285	294	302	300	298	297	300	293	297	294	291	289
9	Q	289	284	284	283	275	273	278	284	285	286	282	276	269	267	278	289	300	302	301	298	298	297	293	291	286
10	Q	290	289	285	282	278	278	282	282	284	282	282	278	274	275	284	297	301	305	301	297	293	291	289	290	287
11	Q	289	288	285	284	283	282	281	281	284	281	275	272	270	277	282	292	304	305	301	300	296	292	294	285	287
12	D	285	287	281	273	258	278	284	281	276	273	267	278	271	276	290	303	312	321	305	313	337	331	312	299	291
13		297	288	257	247	264	288	291	292	288	277	267	266	274	282	288	299	299	298	294	292	284	288	292	291	284
14		285	273	284	281	259	258	267	257	261	275	277	281	282	299	302	305	322	341	367	356	352	317	306	291	296
15		249	276	290	292	290	285	285	288	277	258	257	262	270	287	292	307	315	321	309	299	291	286	288	285	286
16		285	284	286	284	286	273	270	277	278	277	268	267	273	284	300	312	315	321	315	309	306	292	289	288	289
17		273	277	284	284	271	199	265	293	292	284	276	269	284	281	308	305	313	315	311	307	296	290	288	288	286
18		284	284	269	275	291	288	289	285	282	281	276	274	275	282	286	299	307	309	309	304	296	284	281	283	287
19		283	281	283	277	269	281	281	269	269	269	268	266	264	274	284	288	299	307	315	312	306	300	292	287	284
20	D	284	277	274	281	238	237	281	290	289	281	273	269	274	290	296	293	307	323	320	316	317	309	306	303	289
21		288	289	282	285	288	289	288	291	289	281	276	269	266	273	288	299	313	316	311	307	300	296	298	291	291
22		284	281	281	281	284	284	284	282	283	280	272	266	268	268	281	296	308	324	328	315	305	296	289	288	289
23		285	283	281	279	281	281	282	282	281	277	274	273	281	278	285	296	300	306	299	301	305	305	304	303	288
24		298	291	289	283	281	281	283	283	284	277	270	277	277	268	281	299	296	301	299	298	291	292	297	291	287
25		284	275	276	269	253	259	263	269	281	276	267	266	273	281	292	299	309	314	314	305	298	294	294	291	283
26	Q	288	285	283	283	281	279	277	279	280	275	275	269	268	275	281	289	289	288	293	291	290	287	291	288	283
27	D	290	286	285	276	282	275	259	266	252	266	270	255	267	270	289	293	308	316	316	323	353	356	349	314	292
28	D	229	242	268	252	294	301	298	289	285	260	238	191	204	284	339	341	347	323	317	334	331	326	316	316	289
29	D	306	301	308	308	271	268	254	200	259	292	292	295	297	316	326	325	334	330	322	337	322	306	301	299	299
30		297	299	298	299	274	276	297	292	289	227	227	245	267	278	301	308	332	335	315	309	299	289	290	292	289
31		291	293	293	294	285	292	298	292	292	278	274	274	275	293	307	316	315	312	308	302	294	290	289	289	294
MEAN A		286	285	284	282	278	278	282	282	283	277	273	270	272	282	295	304	311	315	312	309	306	301	298	293	290
MEAN Q		289	286	284	283	280	279	280	282	285	282	279	275	273	276	284	294	299	300	299	297	294	293	292	289	286
MEAN D		279	279	283	278	268	272	275	265	272	274	268	258	263	287	308	311	322	322	316	324	332	326	317	306	292

HORIZONTAL INTENSITY

TABLE 16 ST JOHN S — H = 17000 PLUS TABULAR VALUES IN GAMMAS — JUNE 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	619	624	623	575	595	602	614	614	602	574	590	584	562	561	581	595	616	634	639	633	622	638	619	612	605
2		612	612	627	615	612	609	612	614	615	615	609	599	587	589	601	606	612	622	631	620	621	629	619	614	613
3		613	618	619	607	602	602	608	603	600	599	594	580	578	584	575	596	614	631	631	628	628	634	614	615	607
4		611	606	602	606	600	594	595	601	599	599	595	583	574	564	560	564	531	617	632	637	631	620	618	611	600
5		604	608	614	608	606	609	601	605	611	606	595	594	591	576	570	581	534	606	622	625	624	617	612	611	604
6	Q	613	613	614	618	619	614	613	613	611	601	594	587	576	569	570	576	538	605	618	627	632	627	620	618	606
7		614	616	614	617	618	613	613	618	614	611	600	588	576	569	570	582	602	630	645	669	690	645	649	633	617
8		619	613	591	598	604	600	593	599	603	588	569	568	566	573	585	598	605	617	631	634	626	617	617	612	601
9		607	605	604	604	600	600	600	598	594	593	588	579	573	578	601	626	644	656	668	661	651	644	626	617	613
10		615	610	607	600	599	602	602	605	611	607	599	594	581	571	568	586	613	641	651	643	629	617	607	618	607
11	Q	618	617	613	610	607	607	610	607	607	601	593	585	580	582	593	605	629	655	642	637	629	619	622	619	612
12	Q	623	623	613	613	612	613	610	612	606	604	593	591	585	579	590	604	617	628	636	631	628	634	629	630	613
13		630	624	621	617	611	615	617	612	604	606	609	593	562	567	593	599	604	626	635	639	636	629	619	618	612
14		623	623	616	613	604	603	603	605	606	605	599	586	578	568	565	573	539	610	644	655	618	628	637	642	608
15		642	614	610	610	616	617	604	589	598	609	593	583	577	574	574	580	584	590	616	631	637	631	621	625	605
16		625	611	604	592	599	603	596	593	603	598	586	574	553	560	562	574	594	611	629	637	643	631	631	625	602
17		616	616	616	616	615	615	613	618	634	624	609	593	567	585	587	599	617	625	652	686	681	673	668	615	622
18	D	609	593	600	603	603	610	606	593	586	567	549	524	531	541	524	542	586	593	606	628	650	655	637	631	590
19		621	674	604	593	597	592	586	596	594	587	576	568	555	548	553	570	587	622	633	635	631	649	641	630	602
20	D	666	581	573	580	574	560	577	571	565	554	574	573	568	568	565	560	579	605	624	650	676	663	649	621	595
21	D	597	567	574	568	575	565	558	572	586	580	562	562	562	553	554	565	591	615	613	623	635	634	629	623	586
22	Q	624	618	617	618	613	613	615	616	613	611	600	586	572	561	561	567	580	599	622	636	640	637	637	628	608
23	Q	626	621	620	621	616	611	608	609	610	608	597	589	578	571	572	573	586	605	615	629	635	634	624	624	608
24		627	627	621	621	621	620	619	619	620	622	616	610	597	591	591	598	610	622	641	653	636	643	649	641	621
25		627	615	610	616	611	617	617	615	614	610	604	592	586	586	595	598	611	622	629	639	641	649	630	622	615
26		621	623	622	634	629	622	622	617	610	617	617	608	598	591	595	590	600	636	661	667	648	634	624	615	621
27	D	621	622	628	603	602	602	625	635	585	584	591	579	533	565	585	590	615	632	622	630	629	608	614	615	605
28		615	622	608	602	603	598	603	604	601	591	576	573	564	559	562	574	591	608	627	625	634	622	617	616	600
29		611	610	610	610	610	612	610	603	608	605	600	585	570	555	553	554	574	598	623	641	648	627	622	616	602
30		620	617	617	617	616	617	618	612	610	611	605	603	590	578	578	584	610	633	652	653	641	627	617	622	614
MEAN	A	620	615	610	607	606	605	606	606	604	600	593	584	572	570	574	584	601	620	633	640	639	634	627	621	607
MEAN	Q	621	618	615	616	613	611	611	611	609	605	595	587	578	572	577	585	600	618	627	632	633	630	626	623	609
MEAN	D	622	597	599	586	590	588	596	597	585	572	573	564	551	558	562	571	597	616	621	633	642	640	630	621	596

DECLINATION

TABLE 17 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES JUNE 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	14.5	14.6	16.4	17.7	19.7	22.1	18.2	17.5	18.2	11.7	17.4	17.5	17.1	8.5	4.3	1.7	.7	2.7	3.9	2.9	4.9	8.3	7.5	7.7	11.5
2		8.6	7.8	7.5	9.7	7.4	7.6	8.5	10.3	11.6	13.4	14.6	15.2	14.7	11.3	6.8	5.7	3.0	4.4	4.8	5.1	8.6	10.4	10.4	11.5	9.1
3		10.8	10.3	11.2	12.6	10.0	12.3	12.3	9.6	8.5	10.5	14.3	15.6	14.3	10.8	6.6	7.1	7.5	8.7	10.3	10.3	13.5	15.2	16.1	16.6	11.5
4		18.0	19.7	19.8	15.2	17.7	18.6	16.8	16.1	18.5	21.8	23.7	23.8	22.6	20.3	15.1	13.3	9.1	8.3	10.2	12.2	15.1	17.1	18.1	19.4	17.1
5		17.2	16.1	17.6	16.7	15.6	16.8	16.8	19.0	21.5	22.7	24.3	24.6	22.3	20.6	17.0	13.3	10.4	10.3	11.4	13.3	15.0	16.7	17.0	16.7	17.2
6	Q	16.3	16.5	16.3	16.0	15.9	16.9	17.2	18.0	21.9	24.2	24.3	25.2	24.1	21.1	16.5	13.9	11.5	10.6	11.3	13.4	16.8	18.7	18.2	17.0	17.6
7		16.1	15.8	15.7	16.1	16.1	17.3	17.8	18.2	21.0	23.5	25.6	26.0	24.3	20.1	16.8	12.6	10.3	8.7	8.4	10.2	12.1	16.2	15.9	18.9	16.8
8		20.6	19.2	21.5	23.5	22.0	19.7	23.4	21.7	22.9	25.4	26.4	25.3	22.9	19.7	15.1	11.3	9.3	9.3	10.3	12.7	15.1	16.7	17.3	16.3	18.6
9		16.0	15.3	15.4	16.4	17.2	17.1	17.9	19.1	20.2	22.1	23.6	23.6	21.6	16.2	11.6	8.5	7.3	8.7	10.6	12.5	15.1	16.0	16.4	16.0	16.0
10		15.4	15.1	15.4	17.0	16.9	17.3	19.1	19.0	22.5	26.6	26.8	24.6	24.2	22.6	17.3	11.5	9.4	10.5	13.5	14.3	16.5	17.0	16.4	15.2	17.7
11	Q	15.3	15.5	14.6	17.0	16.6	17.0	18.0	19.2	20.8	23.0	24.6	24.8	23.3	20.0	16.5	13.6	9.9	9.7	10.8	12.4	14.2	15.2	15.2	15.4	16.8
12	Q	15.7	16.5	17.2	17.4	18.4	18.9	18.9	18.5	20.1	22.1	24.9	24.7	22.0	18.9	15.2	11.4	8.0	7.2	8.1	8.6	11.5	13.7	15.0	15.3	16.2
13		15.6	15.6	15.6	16.3	18.4	18.1	18.4	21.4	22.7	23.1	22.9	23.2	22.8	16.3	12.5	13.7	10.0	9.7	10.7	11.7	13.7	15.8	16.4	16.3	16.7
14		16.1	16.2	17.1	17.4	18.2	17.1	18.1	18.5	21.0	23.8	25.9	27.0	24.8	21.0	16.2	12.5	9.0	6.1	6.9	9.3	12.8	14.6	15.4	15.4	16.7
15		19.4	20.1	18.7	17.2	18.4	21.5	22.3	18.5	19.3	25.1	26.8	27.0	25.1	22.1	16.1	13.0	9.8	8.1	9.0	11.5	14.5	17.2	19.0	17.2	18.2
16		16.7	16.8	17.5	19.4	17.5	16.5	19.4	19.6	22.0	25.1	27.0	25.9	25.1	19.7	16.4	13.0	10.2	9.2	9.8	11.9	14.5	15.8	16.4	17.2	17.6
17		16.6	15.6	15.6	15.9	16.5	17.2	18.6	19.6	23.3	26.6	28.8	29.4	26.6	18.5	14.7	11.8	9.6	7.8	9.1	10.0	12.5	16.2	15.9	16.1	17.2
18	D	18.3	17.8	17.6	16.3	16.7	18.3	18.7	16.9	21.9	22.0	19.7	23.0	21.2	21.4	18.5	13.7	10.3	9.3	8.9	11.2	15.6	15.1	19.4	20.4	17.2
19		17.5	17.7	19.2	16.9	15.6	15.6	14.9	16.9	19.7	21.7	23.3	24.4	22.5	19.1	14.6	10.1	7.1	7.3	9.2	10.3	12.6	14.7	16.9	16.5	16.0
20	D	16.1	20.5	22.2	22.2	22.3	26.4	20.6	20.7	20.4	19.8	21.6	21.4	19.4	17.4	15.1	12.1	10.2	11.8	11.8	10.3	12.7	13.2	15.1	15.2	17.4
21	D	16.7	14.7	19.7	19.6	19.4	23.2	25.5	25.3	24.4	26.0	24.3	21.9	20.3	18.7	13.1	10.9	9.4	9.4	9.2	10.5	12.9	14.6	14.6	15.2	17.5
22	Q	15.7	15.9	15.8	16.9	16.7	16.7	17.2	18.1	20.4	22.3	23.8	25.0	25.5	24.6	21.5	16.9	11.0	8.6	9.3	10.4	12.9	16.2	16.7	16.6	17.3
23	Q	16.6	16.9	16.7	15.9	16.0	16.0	17.6	18.9	20.0	22.1	23.5	23.9	23.6	21.7	18.0	13.3	10.4	9.1	8.9	11.0	14.1	16.7	16.9	16.9	16.9
24		16.9	17.9	16.1	15.3	15.3	15.9	16.3	17.1	19.0	20.6	21.8	22.7	22.7	20.6	17.8	12.5	9.5	10.4	11.5	12.5	13.6	16.2	16.7	17.2	16.5
25		17.9	20.6	17.5	15.8	15.2	14.8	13.9	16.1	17.7	20.5	22.6	22.7	20.9	21.5	19.0	16.2	13.0	11.5	10.6	12.5	15.1	17.0	17.7	18.6	17.0
26		17.5	17.1	16.3	17.8	16.0	17.3	16.9	11.7	16.3	21.6	23.6	24.3	22.8	20.8	18.2	16.9	12.4	11.3	11.9	12.4	15.7	15.6	16.0	14.7	16.9
27	D	15.0	15.4	14.1	18.3	16.0	17.7	21.6	18.8	18.3	28.1	26.3	22.9	21.9	10.7	14.9	9.7	8.8	9.8	12.2	13.1	14.9	15.7	15.9	15.3	16.5
28		16.2	19.1	20.8	18.4	17.3	12.6	15.6	17.9	19.2	21.2	20.1	21.8	20.9	17.8	15.0	10.6	8.8	9.8	11.4	13.3	15.4	16.9	17.1	16.5	16.4
29		16.1	15.6	15.5	15.8	15.4	15.0	14.1	15.3	20.3	23.3	24.6	25.5	25.5	22.8	18.1	16.1	11.4	8.9	10.7	11.4	13.7	17.1	17.9	17.0	17.0
30		15.6	15.4	15.4	15.4	16.2	16.2	16.2	13.7	16.5	22.0	24.0	24.8	24.0	22.0	19.0	14.6	9.9	8.9	10.8	12.8	14.5	16.2	17.0	16.6	16.6
MEAN	A	16.2	16.4	16.7	16.9	16.7	17.3	17.7	17.7	19.7	22.1	23.4	23.6	22.3	18.9	15.2	12.0	9.2	8.9	9.8	11.1	13.7	15.5	16.1	16.2	16.4
MEAN	Q	15.9	16.3	16.1	16.7	16.7	17.1	17.8	18.5	20.6	22.8	24.2	24.7	23.7	21.3	17.5	13.8	10.1	9.0	9.7	11.2	13.9	16.1	16.4	16.2	16.9
MEAN	D	16.1	16.6	18.0	18.8	18.8	21.5	20.9	19.8	20.6	21.5	21.6	21.3	20.0	15.3	13.2	9.6	7.9	8.6	9.2	9.6	12.2	13.4	14.5	14.8	16.0

VERTICAL INTENSITY

TABLE 18 ST JOHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS JUNE 1970

HOUR UT DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	288	290	278	189	229	269	301	305	286	253	245	260	173	278	298	306	308	323	322	317	302	312	303	288	280
2		278	282	282	250	266	275	289	292	291	291	284	275	270	289	299	297	308	306	309	299	299	304	293	289	288
3		284	284	266	256	243	243	270	285	278	260	260	261	272	290	292	310	300	303	308	309	306	308	294	292	282
4		281	263	259	278	267	270	286	286	275	274	276	279	281	283	300	306	323	324	316	309	300	293	298	293	288
5		289	287	276	261	274	267	260	260	274	282	278	278	278	277	290	300	306	301	302	297	293	290	285	285	283
6	Q	285	283	283	283	271	275	279	283	278	281	279	275	275	279	294	298	302	302	301	295	291	286	286	286	285
7		286	285	283	279	275	276	279	284	284	282	276	274	270	271	277	294	301	308	301	307	316	309	322	298	289
8		276	275	253	270	268	200	212	290	294	283	276	284	293	300	307	307	300	301	301	294	290	287	298	298	282
9		293	290	283	270	279	284	283	278	275	275	278	283	286	302	307	310	310	309	301	294	298	298	294	293	291
10		293	291	287	285	286	286	283	285	270	275	277	284	276	277	296	310	317	326	326	315	302	293	285	291	292
11	Q	291	291	276	283	286	286	284	283	279	277	276	279	286	298	304	309	317	316	301	291	285	278	285	286	289
12	Q	291	287	284	285	279	279	278	282	275	275	269	273	279	286	302	309	310	308	302	301	298	294	291	290	289
13		290	286	287	286	283	286	279	253	269	264	262	260	264	286	294	294	302	307	309	303	300	294	290	290	285
14		290	283	271	237	274	283	286	287	285	279	269	265	271	279	291	294	306	309	317	314	287	286	286	287	285
15		279	268	275	287	285	268	271	278	242	251	255	261	262	260	283	298	313	318	324	317	315	310	301	299	284
16		293	286	283	275	283	232	262	291	290	277	275	270	260	285	291	302	311	309	307	299	295	290	291	283	285
17		279	279	279	283	283	283	283	284	277	269	261	259	263	277	286	299	309	323	335	355	346	326	334	309	295
18	D	293	293	292	292	286	285	286	275	222	214	206	204	214	238	277	322	339	332	333	340	348	338	323	308	286
19		301	283	268	283	292	286	287	292	287	279	277	279	283	291	310	315	315	322	323	322	319	326	322	318	299
20	D	299	271	271	283	259	238	211	200	228	264	261	270	275	283	291	302	325	358	385	401	389	365	349	332	296
21	D	294	214	246	180	238	191	196	214	262	283	277	263	279	287	301	315	333	333	317	301	300	306	300	294	272
22	Q	294	293	287	279	286	287	290	293	293	290	284	278	271	276	290	309	317	315	316	315	310	303	305	299	295
23	Q	298	290	285	279	275	276	279	286	286	287	285	278	271	278	287	301	305	306	309	309	301	295	293	292	290
24		293	286	287	287	285	283	282	283	279	283	278	279	279	279	290	301	300	293	301	308	299	299	301	295	290
25		288	276	293	293	287	290	284	277	277	270	268	268	275	279	295	308	309	306	305	298	293	300	293	293	289
26		291	291	290	278	269	253	264	247	235	239	257	264	278	286	301	307	332	339	339	359	327	307	292	284	289
27	D	288	285	275	230	228	255	256	246	128	158	226	261	257	290	301	330	324	325	308	301	301	291	292	291	269
28		293	275	261	284	279	263	279	287	285	274	268	267	277	284	302	321	326	319	317	307	309	296	295	294	290
29		290	291	292	294	294	291	289	278	283	282	277	275	270	269	283	291	315	324	333	338	330	306	286	278	294
30		278	277	278	279	278	283	284	271	249	252	253	255	264	275	287	302	322	317	309	301	285	279	275	278	280
MEAN	A	289	281	278	270	273	268	272	275	268	267	267	269	268	281	294	306	313	316	316	314	308	302	299	294	287
MEAN	Q	292	289	283	282	279	281	282	285	282	282	279	277	276	283	296	305	310	309	306	302	297	291	292	291	290
MEAN	D	292	271	273	235	248	247	250	248	225	234	243	252	240	275	294	315	326	334	333	332	328	322	313	303	281

HORIZONTAL INTENSITY

TABLE 19 ST JOHN S — H = 17000 PLUS TABULAR VALUES IN GAMMAS — JULY 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		621	629	620	616	620	614	619	616	620	619	608	603	585	561	590	619	609	640	634	635	633	634	629	632	617
2		628	627	626	623	628	635	634	616	627	626	613	602	615	609	604	609	627	634	638	637	631	627	626	632	624
3		633	621	615	614	613	594	603	602	594	597	578	597	589	584	585	589	590	602	621	635	655	664	658	660	612
4		582	585	613	602	597	533	512	582	572	608	595	588	573	565	565	572	590	604	617	624	623	610	609	610	589
5		615	616	621	629	584	589	573	583	595	597	590	582	572	570	571	585	604	621	615	628	631	634	635	636	603
6		635	622	616	616	610	604	596	585	578	601	607	584	560	563	585	594	612	633	641	640	629	620	617	615	607
7	Q	617	616	615	614	612	613	614	611	608	604	601	592	583	584	590	601	617	640	647	644	635	627	632	633	615
8		627	624	616	609	602	598	609	604	615	615	607	591	577	569	577	591	615	635	645	655	664	657	640	652	616
9	D	625	633	639	617	407	481	532	587	593	545	547	569	533	500	518	562	536	589	627	663	741	753	690	649	591
10	D	532	602	602	601	594	592	588	584	593	589	584	576	562	557	560	574	531	600	634	645	652	659	639	631	597
11		613	601	587	594	596	601	595	590	588	584	581	564	559	556	559	576	589	600	615	639	634	640	632	632	597
12		625	610	606	616	607	606	607	601	601	595	594	586	570	571	572	576	590	620	652	622	620	625	631	634	606
13		625	627	618	620	614	608	614	608	613	613	600	594	583	577	577	586	602	626	623	632	640	632	634	625	612
14		626	625	614	608	616	612	609	608	596	606	605	601	594	588	589	590	603	627	633	621	626	628	632	627	612
15	Q	622	615	620	622	619	615	616	613	605	595	602	610	606	596	595	606	619	626	633	633	633	625	627	622	616
16		633	627	609	610	614	620	614	613	610	608	602	589	578	588	606	615	628	634	637	628	620	621	620	620	614
17		618	625	627	615	614	615	615	614	613	607	598	590	581	582	595	615	625	628	632	634	647	653	634	627	617
18	Q	632	614	614	672	612	609	614	608	608	607	600	592	582	573	581	594	607	624	637	650	639	636	632	619	615
19	Q	619	619	620	631	624	619	618	614	613	607	594	591	588	583	578	592	609	631	631	627	639	633	638	633	615
20		623	620	620	620	619	618	618	618	618	613	606	594	592	584	585	586	600	623	643	656	650	648	651	650	619
21	D	620	618	618	612	612	618	623	625	625	632	609	600	582	536	549	600	605	618	656	632	645	651	633	626	614
22		624	617	617	623	624	618	612	607	595	597	605	591	577	573	571	592	622	633	649	662	671	661	649	635	618
23		617	610	611	615	625	626	622	629	624	623	617	608	596	585	568	581	606	635	619	629	637	631	630	630	616
24		636	625	611	589	591	609	564	606	619	611	598	581	581	577	585	599	622	641	624	634	635	636	637	649	611
25	D	679	647	604	592	623	427	-108	211	440	505	513	440	573	534	564	582	607	628	629	621	624	684	660	614	537
26		597	566	558	553	573	597	553	579	577	573	548	552	558	559	567	573	593	604	621	621	632	643	652	609	586
27		610	611	616	611	609	581	604	599	599	587	587	585	580	553	558	584	596	609	629	651	654	616	619	611	603
28	Q	606	601	601	603	601	602	605	608	609	604	592	584	574	570	571	579	590	609	613	622	627	617	615	612	601
29	D	617	608	617	610	604	557	503	527	502	489	484	502	472	516	557	545	570	642	642	621	620	610	604	601	567
30		598	598	601	603	604	604	602	601	597	591	576	566	569	567	571	582	592	604	608	617	622	633	630	617	598
31		609	597	602	608	596	595	597	595	600	594	583	578	575	565	568	577	590	619	633	612	633	633	633	616	600
MEAN A		618	615	612	612	602	594	573	589	595	595	588	580	575	568	575	588	604	622	632	634	640	640	634	628	605
MEAN Q		619	613	614	628	614	612	613	611	609	603	598	594	586	581	583	595	608	626	632	635	635	627	629	624	612
MEAN D		615	622	616	606	568	535	427	507	550	552	547	537	544	529	549	573	594	615	637	636	656	672	645	624	582

DECLINATION

TABLE 20 ST JOHN S — D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES — JULY 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TC 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		16.4	18.0	19.2	18.9	19.2	19.9	13.6	19.0	20.8	25.9	26.9	26.6	25.7	23.2	13.4	8.7	10.3	8.1	10.8	12.7	15.2	17.2	17.9	17.1	17.7
2		16.4	16.3	16.4	16.4	15.7	16.7	17.1	20.0	24.0	25.8	25.4	23.2	22.2	21.3	16.4	12.8	10.8	8.9	9.0	10.8	13.6	16.3	15.6	15.6	16.9
3		17.5	16.3	16.6	17.4	16.4	13.8	24.5	22.1	14.6	23.3	22.1	22.3	22.2	18.2	15.7	13.7	11.6	10.5	10.0	12.4	13.9	17.3	18.5	16.2	17.0
4		23.9	19.4	18.6	17.7	17.5	10.6	24.2	29.9	25.9	27.6	27.6	25.7	24.2	21.1	18.0	13.8	10.9	9.7	11.1	12.8	14.8	15.8	16.4	16.4	18.9
5		16.4	15.7	15.6	16.5	14.6	17.7	24.3	17.7	21.1	22.4	23.3	23.9	23.4	22.2	16.5	12.9	10.1	9.2	9.0	9.9	12.6	14.7	16.3	17.3	16.8
6		22.3	19.5	21.2	20.1	18.8	17.3	22.4	18.7	13.9	22.2	27.4	27.2	26.0	22.2	16.6	13.2	10.8	10.3	10.8	11.8	13.2	14.9	15.4	15.8	18.0
7	Q	16.5	16.3	16.4	16.5	16.6	16.7	17.0	18.2	19.2	21.4	24.0	24.9	24.2	21.3	17.6	13.8	10.2	9.4	9.8	11.4	13.9	15.6	15.5	17.6	16.8
8		17.7	16.7	17.6	18.9	21.4	22.4	22.4	21.5	21.4	22.5	22.6	23.0	22.4	19.2	15.7	12.1	9.4	8.6	9.0	10.9	13.8	15.8	17.4	16.6	17.5
9	D	20.6	18.5	17.3	18.3	9.2	29.9	29.0	24.3	26.9	25.7	21.3	21.5	24.4	11.2	11.4	9.2	6.2	6.3	8.2	9.3	11.1	13.8	16.3	20.4	17.1
10	D	26.3	22.6	19.4	17.9	17.7	17.8	18.5	19.3	19.8	21.3	23.0	24.2	23.6	22.4	20.5	16.4	13.3	11.4	9.0	10.4	12.2	15.7	15.0	14.9	18.0
11		16.1	19.0	20.0	18.6	17.6	17.0	16.7	16.1	19.4	21.9	24.7	25.5	25.0	22.3	17.7	14.1	10.4	10.0	10.4	10.6	12.3	15.1	15.7	17.6	17.2
12		20.0	18.1	17.0	18.6	15.8	19.1	19.3	20.8	21.6	20.9	24.5	24.7	24.5	20.4	17.8	13.3	10.5	10.4	11.2	12.0	13.0	14.4	16.2	17.2	17.7
13		17.0	18.1	18.8	19.1	17.9	14.2	17.6	19.6	20.5	21.8	24.2	23.7	22.8	20.0	16.1	14.1	10.9	10.1	10.5	10.5	12.1	14.0	14.1	14.9	16.8
14		15.6	17.0	18.1	15.9	18.7	18.7	18.6	18.9	17.2	21.4	23.8	23.8	21.9	20.9	17.1	14.4	11.6	12.0	12.4	14.2	15.2	15.9	16.1	18.7	17.4
15	Q	18.0	16.9	16.8	17.4	18.7	18.2	18.2	18.9	20.7	19.9	22.0	22.8	21.8	20.9	17.1	13.2	11.4	11.4	12.2	13.8	14.9	15.2	15.4	16.9	17.2
16		18.2	20.6	21.7	19.2	18.3	19.2	19.0	19.6	20.6	22.0	22.9	23.7	21.7	16.1	14.1	13.4	13.1	11.7	12.3	13.6	15.5	16.2	16.1	16.0	17.7
17		16.2	16.5	17.0	17.0	17.2	17.9	18.3	19.3	20.9	22.7	23.4	23.0	22.6	19.0	15.1	11.5	11.3	10.7	10.7	12.3	13.4	14.6	19.1	18.6	17.0
18	Q	17.1	17.0	17.3	19.1	19.3	17.7	19.0	20.1	21.1	22.9	24.9	24.7	23.9	20.9	16.4	13.6	10.6	10.7	12.4	13.6	14.4	16.0	16.3	16.2	17.7
19	Q	16.1	16.2	17.1	17.0	17.9	13.0	19.2	20.0	21.8	23.4	23.9	23.0	21.7	19.2	15.9	12.3	9.6	10.4	11.5	12.4	14.0	16.0	17.3	17.7	17.2
20		18.1	17.9	17.6	18.1	17.4	16.4	16.9	18.0	20.1	22.1	23.6	24.8	23.5	21.7	18.1	14.5	10.5	8.9	10.4	11.7	14.3	16.4	17.0	15.5	17.2
21	D	18.6	19.8	17.9	16.2	20.1	19.3	18.0	19.7	22.0	27.3	26.6	21.2	23.4	22.6	12.9	8.4	8.6	8.6	11.5	14.0	16.3	17.2	19.9	21.7	18.0
22		20.1	17.9	16.0	16.5	15.3	17.9	18.7	18.1	17.4	18.7	22.6	23.5	21.1	17.8	14.1	9.9	8.9	9.7	11.8	13.6	15.5	17.9	17.3	17.6	16.6
23		19.8	19.1	18.8	18.8	17.3	17.9	15.0	17.3	20.6	23.5	24.7	24.7	24.5	22.3	19.3	14.5	11.6	10.5	10.1	10.7	11.7	14.3	16.0	16.4	17.5
24		17.3	17.8	21.2	22.8	22.9	19.9	14.6	17.1	20.0	21.8	23.0	23.3	19.8	17.5	14.5	10.8	9.0	9.0	8.8	11.5	13.6	15.7	17.0	19.3	17.0
25	D	19.0	18.8	19.3	25.7	19.3	18.1	-10.1	9.4	15.7	22.9	19.8	11.4	13.4	18.2	12.6	13.6	12.7	12.3	14.3	16.2	17.0	15.9	18.9	16.1	15.4
26		17.2	16.2	20.7	19.5	17.1	17.0	15.0	17.2	19.0	21.3	21.7	19.6	21.7	20.2	17.2	15.0	11.5	10.3	11.4	12.6	14.5	15.8	17.3	17.8	17.0
27		16.5	16.7	17.1	19.4	18.7	13.4	16.9	18.9	20.9	21.1	21.6	24.0	24.6	23.7	18.7	16.2	13.4	11.8	11.7	12.5	15.4	15.4	16.4	18.2	17.6
28	Q	17.0	16.1	16.2	16.9	17.1	17.1	17.2	17.3	18.2	20.9	22.7	23.4	22.6	20.2	16.3	11.2	8.8	9.3	10.7	13.2	15.3	16.3	18.3	18.2	16.7
29	D	17.0	18.8	18.3	17.8	10.3	15.1	14.0	10.7	2.2	3.7	9.4	13.7	15.5	3.8	12.2	12.3	9.4	10.8	12.6	13.6	15.2	15.2	15.0	15.0	12.6
30		15.3	15.5	16.2	16.4	16.1	14.1	17.4	18.3	20.1	22.8	24.3	24.5	22.6	19.8	17.1	13.4	12.2	11.8	12.3	15.3	17.3	19.2	20.1	19.8	17.6
31		19.8	21.2	18.9	19.2	19.1	19.3	16.2	14.5	18.1	21.1	20.9	22.6	22.6	18.9	16.0	13.3	8.8	8.8	10.6	13.5	16.4	18.2	19.2	20.0	17.4
MEAN	A	18.2	17.9	18.1	18.3	17.5	17.7	17.7	18.7	19.5	22.0	23.2	23.0	22.6	19.6	16.1	12.9	10.6	10.1	10.9	12.4	14.3	15.9	16.9	17.3	17.1
MEAN	Q	16.9	16.5	16.8	17.4	17.9	17.8	18.1	18.9	20.2	21.7	23.5	23.8	22.8	20.5	16.7	12.8	10.1	10.3	11.3	12.9	14.5	15.8	16.6	17.3	17.1
MEAN	D	20.3	19.7	18.4	19.2	15.3	20.0	13.9	16.7	17.3	20.2	20.0	18.4	20.1	15.6	13.9	12.0	10.0	9.9	11.1	12.7	14.3	15.6	17.0	17.6	16.2

VERTICAL INTENSITY

TABLE 21 ST JOHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS JULY 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		278	272	265	265	245	269	268	254	256	246	262	265	268	261	299	310	287	303	286	294	288	284	278	277	274
2		272	272	271	271	276	255	232	205	248	261	260	256	270	278	287	292	232	300	302	299	291	288	291	291	273
3		284	284	279	280	256	201	223	213	216	208	244	253	261	272	284	299	308	312	316	307	303	309	315	293	272
4		133	244	276	266	230	169	160	159	222	284	285	295	292	296	301	317	320	319	319	307	301	295	292	295	266
5		295	292	288	270	158	152	205	269	286	292	287	284	280	284	302	311	325	335	325	307	296	294	295	295	280
6		269	269	262	276	260	256	231	239	212	228	254	264	275	292	311	310	308	302	300	292	286	280	286	287	273
7	Q	287	287	287	285	284	284	284	284	280	276	280	280	286	295	302	310	312	308	299	295	298	303	307	295	292
8		292	288	276	262	259	257	261	280	287	287	287	280	270	278	295	312	323	319	320	318	316	319	310	302	292
9	D	276	302	301	197	-15	56	263	299	278	220	207	232	223	223	254	288	313	310	333	386	476	478	367	252	272
10	D	182	318	310	300	299	295	294	296	301	299	295	295	295	303	303	318	319	328	340	332	349	336	323	315	306
11		309	295	288	295	294	292	286	276	269	276	284	284	287	293	302	308	318	323	319	327	324	318	310	307	299
12		270	268	221	235	270	292	288	280	287	278	276	277	277	295	308	318	319	319	333	316	303	302	304	291	289
13		292	285	256	254	282	263	270	289	286	284	276	276	276	278	284	292	312	322	311	312	310	302	300	280	287
14		285	285	280	292	276	285	284	280	271	263	264	270	280	286	302	310	310	309	314	308	302	295	293	286	289
15	Q	284	286	285	278	280	287	286	280	275	272	261	258	261	265	280	295	302	302	299	293	287	285	286	286	282
16		278	269	261	286	286	280	286	287	285	280	278	272	279	295	295	288	294	303	308	302	295	294	286	284	286
17		280	284	280	279	286	287	287	286	286	278	272	270	268	278	296	302	302	305	310	310	316	313	310	301	291
18	Q	287	285	284	284	286	288	286	288	288	280	280	286	284	291	299	299	302	302	302	310	305	301	294	287	292
19	Q	286	281	278	268	262	269	284	284	285	284	284	285	280	287	291	300	302	307	302	302	310	302	302	299	289
20		287	285	278	272	280	284	284	280	284	279	276	264	269	269	278	287	295	299	302	306	302	301	307	316	287
21	D	295	287	294	276	272	288	298	293	287	276	277	293	272	265	308	333	324	320	349	366	340	326	309	291	302
22		288	287	290	275	264	267	278	284	276	273	275	272	280	291	301	317	318	323	318	310	316	311	310	295	292
23		267	281	285	272	280	284	286	265	278	272	280	279	280	286	291	308	310	312	307	310	303	294	292	291	288
24		292	274	246	213	223	201	152	261	290	239	288	286	295	287	302	302	310	311	296	302	293	295	305	300	276
25	D	303	302	161	164	263	75	-20	-54	68	133	239	183	325	295	332	333	328	326	306	300	304	364	332	275	235
26		239	206	184	221	269	292	209	262	261	253	268	290	302	316	327	325	331	318	317	310	309	316	319	292	281
27		295	294	294	284	272	244	264	292	291	279	280	288	283	284	310	328	340	333	332	333	323	292	295	291	297
28	Q	292	291	291	292	292	294	295	295	293	287	283	280	277	276	292	309	310	304	304	303	301	287	294	294	293
29	D	294	280	291	280	194	136	86	158	145	184	201	218	229	285	286	302	342	359	362	348	306	288	286	287	256
30		291	294	294	295	295	252	287	300	295	287	284	280	287	287	295	310	315	325	320	316	315	317	316	302	298
31		291	276	293	263	261	268	292	287	261	270	271	269	276	286	303	308	323	337	341	324	311	315	318	296	293
MEAN A		277	281	273	266	256	246	248	257	263	264	270	270	277	283	297	308	313	316	316	314	312	310	304	292	284
MEAN Q		287	286	285	281	281	284	287	286	284	280	277	278	278	283	293	302	305	305	302	301	300	296	296	292	290
MEAN D		270	298	271	244	203	170	184	199	216	222	244	244	269	274	297	315	325	329	338	346	355	359	323	284	274

HORIZONTAL INTENSITY

TABLE 22 ST JOHN S   H = 17000 PLUS TABULAR VALUES IN GAMMAS   AUGUST 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	609	610	610	609	609	608	608	608	607	602	589	577	572	570	570	582	600	614	625	627	627	622	616	619	604
2		608	617	609	610	603	603	604	602	597	600	585	575	566	571	582	594	608	627	640	639	634	627	622	621	606
3	Q	621	624	620	620	618	613	613	614	608	606	569	577	574	565	570	569	613	631	637	633	626	620	618	616	609
4	Q	616	615	617	615	613	612	613	613	608	606	596	587	580	577	581	588	601	615	625	632	627	620	624	625	609
5	Q	621	621	624	620	620	619	618	617	618	613	602	589	577	573	574	581	596	615	632	639	643	639	631	627	613
6		630	627	627	626	626	626	626	625	623	615	618	609	594	581	576	580	539	608	628	633	644	651	645	628	619
7		624	619	615	617	620	620	620	617	612	606	595	592	586	581	582	598	602	624	642	645	644	680	631	611	616
8	D	610	602	602	601	606	607	602	593	581	536	533	561	570	582	585	581	595	617	648	645	625	639	639	617	599
9	D	612	568	550	606	600	604	595	592	598	598	580	560	568	578	588	587	594	612	619	620	626	631	625	623	597
10		618	618	618	617	613	613	613	609	599	599	598	581	578	582	588	592	603	613	624	625	628	630	626	625	609
11		624	616	618	614	612	618	619	619	620	613	613	609	600	581	584	594	609	619	631	635	630	628	643	637	616
12		619	613	604	592	591	607	618	616	606	604	606	592	584	572	568	575	591	616	630	643	667	655	631	624	609
13		622	623	620	618	618	622	612	615	612	608	600	595	576	564	571	587	605	615	646	647	648	649	629	621	614
14		621	621	627	627	610	617	615	617	613	608	593	578	571	566	573	585	533	618	627	625	634	636	634	636	610
15		630	629	628	615	615	616	617	615	610	599	587	579	571	571	574	584	538	618	637	653	636	637	647	630	612
16		623	629	625	617	617	615	618	617	618	612	596	579	561	566	574	579	536	611	627	630	630	631	717	654	614
17	D	674	673	636	334	13	-39	327	247	402	472	448	496	528	511	542	561	536	734	736	687	586	593	605	593	498
18	D	555	567	565	564	523	542	549	541	554	561	515	504	495	502	528	560	601	630	642	620	616	604	604	593	564
19		561	583	581	603	600	593	598	598	591	576	554	554	547	537	549	571	594	600	635	629	630	622	621	623	589
20		620	617	617	617	616	617	617	608	600	599	590	567	560	564	573	579	596	612	623	629	624	630	627	629	605
21		625	622	617	621	624	623	622	617	615	611	603	591	581	572	571	577	588	603	624	636	631	634	629	625	611
22		625	625	624	627	629	626	624	622	618	609	598	579	562	566	577	590	539	618	629	618	627	629	631	629	612
23		624	622	621	622	622	614	622	618	618	620	614	598	583	571	573	579	533	608	628	637	636	637	628	626	613
24	Q	628	622	623	624	622	622	618	618	617	610	598	586	580	583	590	603	615	627	634	634	631	630	630	633	616
25		634	634	630	631	629	617	616	615	612	617	612	590	581	579	586	594	608	615	632	641	637	636	630	628	617
26	D	629	629	631	629	616	586	611	612	623	610	607	585	560	567	574	580	536	611	624	634	637	631	624	627	610
27		617	616	619	622	614	610	621	620	621	616	609	601	589	572	554	568	590	620	626	621	629	628	621	617	609
28		626	627	624	623	626	625	629	624	622	616	609	597	582	570	568	583	593	615	641	638	628	629	622	623	614
29		629	625	628	609	606	612	624	616	620	616	604	589	577	574	575	578	590	597	613	621	621	624	628	628	609
30		626	616	610	612	614	614	621	617	616	616	604	590	578	579	585	601	617	634	636	635	636	635	635	635	615
31		633	628	629	635	636	636	623	609	623	614	617	604	589	583	584	601	620	635	648	635	616	621	621	623	619
MEAN	A	620	618	615	606	593	591	604	599	603	600	589	580	572	568	573	584	600	620	635	635	631	632	630	624	605
MEAN	Q	619	618	619	617	616	615	614	614	612	607	595	583	577	574	577	589	605	620	631	633	631	626	624	624	610
MEAN	D	616	608	597	547	471	460	537	517	552	555	536	541	544	548	563	574	596	641	654	641	618	620	619	611	574

DECLINATION

TABLE 23 ST JOHN S — D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES — AUGUST 1970

DAY \ HOUR UT		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	19.0	17.3	18.3	17.9	17.1	17.2	17.4	18.0	19.2	21.1	22.9	24.8	23.3	20.2	17.3	14.1	11.4	10.4	11.5	13.3	15.2	17.2	17.0	16.5	17.4
2		16.4	14.7	16.0	20.0	20.5	20.6	19.8	20.2	21.8	22.7	26.7	26.7	24.7	20.2	14.9	11.2	9.0	9.7	11.6	13.5	15.3	16.4	16.8	16.6	17.7
3	Q	16.9	17.2	17.3	17.6	18.5	19.2	19.0	19.2	21.1	23.0	24.8	23.9	21.8	18.5	13.0	8.8	7.6	7.7	10.4	14.1	15.9	17.0	16.7	16.2	16.9
4	Q	16.4	16.5	17.0	17.9	18.7	18.7	18.7	19.2	20.6	22.7	24.7	24.7	22.8	19.0	15.2	10.7	9.5	9.6	10.5	12.4	15.0	16.5	17.1	17.1	17.1
5	Q	17.9	17.1	17.4	18.1	18.9	18.5	18.3	18.8	19.8	22.0	22.8	23.4	22.7	21.0	17.3	13.6	10.7	9.8	10.4	12.2	14.3	16.2	16.9	16.6	17.3
6		16.9	17.1	17.3	17.3	17.9	18.2	18.6	19.0	19.8	21.9	22.8	24.8	24.8	22.6	18.9	13.4	10.6	9.7	11.1	12.5	14.0	14.2	15.3	19.0	17.4
7		18.2	17.8	17.5	18.1	18.8	19.7	19.8	21.7	22.6	24.6	25.6	25.5	23.6	21.7	17.8	14.2	11.3	11.5	12.2	13.4	14.3	14.3	21.2	20.9	18.6
8	D	19.0	19.3	15.9	20.1	20.1	19.7	21.0	17.9	12.7	4.8	12.4	15.4	20.6	20.1	17.2	13.6	12.4	10.6	10.5	10.8	12.4	13.0	14.0	21.6	15.6
9	D	19.6	26.1	17.3	18.9	18.9	18.2	17.9	19.8	19.2	20.5	21.8	20.0	21.7	17.4	16.2	14.2	12.2	10.7	12.6	12.1	13.2	14.5	15.3	15.4	17.2
10		15.8	17.3	18.4	19.7	18.0	17.2	17.2	17.3	17.9	19.2	21.8	24.8	22.5	19.4	16.3	13.4	11.3	10.7	12.2	13.3	14.3	15.3	15.5	16.3	16.9
11		16.6	17.4	17.9	17.1	15.2	17.9	18.7	18.8	18.4	18.1	20.2	20.8	20.2	19.2	14.1	11.7	10.5	10.3	11.3	12.6	14.4	16.1	16.9	20.5	16.5
12		20.1	20.7	23.4	23.7	23.7	17.9	18.8	20.0	19.7	20.6	25.6	25.8	23.0	20.9	17.2	13.4	10.5	9.6	10.8	13.3	15.5	18.1	16.8	16.4	18.6
13		16.0	16.2	17.1	18.1	17.1	17.1	18.1	19.5	21.6	23.1	25.3	24.4	22.6	20.1	14.4	10.7	9.4	10.4	11.9	12.5	15.4	17.8	19.2	17.2	17.3
14		17.0	16.3	16.5	19.1	18.7	17.8	17.2	18.3	20.8	23.5	24.8	25.1	23.8	19.0	14.0	10.3	6.3	7.7	11.5	15.3	17.2	18.5	17.4	16.9	17.2
15		16.0	15.3	16.2	18.4	18.1	19.2	20.7	20.1	21.6	24.6	27.5	27.3	23.7	18.1	14.6	11.5	9.4	9.6	12.2	15.2	17.8	18.1	16.5	16.3	17.8
16		18.1	16.4	16.9	17.3	17.5	18.1	19.1	18.9	20.7	23.5	25.8	26.8	26.6	21.8	16.9	12.5	9.6	9.6	11.3	14.4	17.1	18.9	16.0	17.3	18.0
17	D	18.0	23.8	12.7	30.3	40.6	49.4	-.9	27.6	24.6	22.6	22.6	16.2	20.1	15.2	9.2	4.6	4.2	9.3	9.0	11.2	13.4	13.7	18.0	20.2	18.2
18	D	14.6	17.0	16.6	17.3	20.0	14.3	13.6	17.3	19.2	20.7	16.1	16.9	15.4	14.9	14.3	8.6	8.0	9.8	11.6	12.3	13.6	16.2	17.4	20.7	15.3
19		2.6	19.3	14.1	15.3	17.3	13.1	14.5	18.1	20.1	22.5	23.6	25.4	22.5	19.2	11.8	10.3	7.7	7.6	11.5	14.1	15.5	16.2	16.2	16.1	15.6
20		16.0	15.8	16.1	16.2	16.2	16.9	17.1	17.8	18.8	21.5	23.7	24.8	21.9	17.4	14.5	11.5	10.1	9.4	10.6	12.4	13.6	15.3	16.2	16.8	16.3
21		16.9	17.8	21.6	20.0	18.0	17.0	16.9	17.0	19.0	20.7	22.8	22.2	20.8	18.8	14.3	10.6	8.4	7.7	9.8	12.4	15.0	16.8	16.9	16.4	16.6
22		16.4	16.4	16.9	16.9	16.9	17.9	18.7	19.3	20.9	22.7	24.7	26.6	21.9	18.7	15.3	11.9	9.4	9.3	10.5	12.4	14.6	16.2	17.1	17.8	17.1
23		19.1	18.8	18.0	18.8	21.1	17.0	15.3	16.5	18.1	22.8	23.8	23.4	20.7	18.8	14.3	11.3	9.4	9.0	10.6	13.2	15.9	17.2	17.0	16.1	16.9
24	Q	16.2	16.3	16.9	17.9	18.0	17.4	17.3	17.9	18.8	20.9	23.1	23.3	22.7	19.3	16.2	13.3	13.4	15.2	17.3	19.1	19.8	20.0	19.8	17.4	18.2
25		15.4	14.3	13.2	12.1	10.9	10.5	9.1	11.9	14.5	19.0	18.7	20.1	18.8	15.1	13.6	11.2	11.4	12.4	14.8	17.1	19.7	19.5	17.6	18.3	15.0
26	D	19.4	18.9	16.5	17.1	15.4	18.3	22.5	19.1	20.6	18.9	22.3	18.8	18.7	11.4	9.7	7.6	5.9	8.5	12.0	14.7	16.7	18.4	19.2	18.1	16.2
27		18.9	17.6	19.0	17.4	16.1	13.6	17.2	19.0	18.4	19.2	21.9	22.6	21.2	19.2	15.2	10.0	6.9	7.7	10.3	14.2	17.1	17.3	17.5	17.3	16.5
28		16.3	15.8	16.0	16.1	16.3	16.4	18.0	18.5	19.4	20.7	21.5	21.9	22.1	19.2	16.2	8.8	6.1	9.0	12.6	15.3	17.1	17.0	18.1	20.3	16.6
29		17.9	17.5	16.4	16.2	22.4	19.2	17.0	17.9	21.7	24.7	24.7	25.7	20.6	17.1	13.1	10.9	9.4	10.0	13.3	15.4	17.1	17.3	17.5	17.2	17.5
30		17.2	20.3	20.2	18.9	16.1	16.3	17.3	20.1	20.8	24.6	24.8	23.3	21.0	17.2	14.1	10.9	9.4	10.9	13.6	16.0	17.3	17.4	17.0	16.4	17.6
31		16.1	16.0	16.3	16.7	17.5	16.2	24.7	24.7	27.7	27.4	24.9	23.5	21.0	14.9	9.8	7.6	6.6	8.8	11.6	13.8	16.5	17.4	17.2	16.3	17.3
MEAN	A	16.8	17.7	17.1	18.3	18.8	18.4	17.4	19.0	20.0	21.4	23.1	23.2	21.9	18.6	14.7	11.2	9.3	9.8	11.6	13.7	15.6	16.7	17.1	17.6	17.0
MEAN	Q	17.3	16.9	17.4	17.9	18.2	18.2	18.2	18.6	19.9	21.9	23.6	24.0	22.7	19.6	15.8	12.1	10.5	10.5	12.0	14.2	16.0	17.4	17.5	16.8	17.4
MEAN	D	18.1	21.0	15.8	20.8	23.0	24.0	14.8	20.3	19.3	17.5	19.5	17.5	19.3	15.8	13.3	9.7	8.5	9.8	11.1	12.2	13.9	15.1	16.8	19.2	16.5

VERTICAL INTENSITY

TABLE 24 ST JOHN S — Z = 50500 PLUS TABULAR VALUES IN GAMMAS — AUGUST 1970

HOUR UT / DAY		0 TC 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TC 6	6 TO 7	7 TO 8	8 TC 9	9 TO 10	10 TO 11	11 TO 12	12 TC 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	292	293	285	286	292	294	294	295	293	293	287	279	286	294	302	307	307	310	309	303	301	301	296	296	296
2		294	287	256	257	265	286	294	294	287	280	272	278	278	286	295	295	302	309	303	295	294	288	287	287	286
3	Q	287	286	284	284	279	280	287	288	285	284	276	279	276	286	302	310	316	316	306	295	295	292	291	292	291
4	Q	288	287	286	282	280	286	287	287	287	291	280	279	284	287	295	303	304	311	318	317	308	296	294	292	293
5	Q	287	291	286	284	277	282	286	288	292	288	285	280	278	284	287	296	308	307	306	304	302	295	291	291	291
6		286	287	286	286	284	284	284	285	286	284	280	280	276	276	278	287	296	296	307	303	309	308	300	292	289
7		295	296	292	287	284	280	281	276	280	284	284	284	287	287	299	303	310	315	312	303	300	327	312	308	295
8	D	299	294	260	245	293	294	277	276	205	158	167	227	286	302	307	318	316	324	334	335	310	319	328	299	282
9	D	295	214	175	276	266	270	280	276	302	301	288	287	303	318	315	309	311	325	329	320	311	310	302	298	291
10		296	294	291	278	294	293	285	286	280	280	280	269	284	288	293	295	309	310	309	299	295	299	301	296	292
11		295	291	293	286	279	280	286	288	286	284	280	285	287	290	311	318	323	324	321	316	307	300	304	294	297
12		280	280	269	260	260	285	296	291	285	280	278	281	285	287	299	310	318	327	325	319	334	304	294	291	293
13		292	292	287	291	295	286	284	286	287	284	272	278	284	287	307	316	318	323	335	332	332	327	308	292	300
14		287	288	288	276	284	299	301	296	292	288	281	284	284	294	306	311	325	327	325	311	302	295	294	293	297
15		293	292	287	284	291	291	291	295	294	286	276	271	277	291	302	315	322	325	325	320	302	299	302	302	297
16		300	296	295	296	295	291	292	293	291	286	270	264	264	280	298	303	320	329	325	318	306	300	334	306	298
17	D	286	322	316	-40	-141	-134	24	-44	252	327	248	269	303	331	303	378	410	478	477	403	321	318	325	303	251
18	D	248	212	223	205	192	260	256	231	249	254	269	292	302	325	359	382	381	422	434	341	318	317	318	292	295
19		207	239	249	269	280	286	288	296	293	292	296	296	295	299	318	318	333	333	333	311	308	302	302	304	294
20		301	295	294	289	288	291	291	287	286	287	286	284	287	296	299	303	304	309	304	302	297	299	297	297	295
21		294	291	272	283	286	286	286	286	287	288	283	282	285	287	293	295	300	304	304	301	294	295	294	294	290
22		293	288	287	286	280	276	276	280	280	280	276	272	286	291	295	308	316	319	311	299	295	292	291	288	290
23		288	290	288	276	254	286	270	270	265	262	269	270	278	277	294	302	311	318	315	304	295	294	288	291	286
24	Q	289	288	288	276	285	287	286	287	287	281	273	272	279	287	301	309	311	311	309	303	296	295	293	296	291
25		296	296	295	293	285	281	264	266	248	271	273	264	269	287	293	306	309	313	311	309	301	300	296	291	288
26	D	287	287	294	286	216	213	255	233	246	231	236	254	263	303	308	318	325	322	320	318	318	311	303	300	281
27		291	270	265	281	270	230	238	287	296	295	287	278	279	281	296	313	330	333	326	309	311	317	313	296	291
28		294	293	291	294	294	285	263	291	288	287	279	271	271	279	288	319	322	328	335	333	326	326	319	296	299
29		293	286	287	232	224	266	287	281	270	277	278	264	271	274	288	301	317	311	311	309	296	293	290	291	283
30		287	271	277	274	281	293	287	280	285	280	272	265	271	279	287	300	308	312	311	303	299	294	289	287	287
31		285	281	281	281	279	265	233	237	232	264	263	266	266	279	285	296	310	322	344	356	326	302	289	287	285
MEAN	A	287	283	278	266	261	266	271	270	277	278	273	274	281	291	300	311	319	326	327	316	307	304	301	295	290
MEAN	Q	289	289	286	282	283	286	288	289	289	288	280	278	281	287	298	305	309	311	310	304	300	296	293	294	292
MEAN	D	283	266	254	194	165	181	218	195	251	254	242	266	292	316	319	341	349	374	379	343	316	315	315	298	280

HORIZONTAL INTENSITY

TABLE 25 ST JOHN S H = 17000 PLUS TABULAR VALUES IN GAMMAS SEPTEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	625	627	626	628	626	626	624	603	616	617	583	610	585	573	577	585	604	635	660	674	648	660	643	633	620
2		630	627	621	621	617	620	619	622	620	604	572	582	582	566	564	566	535	608	624	628	641	614	616	622	607
3		622	622	623	635	614	616	616	615	601	607	599	558	548	578	582	580	595	609	630	635	637	623	636	616	608
4		621	623	623	619	617	617	614	609	609	610	602	583	585	589	599	601	609	633	646	643	635	635	629	635	616
5		633	628	627	626	621	622	621	622	621	616	604	597	585	578	594	596	614	639	646	652	643	642	628	628	620
6	Q	627	628	632	633	628	627	627	627	623	622	611	596	581	571	572	590	613	634	652	640	647	640	634	628	620
7		634	636	634	633	633	633	632	627	626	620	608	596	589	589	594	602	615	628	641	653	658	640	639	635	625
8		637	635	634	634	635	635	634	629	627	627	615	603	588	574	571	582	613	639	657	645	626	628	635	632	622
9	Q	628	628	631	629	627	622	620	627	623	620	605	593	584	583	583	589	602	615	628	628	632	626	622	620	615
10		634	620	612	608	603	605	606	608	611	604	596	584	573	574	578	588	598	608	619	623	627	632	633	632	607
11	Q	630	628	628	627	628	626	626	625	624	620	609	600	591	587	589	595	608	622	635	644	644	640	643	644	621
12	Q	642	644	640	638	628	632	638	632	629	629	615	607	596	590	589	597	613	627	634	640	640	644	645	642	626
13	D	640	636	638	634	633	615	624	634	640	617	615	620	590	583	589	593	604	622	637	654	636	620	616	610	621
14	D	617	622	614	620	617	621	622	628	620	621	614	571	576	552	559	576	595	620	627	630	627	616	622	625	609
15		619	620	622	608	605	617	618	622	620	613	603	590	584	584	589	594	605	620	622	629	634	634	624	632	613
16		628	633	634	627	622	627	620	623	625	625	613	602	591	586	591	598	615	634	640	639	638	633	635	634	621
17		634	632	628	622	620	611	615	627	623	622	613	597	584	573	572	589	606	628	640	640	636	639	628	628	617
18		634	629	627	621	622	627	627	617	634	638	626	607	590	577	576	583	607	630	628	639	635	639	632	633	620
19		634	634	632	631	624	608	627	634	636	634	634	622	596	578	572	584	539	613	637	646	643	630	622	627	620
20		633	633	633	634	632	633	628	633	635	627	632	627	605	583	584	588	608	619	636	645	632	634	635	621	624
21	D	621	622	615	616	626	628	623	613	634	635	623	602	567	545	564	595	609	634	633	640	634	632	625	635	615
22		638	647	634	627	621	627	634	634	632	621	625	619	606	597	596	601	611	620	627	633	634	634	632	638	624
23		639	626	630	632	632	634	633	636	637	634	628	627	613	598	591	590	598	610	623	627	634	635	638	635	624
24		633	627	628	638	627	623	628	628	640	634	627	619	605	596	597	601	608	619	627	627	638	640	639	637	624
25		639	640	639	643	634	624	627	632	622	633	628	621	608	595	588	594	613	633	637	628	634	635	639	639	626
26		639	639	638	633	627	631	633	635	634	633	626	615	610	601	599	607	620	631	638	643	643	646	648	634	629
27	D	627	615	616	612	603	595	601	608	633	633	622	615	607	602	589	599	601	626	626	619	620	634	622	610	614
28		614	632	627	626	627	631	631	629	627	626	620	608	595	585	583	593	607	621	626	631	633	633	638	634	620
29	Q	635	638	639	639	641	636	638	643	636	634	633	626	613	601	600	601	608	620	632	639	639	645	645	639	630
30		642	641	638	639	633	636	641	639	636	630	621	618	614	605	602	612	623	631	645	651	651	651	646	645	633
MEAN	A	631	630	629	628	624	624	625	625	626	623	614	604	591	583	584	592	606	624	635	639	637	635	633	631	620
MEAN	Q	633	633	634	633	631	629	630	631	627	625	615	604	593	586	587	594	609	624	636	638	640	639	638	635	623
MEAN	D	626	624	622	622	621	617	619	617	628	625	611	604	585	571	575	590	603	627	637	643	633	632	625	623	616

DECLINATION

TABLE 26 ST JOHN S — D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES — SEPTEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	15.5	15.4	15.9	16.3	17.0	17.4	17.9	13.7	18.3	24.6	21.0	19.0	20.0	16.4	11.3	8.0	6.6	8.0	8.8	9.7	14.9	15.2	14.9	14.6	15.0
2		15.5	15.9	15.5	15.6	17.1	19.1	20.0	20.7	21.3	24.6	23.2	18.8	19.1	16.3	11.3	8.0	7.1	7.1	10.7	14.4	16.5	17.4	17.5	16.3	16.2
3		15.6	15.5	15.5	15.1	18.2	17.5	18.0	20.6	19.8	22.0	27.3	25.8	19.1	15.2	12.8	8.7	6.0	7.7	10.7	13.4	15.1	16.6	16.8	17.4	16.3
4		17.0	17.4	16.6	17.2	17.1	17.2	18.9	20.3	19.9	22.6	23.6	26.6	20.2	17.9	14.3	11.5	8.5	10.4	11.3	13.9	15.6	16.3	15.5	16.0	16.9
5		18.8	16.2	16.3	16.2	18.0	18.5	18.3	18.7	19.1	20.8	22.6	22.7	22.0	19.7	15.8	13.3	10.7	9.5	10.8	13.4	15.4	15.8	19.1	17.2	17.0
6	Q	16.2	16.4	16.3	16.2	16.9	17.3	18.1	18.5	19.1	21.0	23.4	24.3	23.7	20.3	16.8	12.5	10.2	10.9	13.2	16.5	17.4	17.0	18.7	17.7	17.4
7		16.4	15.4	16.1	16.4	16.3	16.9	17.3	18.1	18.5	20.2	22.1	23.8	21.9	17.2	12.8	10.6	9.5	10.0	12.4	13.7	14.6	15.6	15.5	16.1	16.1
8		16.6	16.4	16.6	16.4	17.2	17.4	18.1	20.3	20.2	20.3	22.3	23.0	21.8	19.4	12.8	8.7	6.4	6.2	7.9	12.4	14.8	14.7	14.6	15.6	15.8
9	Q	15.6	16.2	16.4	16.7	17.6	19.5	20.3	20.0	19.2	19.6	21.2	21.5	19.5	17.2	14.1	11.5	10.1	11.8	13.9	15.6	16.5	16.7	15.7	15.5	16.7
10		19.0	16.7	16.6	18.7	18.8	19.9	19.4	20.2	20.2	20.9	21.7	21.4	20.8	17.1	14.3	12.6	11.6	12.5	14.4	16.2	17.2	16.8	16.3	16.1	17.5
11	Q	16.1	16.2	16.4	16.4	16.6	17.2	17.3	17.5	18.1	19.2	20.8	21.0	20.1	18.1	15.5	13.0	11.0	11.4	12.6	14.1	16.2	16.3	15.9	15.6	16.4
12	Q	16.1	16.2	16.4	17.5	14.3	15.3	20.2	21.3	18.7	20.3	21.3	21.5	20.7	18.3	15.6	13.6	12.5	12.8	14.5	16.2	17.1	16.1	15.5	15.4	17.0
13	D	15.6	15.9	16.7	17.1	16.4	16.0	25.3	25.0	19.3	16.0	10.7	12.3	11.9	8.1	5.1	8.2	7.7	9.6	12.9	15.5	18.2	18.5	22.0	23.5	15.3
14	D	16.5	13.4	18.4	19.7	18.1	17.2	17.3	18.1	16.3	18.4	21.1	14.4	13.7	11.7	11.5	7.8	7.1	10.0	13.5	16.1	19.5	19.2	18.0	17.4	15.6
15		17.2	18.3	22.9	14.4	20.3	20.8	21.8	19.2	18.6	20.0	20.3	19.6	18.0	13.7	11.7	10.1	10.1	11.4	13.7	15.6	17.0	18.0	17.2	16.5	16.9
16		16.7	17.4	17.0	17.4	18.6	18.8	21.1	20.1	18.0	20.8	21.0	21.9	19.5	17.3	13.2	11.4	10.9	11.4	13.3	15.8	17.4	17.5	17.4	17.2	17.1
17		16.6	18.3	17.8	19.0	18.4	15.5	13.8	21.9	22.4	20.2	21.9	22.2	21.1	18.3	15.5	11.1	9.4	9.5	11.7	15.4	17.2	17.6	17.8	16.9	17.1
18		17.2	20.2	18.6	21.5	19.2	18.4	19.0	16.6	16.5	21.6	21.4	21.4	20.3	18.2	14.4	9.7	8.8	8.9	11.6	14.0	16.5	18.4	17.2	16.4	16.9
19		16.4	16.5	17.9	18.9	20.2	21.1	22.9	19.2	15.4	15.5	19.3	20.0	20.9	19.0	14.4	9.8	8.0	7.8	9.5	11.7	13.6	17.1	21.0	17.9	16.4
20		18.3	18.3	17.0	16.3	16.4	12.6	16.2	17.4	18.4	15.1	20.5	19.6	19.2	16.4	14.0	10.4	9.9	9.6	11.5	13.8	17.1	16.9	17.4	21.6	16.0
21	D	20.1	20.4	18.3	15.6	20.1	21.1	21.4	14.1	17.2	19.2	21.4	22.8	18.8	16.1	12.5	8.1	8.7	9.6	14.1	16.1	15.8	16.0	15.8	16.2	16.7
22		16.5	15.1	13.8	18.9	12.6	18.1	18.7	18.4	18.5	18.2	18.5	20.6	19.0	17.3	15.7	13.6	11.5	10.8	13.0	15.4	15.8	15.7	18.5	17.3	16.3
23		16.6	18.5	17.5	16.9	16.6	17.1	16.5	16.4	17.6	17.7	16.3	20.1	19.7	16.4	15.4	12.6	11.1	11.8	13.0	14.6	15.7	15.9	16.4	16.4	16.1
24		17.5	16.7	17.4	17.6	19.3	18.9	20.4	19.8	20.2	18.5	19.0	19.4	19.3	18.2	15.0	13.6	12.7	12.6	14.1	15.5	15.7	16.3	16.5	15.7	17.1
25		15.7	15.8	16.3	17.7	20.3	24.8	24.0	20.9	18.4	17.5	21.3	20.3	19.4	18.3	15.7	13.2	13.1	13.5	14.6	15.7	16.4	15.7	15.7	15.7	17.5
26		15.7	16.3	17.3	19.7	21.3	20.4	20.3	19.4	18.6	19.4	20.4	22.1	21.1	19.1	16.7	13.8	13.8	12.5	14.6	15.7	16.5	16.9	17.7	20.3	17.9
27	D	20.9	19.5	18.4	20.3	25.9	25.1	24.0	21.9	18.2	20.1	21.7	17.8	18.4	16.3	13.1	10.0	10.7	11.7	11.8	13.5	15.7	17.2	19.4	22.2	18.1
28		21.1	19.2	17.4	16.5	16.6	16.8	17.5	17.6	17.9	19.0	21.3	22.6	22.1	19.1	16.2	13.8	13.2	13.7	14.3	14.8	15.1	15.2	15.6	15.7	17.2
29	Q	15.7	16.3	16.5	17.1	18.2	18.4	17.6	18.4	18.3	18.5	19.2	20.2	20.5	19.4	16.9	14.5	12.8	12.6	13.1	14.2	15.2	15.7	16.2	15.8	16.7
30		15.8	16.1	16.7	15.9	18.8	19.4	19.9	19.4	19.6	19.9	20.4	21.8	21.4	19.3	16.5	13.6	10.9	10.2	12.2	14.5	15.6	15.8	16.3	15.7	16.9
MEAN	A	16.9	16.9	17.0	17.3	18.1	18.5	19.4	19.1	18.7	19.7	20.9	20.9	19.8	17.2	14.0	11.2	10.0	10.5	12.5	14.6	16.2	16.6	17.1	17.1	16.7
MEAN	Q	16.0	16.3	16.4	16.8	16.7	17.5	18.7	19.1	18.7	19.7	21.2	21.7	20.9	18.7	15.7	13.0	11.3	11.9	13.5	15.3	16.5	16.3	16.4	16.0	16.8
MEAN	D	17.7	16.9	17.5	17.8	19.5	19.4	21.2	18.5	17.9	19.7	19.2	17.3	16.6	13.7	10.7	8.4	8.1	9.8	12.2	14.2	16.8	17.2	18.0	18.8	16.1

VERTICAL INTENSITY

TABLE 27 ST JOHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS SEPTEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TC 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	D	288	287	286	285	282	284	280	243	207	204	225	225	240	250	270	296	309	320	337	353	335	333	325	304	282
2		302	285	289	288	288	286	286	288	288	278	267	278	279	289	304	318	325	339	332	312	312	293	293	293	296
3		288	286	286	248	233	286	288	276	266	233	233	244	263	286	286	290	311	309	311	302	298	296	312	305	281
4		297	289	288	282	286	282	278	278	286	278	280	266	288	281	287	288	304	305	304	303	297	298	289	289	288
5		278	286	282	280	266	273	282	280	284	282	281	279	277	283	294	296	310	315	305	302	295	297	293	296	288
6	Q	289	288	287	286	278	281	280	281	285	284	278	274	272	279	286	303	314	320	321	297	299	289	289	293	290
7		294	283	281	284	283	281	281	279	281	280	278	272	273	282	297	303	303	302	297	301	297	296	294	288	288
8		286	282	283	283	280	281	263	263	274	279	272	273	272	272	295	304	322	330	332	318	287	280	283	280	287
9	Q	285	284	284	284	282	275	280	284	287	287	276	279	283	288	297	304	305	301	302	297	303	299	303	299	290
10		265	268	289	280	287	285	290	287	289	285	280	275	273	287	297	300	306	304	301	295	290	289	289	289	287
11	Q	290	288	289	290	289	289	288	287	287	282	278	274	279	285	297	305	312	313	309	298	290	287	287	284	291
12	Q	285	287	288	287	283	267	273	264	281	275	273	272	273	281	290	302	309	313	304	300	293	290	289	285	286
13	D	283	282	283	287	287	234	227	239	241	245	249	244	257	287	298	298	319	329	318	329	347	358	313	281	285
14	D	290	242	249	290	297	297	295	288	281	273	267	273	281	287	305	330	336	335	328	332	334	321	304	299	297
15		287	254	199	251	259	288	281	302	301	293	289	285	286	290	297	305	314	321	317	313	305	303	298	292	289
16		286	280	264	275	273	256	264	231	290	280	274	268	273	281	290	298	303	310	305	302	298	293	295	289	284
17		287	275	273	273	273	267	245	255	279	290	280	275	279	281	283	296	305	312	310	296	291	295	291	295	284
18		286	272	274	249	266	281	275	280	261	267	275	273	279	279	291	307	339	317	307	305	296	296	298	294	285
19		289	284	279	267	242	177	261	274	261	257	251	267	273	281	297	313	309	321	328	343	333	304	295	297	283
20		285	281	285	283	240	244	235	272	269	279	268	273	274	282	297	304	319	321	317	311	295	298	292	279	285
21	D	287	266	258	242	260	245	234	224	198	263	273	263	273	272	295	313	313	321	326	314	296	296	291	288	275
22		286	267	242	259	246	275	278	278	277	274	271	264	280	287	287	295	304	307	305	296	289	286	280	282	280
23		274	274	286	283	282	280	278	264	249	263	263	259	264	278	283	295	237	302	297	292	288	286	286	284	280
24		278	282	285	265	269	271	270	264	258	272	276	280	273	275	286	295	301	304	303	299	295	291	286	283	282
25		281	281	280	273	239	233	253	274	273	272	266	267	272	277	286	296	235	302	297	282	282	283	284	280	276
26		280	281	280	265	264	278	280	283	281	278	274	263	265	272	277	286	234	296	291	286	280	280	278	266	278
27	D	269	274	286	272	246	242	248	260	283	287	271	278	265	273	281	299	310	320	316	304	289	295	293	292	281
28		290	263	285	286	286	285	285	285	285	284	279	273	273	281	288	296	295	297	295	296	291	288	288	286	286
29	Q	285	282	283	281	282	283	288	281	286	286	283	279	273	273	277	285	290	294	296	294	289	288	287	285	285
30		281	279	274	263	262	279	285	286	281	281	279	271	271	271	277	285	236	300	302	294	288	288	286	287	282
MEAN	A	285	278	277	275	272	269	272	273	272	273	270	269	273	280	290	300	308	313	310	306	299	297	293	289	285
MEAN	Q	287	286	286	285	283	279	282	280	285	283	278	276	276	281	289	300	306	308	306	297	295	291	291	289	288
MEAN	D	283	270	272	275	274	260	257	251	242	254	257	257	263	274	290	307	317	325	325	327	320	321	305	293	284

HORIZONTAL INTENSITY

TABLE 28 ST JOHN S — H = 17000 PLUS TABULAR VALUES IN GAMMAS — OCTOBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		660	659	645	643	640	639	645	646	645	644	638	627	614	602	595	600	613	627	651	646	634	646	651	653	636
2		651	639	640	645	642	643	641	640	641	637	635	630	614	601	594	601	614	638	640	652	651	653	653	651	635
3		645	640	640	639	641	643	641	641	640	640	633	623	607	601	602	608	628	634	653	650	645	656	652	653	635
4	D	647	645	645	619	594	625	627	605	619	629	614	600	601	588	599	614	626	636	630	646	648	645	647	651	625
5		646	647	664	645	640	640	621	634	640	632	632	621	610	602	604	616	625	636	640	647	649	642	645	646	634
6		647	652	644	641	639	637	638	639	639	637	627	618	610	600	602	614	631	644	652	645	649	646	645	646	635
7	Q	648	647	646	645	645	645	645	643	642	639	633	626	616	610	612	613	622	631	643	646	652	652	653	652	638
8	Q	651	650	646	648	647	648	651	650	646	645	639	630	619	607	600	606	619	633	647	650	653	655	657	657	640
9	Q	652	653	652	652	652	652	652	652	652	652	646	639	621	605	600	605	617	626	639	644	650	653	654	655	641
10		653	653	653	653	653	649	639	639	653	652	646	638	626	613	607	611	622	639	651	653	656	643	632	631	640
11		620	616	613	625	620	613	627	630	631	653	639	617	598	595	591	594	606	624	633	631	632	645	647	644	623
12		621	626	614	598	583	607	608	624	640	639	631	624	613	606	603	610	618	628	637	639	640	645	646	645	623
13		644	644	643	639	640	638	648	641	652	646	639	631	611	612	613	612	617	630	627	639	635	640	639	643	634
14		640	632	626	638	639	640	639	637	636	645	640	630	618	600	600	613	626	637	645	641	642	640	646	645	633
15	Q	640	642	644	643	644	642	645	646	650	652	644	631	612	598	598	612	626	640	648	652	652	647	650	652	638
16	D	652	651	650	651	650	652	651	650	648	653	657	599	587	614	613	604	598	613	705	631	600	598	592	587	629
17	D	592	599	608	612	619	621	611	629	628	632	629	612	589	560	567	571	579	600	631	657	663	652	578	552	608
18	D	547	534	500	560	600	605	610	591	593	623	615	604	585	573	566	560	573	606	617	621	625	624	625	630	591
19		628	627	631	624	613	627	629	625	618	638	635	622	607	590	588	585	592	607	613	630	630	636	635	631	619
20		630	629	624	624	619	622	629	632	642	637	638	637	622	614	611	614	625	631	637	643	644	646	644	645	631
21	Q	643	643	642	642	641	642	642	643	646	643	636	625	615	606	604	610	616	628	639	647	649	652	649	644	635
22		644	637	637	627	630	636	632	630	623	641	638	622	603	598	603	615	623	640	650	652	667	656	663	630	633
23	D	609	584	590	604	602	596	609	635	637	635	634	627	612	601	589	578	605	622	660	639	631	616	618	626	615
24		627	628	628	622	621	613	627	626	628	627	627	608	602	601	601	609	620	628	627	628	633	638	640	641	623
25		636	641	641	644	641	640	636	631	644	647	640	624	607	588	596	603	615	633	644	642	642	646	647	648	632
26		647	643	643	650	647	645	646	647	646	641	634	622	608	600	597	606	619	627	634	639	641	647	650	648	634
27		647	647	647	647	645	646	645	647	647	645	637	621	602	596	601	611	621	635	640	648	654	652	653	652	637
28		654	650	640	647	641	648	646	640	641	639	633	624	609	602	602	606	613	626	636	630	642	647	633	642	633
29		639	640	640	640	640	638	633	644	645	642	634	621	612	607	613	616	631	633	640	639	638	639	631	630	633
30		630	633	649	628	634	640	639	640	640	638	633	624	614	608	603	607	607	633	639	644	647	648	651	651	632
31		651	651	648	646	646	644	641	644	640	637	638	626	608	601	599	601	613	625	638	646	644	649	651	651	635
MEAN	A	637	635	633	634	632	635	635	636	638	641	635	623	609	600	599	604	615	629	641	642	643	644	641	640	630
MEAN	Q	647	647	646	646	646	646	647	647	647	646	640	630	616	605	603	609	620	632	643	648	651	652	653	652	638
MEAN	D	609	602	599	609	613	620	621	622	625	635	630	608	595	587	587	585	596	615	649	639	633	627	612	609	614

DECLINATION

TABLE 29 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES OCTOBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		18.2	17.4	17.8	17.6	18.5	17.4	20.3	21.1	20.3	20.2	21.4	22.2	24.1	21.7	19.2	14.5	12.0	10.9	10.6	11.5	13.5	15.6	16.6	20.0	17.6
2		24.9	20.0	18.4	17.0	17.3	18.4	19.8	19.3	20.1	21.1	20.1	23.2	23.1	19.7	16.8	13.7	11.7	10.6	12.6	13.3	15.6	16.2	16.3	17.1	17.7
3		17.4	18.1	17.6	18.3	18.6	20.6	20.9	21.3	21.3	20.6	22.3	22.9	22.8	20.9	18.1	13.5	9.8	10.5	9.8	11.3	16.7	14.9	18.3	22.6	17.9
4	D	16.5	17.6	20.6	19.5	21.7	24.2	26.2	20.4	16.7	18.9	22.1	20.0	20.2	16.7	15.9	13.5	12.9	13.4	14.3	15.3	15.8	16.5	19.2	17.8	18.2
5		16.5	17.0	16.4	18.2	18.3	18.2	16.1	16.4	18.6	19.3	20.5	22.1	21.6	19.2	15.1	11.7	10.7	11.4	13.3	15.5	16.7	16.7	16.5	16.8	16.8
6		17.3	16.5	17.4	19.2	19.0	18.7	19.2	19.4	19.4	19.5	21.4	21.9	22.3	20.5	17.4	14.1	12.6	12.9	13.6	15.0	15.8	18.7	17.1	17.3	17.7
7	Q	17.7	17.7	17.8	18.2	17.6	17.8	18.3	17.6	18.4	19.1	20.4	22.0	22.7	19.9	16.8	14.3	12.3	11.8	12.5	14.5	16.3	16.7	17.3	17.5	17.3
8	Q	17.5	17.3	17.5	17.5	17.7	18.2	18.4	18.5	18.7	19.3	20.8	22.6	23.2	22.0	18.7	14.6	12.4	11.6	13.1	15.5	16.8	16.6	17.0	17.2	17.6
9	Q	17.5	17.7	17.5	17.9	18.2	18.3	18.7	18.7	19.1	19.4	21.0	22.5	23.8	22.5	18.9	15.6	13.3	12.6	13.5	15.4	16.6	16.6	16.8	16.8	17.9
10		17.3	17.4	17.6	18.2	18.6	20.5	20.6	20.7	21.6	20.3	20.8	21.2	22.5	21.6	19.2	16.1	12.9	11.0	10.1	10.9	11.1	7.9	14.5	14.9	17.0
11		20.2	21.5	22.4	23.5	25.1	27.1	25.7	20.8	24.8	19.8	18.7	20.6	17.5	15.5	11.0	10.6	10.8	11.5	12.5	13.4	17.1	17.6	17.4	18.3	18.5
12		19.7	22.2	23.4	21.4	30.9	27.6	21.3	18.8	24.1	21.7	19.3	18.6	19.3	16.6	14.8	13.7	12.8	12.9	14.4	15.9	16.8	16.5	16.5	16.7	19.0
13		16.8	17.1	17.3	17.4	18.5	15.5	21.1	19.7	20.8	20.6	21.5	22.3	20.1	16.6	16.0	13.8	12.9	13.5	16.3	17.5	17.8	17.9	17.5	17.2	17.7
14		17.8	23.2	20.1	17.5	17.4	18.6	19.2	19.2	18.4	19.7	20.8	19.9	19.8	17.5	14.4	12.6	11.7	12.9	14.7	16.5	17.6	18.2	17.6	16.8	17.6
15	Q	19.5	17.8	18.3	18.4	18.9	19.5	20.6	20.3	19.7	19.5	20.9	22.5	23.2	21.2	15.6	12.7	12.0	13.0	15.1	17.3	17.8	17.4	17.5	17.4	18.2
16	D	17.4	17.3	17.0	17.4	18.0	17.7	19.0	18.8	19.5	20.8	23.4	23.2	11.7	8.9	11.5	9.2	6.0	7.1	4.0	10.0	13.2	17.3	17.7	20.3	15.3
17	D	20.6	21.0	24.4	20.5	19.6	20.3	14.5	16.5	17.2	13.9	16.8	14.6	14.0	9.9	6.2	8.0	7.7	10.0	12.3	12.0	4.6	5.0	25.1	19.6	14.8
18	D	24.4	25.3	27.6	26.3	15.9	13.8	15.7	17.7	11.6	14.2	20.5	22.7	23.5	21.5	18.4	15.0	14.1	12.5	11.7	13.8	15.5	17.3	20.7	17.5	18.2
19		17.9	17.8	18.9	19.8	17.5	18.5	20.1	17.9	12.0	17.5	18.7	19.5	18.9	16.6	14.2	12.9	10.8	9.7	12.3	14.0	15.7	16.2	16.7	17.5	16.3
20		17.7	18.1	19.2	20.5	19.9	17.4	19.5	18.7	18.5	17.6	15.0	18.5	18.9	17.5	15.1	12.7	10.6	10.8	12.0	13.8	15.4	16.5	16.7	17.3	16.6
21	Q	17.6	17.9	17.9	18.1	17.9	17.9	17.8	17.9	18.6	18.8	19.9	21.7	22.7	20.8	17.9	14.7	12.0	11.7	12.8	14.3	15.8	16.6	16.4	16.9	17.3
22		19.2	19.5	19.8	21.7	19.6	21.4	21.8	21.1	17.7	19.9	22.5	23.1	20.8	16.1	11.0	7.3	6.4	7.0	7.0	7.9	5.9	2.1	13.8	20.8	15.6
23	D	17.8	24.7	26.1	23.1	22.8	15.2	23.9	22.0	21.7	18.8	17.2	18.2	19.0	15.6	12.6	8.2	7.3	9.3	9.2	12.4	12.9	14.9	16.9	23.9	17.2
24		24.0	17.9	17.0	18.9	20.6	21.7	18.9	19.7	14.9	16.8	19.9	17.8	18.3	16.1	14.5	13.0	12.0	12.6	14.1	16.1	17.0	17.0	17.0	17.9	17.3
25		17.2	17.5	17.3	16.6	17.8	18.1	18.0	17.1	18.1	19.8	20.7	21.9	21.3	19.3	15.0	11.6	10.3	11.9	13.5	16.0	16.9	17.2	17.5	17.3	17.0
26		17.1	17.4	20.4	18.1	18.1	18.5	18.9	19.0	19.8	20.0	21.0	21.2	19.7	17.3	14.0	11.7	11.0	11.8	13.6	15.4	16.7	16.9	16.8	17.1	17.1
27		17.3	17.7	17.9	18.1	18.3	18.9	19.8	19.2	19.6	19.9	21.1	22.5	21.9	19.2	15.0	12.2	12.3	13.3	15.2	16.3	16.5	16.1	16.9	17.1	17.6
28		17.2	18.2	18.5	20.1	21.4	20.9	25.1	23.0	21.2	21.1	21.0	21.8	21.1	18.1	14.4	10.1	11.6	12.5	12.4	14.1	14.9	12.0	15.3	17.1	17.6
29		18.0	18.2	18.3	18.3	19.0	19.8	19.9	20.3	20.5	21.6	21.1	22.2	22.1	18.1	13.9	12.9	11.4	11.0	9.6	10.9	18.7	15.0	19.1	21.5	17.2
30		19.3	16.4	17.2	21.4	18.2	17.7	17.4	19.0	19.2	19.5	20.3	21.8	21.9	19.2	16.1	12.9	12.5	12.4	13.6	15.4	16.4	17.3	18.1	17.8	17.5
31		18.2	18.3	18.3	18.6	19.0	19.1	19.4	20.3	21.2	20.1	21.5	22.4	22.2	19.7	16.2	13.1	12.4	12.4	14.2	15.6	17.1	17.4	18.0	18.3	18.0
MEAN	A	18.6	18.8	19.2	19.3	19.4	19.3	19.9	19.4	19.1	19.4	20.4	21.2	20.8	18.3	15.3	12.6	11.3	11.5	12.4	14.1	15.1	15.4	17.4	18.1	17.3
MEAN	Q	17.9	17.7	17.8	18.1	18.1	18.3	18.8	18.6	18.9	19.2	20.6	22.3	23.1	21.3	17.6	14.4	12.4	12.2	13.4	15.4	16.7	16.8	17.0	17.1	17.6
MEAN	D	19.3	21.2	23.1	21.3	19.6	18.3	19.9	19.1	17.3	17.3	20.0	19.7	17.7	14.5	12.9	10.8	9.6	10.5	10.3	12.7	12.4	14.2	19.9	19.8	16.7

VERTICAL INTENSITY

TABLE 30 ST JOHN S — Z = 50500 PLUS TABULAR VALUES IN GAMMAS — OCTOBER 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1		273	259	273	278	277	273	272	281	285	282	280	273	269	271	272	285	290	295	309	311	302	296	290	276	282
2		247	281	286	287	281	280	279	283	281	280	282	270	270	273	273	284	292	302	294	298	287	287	293	286	282
3		291	288	285	281	271	277	280	279	280	281	273	269	266	272	273	287	301	295	304	309	296	306	285	272	284
4	D	303	302	296	240	186	280	254	254	271	276	271	284	286	291	290	288	296	295	295	302	300	293	286	288	280
5		290	287	276	261	277	276	261	276	277	280	283	277	278	276	278	286	296	287	287	292	295	287	290	287	281
6		287	285	276	278	279	284	279	278	279	280	280	278	276	278	281	285	296	286	287	286	291	284	292	286	283
7	Q	285	284	282	280	280	279	278	278	277	280	278	272	269	277	280	287	291	290	287	284	285	284	283	283	281
8	Q	282	284	284	280	284	281	278	276	277	278	275	271	271	273	276	287	298	299	296	289	284	280	279	279	282
9	Q	278	279	280	279	278	277	275	274	272	272	270	270	268	269	272	280	292	295	294	285	280	278	276	276	278
10		275	275	275	275	270	268	263	253	264	275	270	269	267	268	279	285	296	306	309	314	314	320	299	305	283
11		292	283	277	279	269	253	228	191	215	230	242	260	260	267	286	295	301	310	317	327	298	287	293	290	273
12		286	279	283	241	144	247	261	206	237	268	278	269	266	274	272	276	296	294	298	293	290	290	285	281	267
13		279	280	283	284	283	283	255	279	278	279	277	275	277	283	283	291	299	302	296	305	294	294	290	286	285
14		279	262	281	279	268	286	287	284	286	279	277	275	268	266	268	275	296	296	300	294	293	288	287	285	281
15	Q	273	281	277	278	276	279	281	286	290	289	280	274	267	262	271	283	299	293	293	290	291	289	286	284	282
16	D	279	277	278	275	277	279	279	285	285	283	277	257	303	293	272	285	317	360	467	389	320	305	301	307	302
17	D	290	275	233	278	275	273	248	238	239	260	269	274	268	269	291	302	325	364	388	402	411	465	283	309	301
18	D	307	279	198	301	324	314	307	269	260	301	301	294	294	300	298	312	331	332	331	322	310	309	305	309	300
19		301	294	279	275	277	273	274	282	279	284	286	285	284	284	293	299	307	309	309	317	309	304	299	298	292
20		298	292	286	275	273	265	260	279	285	286	286	279	277	278	281	286	291	292	293	294	293	293	291	287	284
21	Q	288	287	286	286	286	288	286	284	285	284	284	279	274	269	275	283	293	299	298	294	290	286	286	285	286
22		279	282	279	279	286	280	283	286	276	264	265	262	268	272	286	301	309	320	336	359	422	458	443	347	310
23	D	279	264	268	256	192	240	215	277	277	290	282	277	269	279	293	313	324	344	364	347	363	354	325	293	291
24		286	309	294	283	273	247	288	284	261	256	279	277	274	283	293	299	300	302	301	305	301	293	291	286	286
25		287	286	286	277	286	286	288	280	284	283	281	277	280	285	301	307	313	314	306	295	293	290	286	285	290
26		285	284	278	285	283	285	288	286	285	284	279	275	271	276	284	292	292	293	293	291	286	286	286	284	285
27		283	284	284	285	284	283	283	286	283	279	276	269	264	268	277	286	286	291	286	287	286	286	280	278	281
28		277	271	283	273	278	284	246	283	286	282	277	270	262	270	269	286	295	290	302	309	310	313	291	284	283
29		278	277	278	279	279	279	276	286	286	277	279	268	261	269	277	276	286	287	306	328	319	309	286	279	284
30		286	275	236	249	271	290	292	285	285	284	280	271	264	268	272	281	286	294	291	288	285	282	283	279	278
31		277	276	275	276	277	276	281	282	279	284	278	271	263	262	275	287	293	294	293	291	290	287	284	281	281
MEAN	A	284	281	275	275	269	276	272	273	274	278	277	273	272	275	280	289	297	304	311	310	306	306	295	289	285
MEAN	Q	281	283	282	281	281	281	279	280	280	280	277	273	270	270	275	284	293	295	294	288	286	283	282	281	282
MEAN	D	291	279	255	270	251	277	260	265	266	282	280	277	284	287	289	300	317	339	369	352	341	345	300	301	295

HORIZONTAL INTENSITY

TABLE 31 ST JOHN S H = 17000 PLUS TABULAR VALUES IN GAMMAS NOVEMBER 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	650	649	651	649	650	649	648	646	645	644	641	630	613	600	598	600	611	625	639	646	652	652	651	651	637
2		652	652	652	652	652	653	654	652	645	651	651	633	611	607	608	606	613	624	637	645	650	651	648	650	639
3		644	645	641	645	632	632	635	637	633	637	634	623	611	601	606	611	624	637	643	646	646	638	639	645	633
4		637	633	633	634	632	631	631	631	630	633	632	625	618	606	609	616	624	636	649	653	657	651	652	656	634
5		653	638	643	644	641	632	636	638	637	644	645	637	623	612	610	604	612	631	640	643	643	638	632	642	634
6		643	639	629	624	622	627	630	635	641	648	643	635	610	595	599	604	610	617	622	630	635	628	631	636	626
7	D	648	643	613	576	446	540	578	556	494	535	552	550	595	559	550	583	597	604	609	613	598	621	628	622	580
8		621	621	621	614	621	623	627	629	627	623	621	610	601	597	596	601	609	618	622	623	635	636	635	634	619
9		635	633	631	630	634	635	627	629	630	634	629	621	609	610	603	601	610	617	616	629	629	635	641	641	625
10		636	639	647	629	623	622	634	635	636	632	614	603	613	614	602	583	605	609	623	634	640	635	640	636	624
11	D	628	628	614	614	620	616	621	630	628	622	620	622	605	595	595	601	603	626	627	629	628	615	633	635	619
12		639	634	635	634	633	635	638	631	629	639	633	626	616	602	594	602	608	622	626	633	634	635	636	637	627
13		638	634	627	621	628	625	625	632	633	634	629	620	608	601	602	604	611	619	617	617	621	625	627	621	622
14		619	621	625	625	626	626	628	634	634	638	631	625	611	604	601	599	607	619	627	631	639	641	643	643	625
15	Q	645	641	640	640	640	641	640	641	640	639	637	628	619	610	602	601	610	625	635	646	648	647	651	651	634
16		645	648	646	646	646	647	647	647	646	647	642	640	631	620	619	623	630	632	646	651	658	653	657	654	643
17		644	638	639	651	644	645	650	651	652	652	650	640	626	619	613	610	618	625	629	640	648	651	651	652	639
18		646	645	646	652	652	652	649	647	651	652	652	647	639	641	633	626	644	650	646	644	646	662	644	626	645
19		626	626	599	597	584	586	587	604	613	618	617	606	600	598	598	605	615	619	626	630	637	638	639	641	613
20	Q	640	639	639	638	639	641	642	642	643	643	639	637	630	628	625	625	626	631	636	638	644	645	643	638	637
21	D	638	632	626	617	625	636	644	640	618	573	571	572	574	560	567	605	602	604	612	618	621	623	624	627	609
22	D	619	617	618	598	618	623	625	617	614	623	615	620	601	584	584	590	599	605	611	613	612	611	613	612	610
23	D	615	616	616	610	623	627	629	637	637	637	618	605	604	598	573	574	595	612	611	606	622	630	616	615	613
24		623	624	627	629	628	636	639	643	643	636	637	632	629	621	616	617	619	629	639	635	635	637	638	637	631
25		636	635	642	639	636	641	637	636	636	630	641	639	631	624	617	615	630	636	623	636	643	641	642	642	634
26		637	638	641	641	638	643	641	642	642	642	641	636	630	623	621	616	623	635	643	648	632	639	642	643	637
27		641	640	646	638	636	640	640	641	641	643	648	647	628	613	616	622	631	640	635	643	649	641	636	638	637
28		646	640	642	642	640	638	640	642	642	642	641	636	628	623	613	607	616	629	640	646	648	647	648	648	637
29	Q	648	648	644	642	641	642	642	642	642	642	639	636	635	632	627	627	632	636	642	649	653	652	652	654	642
30	Q	651	648	647	648	647	647	647	647	647	647	645	642	636	630	627	625	627	633	641	648	652	654	653	654	643
MEAN	A	638	636	634	631	627	631	634	634	632	633	630	624	616	607	604	607	615	625	630	635	638	639	639	639	628
MEAN	Q	647	645	644	643	643	644	644	643	643	643	640	635	627	620	616	616	621	630	639	645	650	650	650	649	639
MEAN	D	629	627	617	603	586	608	619	616	598	598	595	594	596	579	574	590	597	618	614	616	616	620	623	622	606

DECLINATION

TABLE 32 ST JOHN S — D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES — NOVEMBER 1970

DAY (HOUR UT)		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	18.5	18.4	18.2	18.4	18.6	19.0	19.3	19.6	20.1	20.3	21.1	23.0	23.1	21.2	17.1	14.1	12.4	12.6	14.5	16.3	17.4	17.6	18.0	18.3	18.2
2		18.4	18.4	18.4	18.4	18.5	19.1	19.0	20.0	19.8	19.2	21.5	23.3	22.2	17.4	14.5	12.5	12.4	12.8	14.6	16.4	17.4	17.7	18.0	17.6	17.8
3		18.8	17.4	18.0	19.2	21.7	20.1	19.5	19.4	20.2	21.4	21.4	21.8	21.3	18.6	15.6	13.3	11.0	11.3	12.7	13.9	13.6	15.3	15.5	16.6	17.4
4		19.1	19.5	20.2	20.4	20.2	20.4	19.9	20.2	19.6	21.4	22.3	23.1	21.1	20.3	17.2	13.7	11.8	12.4	13.7	15.6	15.7	15.8	17.0	17.9	18.3
5		18.2	20.3	19.6	19.8	19.4	19.3	20.1	21.4	19.3	19.3	20.6	22.1	22.1	20.2	16.3	14.1	12.8	12.6	13.6	15.4	16.7	17.2	18.2	18.5	18.2
6		17.8	19.2	20.6	22.3	19.5	20.4	24.4	21.8	19.6	19.3	15.6	15.8	16.9	15.6	13.8	12.0	12.7	13.9	15.0	16.3	17.1	18.0	18.0	18.3	17.7
7	D	20.3	24.2	21.7	24.4	20.5	30.0	27.4	18.6	4.8	5.8	7.1	15.6	17.4	16.6	12.0	12.2	14.0	14.4	15.4	17.7	25.7	19.9	17.9	22.8	17.8
8		20.9	18.4	16.5	18.5	19.0	18.7	18.7	18.7	18.7	18.6	18.7	18.6	19.6	17.9	14.8	13.4	14.4	14.9	15.9	17.2	17.7	17.6	17.6	17.9	17.6
9		18.4	18.0	18.3	17.9	17.2	18.6	19.6	19.5	19.7	18.9	18.7	19.7	18.7	18.5	16.6	14.9	14.3	14.7	16.7	17.2	18.5	19.3	17.9	18.0	17.9
10		18.5	19.4	20.4	19.4	19.6	17.4	20.6	20.5	20.2	19.0	14.2	14.6	15.8	16.5	15.4	13.3	11.8	13.3	14.3	17.1	17.3	18.2	18.3	18.3	17.2
11	D	21.3	27.5	22.5	22.0	18.7	18.3	18.7	19.7	18.8	14.8	17.7	19.5	19.1	18.6	17.1	14.1	14.5	15.4	16.0	17.3	17.5	20.5	17.5	18.6	18.6
12		20.2	20.7	19.8	19.7	17.0	19.6	19.8	18.6	17.9	17.8	18.3	18.8	19.5	18.3	16.5	14.5	14.2	14.6	15.8	16.7	17.8	17.9	18.0	18.1	17.9
13		18.7	19.4	19.9	21.0	19.9	20.3	19.9	20.2	20.7	20.7	20.5	20.5	19.7	18.6	16.1	14.0	12.7	11.9	12.7	14.0	16.0	17.2	19.1	21.0	18.1
14		21.3	23.1	20.7	19.7	19.1	18.8	19.6	20.8	22.2	20.9	21.1	21.9	21.7	19.6	17.1	15.6	12.6	12.9	13.1	14.8	17.8	18.9	19.1	19.6	18.8
15	Q	19.9	19.8	19.5	19.2	19.7	19.7	19.9	20.0	20.2	20.7	21.7	22.3	23.5	22.0	19.3	17.0	15.3	15.1	14.9	16.2	17.1	18.0	19.1	19.9	19.2
16		20.2	20.0	19.9	19.8	19.7	19.8	19.8	20.0	20.2	20.9	21.0	22.2	23.1	21.6	18.5	15.2	11.9	12.0	14.1	16.8	17.9	18.6	19.2	19.3	18.8
17		21.5	21.8	21.1	21.5	22.3	21.0	21.1	21.2	22.0	22.1	22.2	23.1	24.2	22.9	20.3	17.9	15.8	15.0	15.8	17.0	18.8	19.1	19.7	19.9	20.3
18		20.3	20.7	20.0	20.1	20.0	19.8	20.4	20.0	20.5	21.1	22.1	22.6	23.0	20.3	17.1	14.6	13.8	14.0	15.1	15.9	17.5	17.0	12.8	14.6	18.5
19		15.5	20.3	19.9	25.6	25.0	23.1	22.9	19.2	23.0	21.9	21.0	21.4	20.9	19.1	17.1	15.9	15.0	15.6	16.4	17.3	18.2	18.9	19.2	19.2	19.6
20	Q	19.3	19.4	19.5	19.8	19.9	19.8	19.6	20.2	20.4	21.1	21.4	21.9	21.7	20.9	19.2	18.0	18.1	18.2	19.1	18.9	19.0	19.2	19.1	19.4	19.7
21	D	20.2	19.7	21.2	20.7	21.9	21.5	21.2	18.5	9.4	-.6	1.1	9.6	13.2	18.1	18.8	20.7	17.8	18.0	22.3	22.1	21.1	20.5	20.2	20.2	17.4
22	D	21.5	23.2	19.3	17.3	19.1	19.3	20.3	21.2	19.2	21.6	16.8	20.4	20.1	19.4	17.1	14.9	11.4	11.3	11.5	14.3	16.4	19.0	20.3	21.5	18.2
23	D	21.3	23.8	22.9	24.1	22.9	21.3	22.4	20.8	16.6	14.1	14.7	17.1	20.1	19.0	17.4	13.6	11.0	10.0	10.8	14.7	16.8	19.1	20.0	21.0	18.2
24		21.0	20.9	21.3	21.1	19.6	19.4	20.5	21.1	20.7	21.1	21.3	22.2	22.5	21.5	20.1	17.8	15.5	12.1	12.9	14.6	17.1	17.5	18.9	19.5	19.2
25		20.2	22.6	23.2	19.4	20.1	19.4	20.5	21.4	22.6	20.6	20.4	21.8	21.5	20.4	19.2	17.4	15.9	13.9	13.8	15.9	17.6	19.3	20.2	20.4	19.5
26		22.4	21.5	20.4	20.3	20.1	21.1	21.1	21.3	21.4	22.1	21.2	21.2	21.5	20.0	17.4	15.2	13.7	15.6	17.3	17.4	18.4	20.1	19.6	20.2	19.6
27		20.5	20.9	21.0	21.2	21.4	20.9	19.5	21.4	22.2	20.5	20.8	21.4	21.2	18.5	16.4	16.2	14.6	14.4	16.4	18.5	18.7	19.5	21.4	21.4	19.5
28		21.2	21.5	21.1	20.2	19.1	17.6	20.5	21.4	21.6	21.6	21.7	21.5	22.0	22.1	18.5	16.4	15.3	15.7	17.2	18.4	19.5	20.4	20.5	20.8	19.8
29	Q	20.6	20.6	20.7	20.5	20.7	21.3	21.3	21.6	21.7	22.4	22.4	22.3	21.4	20.4	18.9	17.6	16.2	16.2	16.5	17.7	19.5	20.1	20.4	20.5	20.1
30	Q	20.7	20.6	20.6	20.6	21.0	21.1	21.0	21.4	21.9	21.9	22.3	22.6	22.7	21.9	20.3	18.6	17.4	16.8	17.4	18.6	19.7	20.3	20.7	21.2	20.5
MEAN	A	19.9	20.7	20.2	20.4	20.1	20.2	20.6	20.3	19.5	19.0	19.0	20.4	20.7	19.5	17.2	15.3	14.0	14.0	15.2	16.7	18.0	18.6	18.7	19.3	18.6
MEAN	Q	19.8	19.8	19.7	19.7	20.0	20.2	20.2	20.6	20.9	21.3	21.7	22.4	22.5	21.3	19.0	17.1	15.9	15.8	16.5	17.5	18.5	19.0	19.5	19.9	19.5
MEAN	D	20.9	23.7	21.5	21.7	20.6	22.1	22.0	19.7	13.7	11.1	11.5	16.4	18.0	18.3	16.5	15.1	13.7	13.8	15.2	17.2	19.5	19.8	19.2	20.8	18.0

HORIZONTAL INTENSITY

TABLE 31 ST JOHN S — H = 17000 PLUS TABULAR VALUES IN GAMMAS — NOVEMBER 1970

DAY	HOUR UT	0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	650	649	651	649	650	649	648	646	645	644	641	630	613	600	598	600	611	625	639	646	652	652	651	651	637
2		652	652	652	652	652	653	654	652	645	651	651	633	611	607	608	606	613	624	637	645	650	651	648	650	639
3		644	645	641	645	632	632	635	637	633	637	634	623	611	601	606	611	624	637	643	646	646	638	639	645	633
4		637	633	633	634	632	631	631	631	630	633	632	625	618	606	609	616	624	636	649	653	657	651	652	656	634
5		653	638	643	644	641	632	636	638	637	644	645	637	623	612	610	604	612	631	640	643	643	638	632	642	634
6		643	639	629	624	622	627	630	635	641	648	643	635	610	595	599	604	610	617	622	630	635	628	631	636	626
7	D	648	643	613	576	446	540	578	556	494	535	552	550	595	559	550	583	597	604	609	613	598	621	628	622	580
8		621	621	621	614	621	623	627	629	627	623	621	610	601	597	596	601	609	618	622	623	635	636	635	634	619
9		635	633	631	630	634	635	627	629	630	634	629	621	609	610	603	601	610	617	616	629	629	635	641	641	625
10		636	639	647	629	623	622	634	635	636	632	614	603	613	614	602	583	605	609	623	634	640	635	640	636	624
11	D	628	628	614	614	620	616	621	630	628	622	620	622	605	595	595	601	603	626	627	629	628	615	633	635	619
12		639	634	635	634	633	635	638	631	629	639	633	626	616	602	594	602	608	622	626	633	634	635	636	637	627
13		638	634	627	621	628	625	625	632	633	634	629	620	608	601	602	604	611	619	617	617	621	625	627	621	622
14		619	621	625	625	626	626	628	634	634	638	631	625	611	604	601	599	607	619	627	631	639	641	643	643	625
15	Q	645	641	640	640	640	641	640	641	640	639	637	628	619	610	602	601	610	625	635	646	648	647	651	651	634
16		645	648	646	646	646	647	647	647	646	647	642	640	631	620	619	623	630	632	646	651	658	653	657	654	643
17		644	638	639	651	644	645	650	651	652	652	650	640	626	619	613	610	618	625	629	640	648	651	651	652	639
18		646	645	646	652	652	652	649	647	651	652	652	647	639	641	633	626	644	650	646	644	646	662	644	626	645
19		626	626	599	597	584	586	587	604	613	618	617	606	600	598	598	605	615	619	626	630	637	638	639	641	613
20	Q	640	639	639	638	639	641	642	642	643	643	639	637	630	628	625	625	626	631	636	638	644	645	643	638	637
21	D	638	632	626	617	625	636	644	640	618	573	571	572	574	560	567	605	602	604	612	618	621	623	624	627	609
22	D	619	617	618	598	618	623	625	617	614	623	615	620	601	584	584	590	599	605	611	613	612	611	613	612	610
23	D	615	616	616	610	623	627	629	637	637	637	618	605	604	598	573	574	595	612	611	606	622	630	616	615	613
24		623	624	627	629	628	636	639	643	643	636	637	632	629	621	616	617	619	629	639	635	635	637	638	637	631
25		636	635	642	639	636	641	637	636	636	630	641	639	631	624	617	615	630	636	623	636	643	641	642	642	634
26		637	638	641	641	638	643	641	642	642	642	641	636	630	623	621	616	623	635	643	648	632	639	642	643	637
27		641	640	646	638	636	640	640	641	641	643	648	647	628	613	616	622	631	640	635	643	649	641	636	638	637
28		646	640	642	642	640	638	640	642	642	642	641	636	628	623	613	607	616	629	640	646	648	647	648	648	637
29	Q	648	648	644	642	641	642	642	642	642	642	639	636	635	632	627	627	632	636	642	649	653	652	652	654	642
30	Q	651	648	647	648	647	647	647	647	647	647	645	642	636	630	627	625	627	633	641	648	652	654	653	654	643
MEAN A		638	636	634	631	627	631	634	634	632	633	630	624	616	607	604	607	615	625	630	635	638	639	639	639	628
MEAN Q		647	645	644	643	643	644	644	643	643	643	640	635	627	620	616	616	621	630	639	645	650	650	650	649	639
MEAN D		629	627	617	603	586	608	619	616	598	598	595	594	596	579	574	590	597	610	614	616	616	620	623	622	606

DECLINATION

TABLE 32 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES NOVEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	18.5	18.4	18.2	18.4	18.6	19.0	19.3	19.6	20.1	20.3	21.1	23.0	23.1	21.2	17.1	14.1	12.4	12.6	14.5	16.3	17.4	17.6	18.0	18.3	18.2
2		18.4	18.4	18.4	18.4	18.5	19.1	19.0	20.0	19.8	19.2	21.5	23.3	22.2	17.4	14.5	12.5	12.4	12.8	14.6	16.4	17.4	17.7	18.0	17.6	17.8
3		18.8	17.4	18.0	19.2	21.7	20.1	19.5	19.4	20.2	21.4	21.4	21.8	21.3	18.6	15.6	13.3	11.0	11.3	12.7	13.9	13.6	15.3	15.5	16.6	17.4
4		19.1	19.5	20.2	20.4	20.2	20.4	19.9	20.2	19.6	21.4	22.3	23.1	21.1	20.3	17.2	13.7	11.8	12.4	13.7	15.6	15.7	15.8	17.0	17.9	18.3
5		18.2	20.3	19.6	19.8	19.4	19.3	20.1	21.4	19.3	19.3	20.6	22.1	22.1	20.2	16.3	14.1	12.8	12.6	13.6	15.4	16.7	17.2	18.2	18.5	18.2
6		17.8	19.2	20.6	22.3	19.5	20.4	24.4	21.8	19.6	19.3	15.6	15.8	16.9	15.6	13.8	12.0	12.7	13.9	15.0	16.3	17.1	18.0	18.0	18.3	17.7
7	D	20.3	24.2	21.7	24.4	20.5	30.0	27.4	18.6	4.8	5.8	7.1	15.6	17.4	16.6	12.0	12.2	14.0	14.4	15.4	17.7	25.7	19.9	17.9	22.8	17.8
8		20.9	18.4	16.5	18.5	19.0	18.7	18.7	18.7	18.7	18.6	18.7	18.6	19.6	17.9	14.8	13.4	14.4	14.9	15.9	17.2	17.7	17.6	17.6	17.9	17.6
9		18.4	18.0	18.3	17.9	17.2	18.6	19.6	19.5	19.7	18.9	18.7	19.7	18.7	18.5	16.6	14.9	14.3	14.7	16.7	17.2	18.5	19.3	17.9	18.0	17.9
10		18.5	19.4	20.4	19.4	19.6	17.4	20.6	20.5	20.2	19.0	14.2	14.6	15.8	16.5	15.4	13.3	11.8	13.3	14.3	17.1	17.3	18.2	18.3	18.3	17.2
11	D	21.3	27.5	22.5	22.0	18.7	18.3	18.7	19.7	18.8	14.8	17.7	19.5	19.1	18.6	17.1	14.1	14.5	15.4	16.0	17.3	17.5	20.5	17.5	18.6	18.6
12		20.2	20.7	19.8	19.7	17.0	19.6	19.8	18.6	17.9	17.8	18.3	18.8	19.5	18.3	16.5	14.5	14.2	14.6	15.8	16.7	17.8	17.9	18.0	18.1	17.9
13		18.7	19.4	19.9	21.0	19.9	20.3	19.9	20.2	20.7	20.7	20.5	20.5	19.7	18.6	16.1	14.0	12.7	11.9	12.7	14.0	16.0	17.2	19.1	21.0	18.1
14		21.3	23.1	20.7	19.7	19.1	18.8	19.6	20.8	22.2	20.9	21.1	21.9	21.7	19.6	17.1	15.6	12.6	12.9	13.1	14.8	17.8	18.9	19.1	19.6	18.8
15	Q	19.9	19.8	19.5	19.2	19.7	19.7	19.9	20.0	20.2	20.7	21.7	22.3	23.5	22.0	19.3	17.0	15.3	15.1	14.9	16.2	17.1	18.0	19.1	19.9	19.2
16		20.2	20.0	19.9	19.8	19.7	19.8	19.8	20.0	20.2	20.9	21.0	22.2	23.1	21.6	18.5	15.2	11.9	12.0	14.1	16.8	17.9	18.6	19.2	19.3	18.8
17		21.5	21.8	21.1	21.5	22.3	21.0	21.1	21.2	22.0	22.1	22.2	23.1	24.2	22.9	20.3	17.9	15.8	15.0	15.8	17.0	18.8	19.1	19.7	19.9	20.3
18		20.3	20.7	20.0	20.1	20.0	19.8	20.4	20.0	20.5	21.1	22.1	22.6	23.0	20.3	17.1	14.6	13.8	14.0	15.1	15.9	17.5	17.0	12.8	14.6	18.5
19		15.5	20.3	19.9	25.6	25.0	23.1	22.9	19.2	23.0	21.9	21.0	21.4	20.9	19.1	17.1	15.9	15.0	15.6	16.4	17.3	18.2	18.9	19.2	19.2	19.6
20	Q	19.3	19.4	19.5	19.8	19.9	19.8	19.6	20.2	20.4	21.1	21.4	21.9	21.7	20.9	19.2	18.0	18.1	18.2	19.1	18.9	19.0	19.2	19.1	19.4	19.7
21	D	20.2	19.7	21.2	20.7	21.9	21.5	21.2	18.5	9.4	-.6	1.1	9.6	13.2	18.1	18.8	20.7	17.8	18.0	22.3	22.1	21.1	20.5	20.2	20.2	17.4
22	D	21.5	23.2	19.3	17.3	19.1	19.3	20.3	21.2	19.2	21.6	16.8	20.4	20.1	19.4	17.1	14.9	11.4	11.3	11.5	14.3	16.4	19.0	20.3	21.5	18.2
23	D	21.3	23.8	22.9	24.1	22.9	21.3	22.4	20.8	16.6	14.1	14.7	17.1	20.1	19.0	17.4	13.6	11.0	10.0	10.8	14.7	16.8	19.1	20.0	21.0	18.2
24		21.0	20.9	21.3	21.1	19.6	19.4	20.5	21.1	20.7	21.1	21.3	22.2	22.5	21.5	20.1	17.8	15.5	12.1	12.9	14.6	17.1	17.5	18.9	19.5	19.2
25		20.2	22.6	23.2	19.4	20.1	19.4	20.5	21.4	22.6	20.6	20.4	21.8	21.5	20.4	19.2	17.4	15.9	13.9	13.8	15.9	17.6	19.3	20.2	20.4	19.5
26		22.4	21.5	20.4	20.3	20.1	21.1	21.1	21.3	21.4	22.1	21.2	21.2	21.5	20.0	17.4	15.2	13.7	15.6	17.3	17.4	18.4	20.1	19.6	20.2	19.6
27		20.5	20.9	21.0	21.2	21.4	20.9	19.5	21.4	22.2	20.5	20.8	21.4	21.2	18.5	16.4	16.2	14.6	14.4	16.4	18.5	18.7	19.5	21.4	21.4	19.5
28		21.2	21.5	21.1	20.2	19.1	17.6	20.5	21.4	21.6	21.6	21.7	21.5	22.0	22.1	18.5	16.4	15.3	15.7	17.2	18.4	19.5	20.4	20.5	20.8	19.8
29	Q	20.6	20.6	20.7	20.5	20.7	21.3	21.3	21.6	21.7	22.4	22.4	22.3	21.4	20.4	18.9	17.6	16.2	16.2	16.5	17.7	19.5	20.1	20.4	20.5	20.1
30	Q	20.7	20.6	20.6	20.6	21.0	21.1	21.0	21.4	21.9	21.9	22.3	22.6	22.7	21.9	20.3	18.6	17.4	16.8	17.4	18.6	19.7	20.3	20.7	21.2	20.5
MEAN	A	19.9	20.7	20.2	20.4	20.1	20.2	20.6	20.3	19.5	19.0	19.0	20.4	20.7	19.5	17.2	15.3	14.0	14.0	15.2	16.7	18.0	18.6	18.7	19.3	18.6
MEAN	Q	19.8	19.8	19.7	19.7	20.0	20.2	20.2	20.6	20.9	21.3	21.7	22.4	22.5	21.3	19.0	17.1	15.9	15.8	16.5	17.5	18.5	19.0	19.5	19.9	19.5
MEAN	D	20.9	23.7	21.5	21.7	20.6	22.1	22.0	19.7	13.7	11.1	11.5	16.4	18.0	18.3	16.5	15.1	13.7	13.8	15.2	17.2	19.5	19.8	19.2	20.8	18.0

VERTICAL INTENSITY

TABLE 33 ST JOHN S — Z = 50500 PLUS TABULAR VALUES IN GAMMAS — NOVEMBER 1978

HOUR UT DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	281	279	280	278	279	280	281	284	282	282	279	273	266	264	270	282	290	296	297	294	289	287	286	282	282
2		282	280	279	279	279	280	282	280	278	280	274	270	265	274	282	290	289	288	288	287	286	288	287	288	282
3		284	291	287	281	272	288	289	288	280	282	287	282	278	279	281	289	296	300	296	296	296	294	300	295	288
4		288	288	286	285	286	283	286	282	279	274	280	275	278	272	274	284	289	292	295	289	294	290	294	289	285
5		290	287	292	287	286	286	276	282	288	282	286	282	278	278	281	288	295	296	297	290	291	292	295	294	288
6		288	271	276	269	259	248	258	264	238	241	262	257	262	273	289	304	304	303	295	297	297	289	296	297	277
7	D	289	213	266	203	98	174	183	170	88	141	227	241	310	290	331	344	322	320	321	326	311	320	311	281	253
8		290	311	295	293	305	298	302	297	294	289	288	289	288	291	305	310	309	306	305	303	303	297	296	294	298
9		291	294	296	297	296	281	278	280	279	280	281	282	280	282	287	298	306	312	304	310	300	297	294	289	291
10		288	287	257	288	282	274	288	290	289	282	272	294	274	280	278	303	321	313	320	311	306	296	292	294	291
11	D	279	243	273	274	297	290	280	278	279	274	282	286	281	286	298	307	316	320	305	304	306	301	303	295	290
12		286	286	287	278	282	282	289	283	287	279	281	282	278	270	282	300	302	306	302	298	296	295	294	290	288
13		288	286	281	274	294	289	286	296	299	295	290	288	287	281	296	300	306	313	313	312	312	306	298	291	295
14		286	281	294	296	297	296	296	291	292	298	294	290	287	286	288	296	306	313	314	307	302	299	296	294	296
15	Q	290	288	288	287	288	289	290	294	291	293	288	286	276	275	281	286	294	298	307	304	302	295	294	290	291
16		286	286	283	284	284	286	288	288	289	288	287	280	272	269	273	278	290	294	296	289	287	288	289	292	285
17		286	287	286	266	274	286	285	287	284	285	282	278	271	270	273	278	282	289	291	294	290	288	288	288	283
18		286	284	286	282	280	280	280	282	281	282	280	278	270	271	260	282	298	288	280	282	283	296	336	364	287
19		386	254	294	262	280	302	310	330	302	304	299	298	297	302	305	309	306	298	297	296	295	294	294	293	300
20	Q	294	294	294	295	294	290	289	289	288	288	287	287	288	288	291	294	286	295	290	290	291	288	287	288	291
21	D	288	288	272	270	280	295	288	280	240	255	259	260	278	304	392	381	344	315	310	304	303	298	297	296	296
22	D	283	264	241	200	284	303	302	288	285	272	280	273	280	288	304	321	330	335	343	337	328	315	310	302	294
23	D	299	284	275	270	288	273	263	254	241	241	243	246	278	274	289	318	350	361	342	329	311	307	303	306	289
24		298	295	290	291	298	299	295	294	289	286	287	281	281	260	281	294	305	313	317	302	296	298	294	294	294
25		294	298	298	304	298	302	295	290	286	289	289	285	282	280	286	297	308	316	312	305	302	295	294	294	296
26		290	298	297	296	295	294	295	296	295	290	294	289	286	268	290	300	305	306	304	306	297	295	294	290	296
27		289	288	288	289	294	295	301	295	290	282	280	276	268	280	289	294	303	312	298	298	304	295	289	297	291
28		292	288	291	288	289	270	279	294	295	294	289	287	280	274	278	289	296	303	302	303	298	294	294	289	290
29	Q	288	286	287	288	289	291	294	295	296	294	289	285	281	279	281	288	296	301	303	298	295	291	288	288	290
30	Q	287	283	282	282	282	286	288	290	289	289	287	282	278	279	282	281	287	289	295	294	290	289	286	286	286
MEAN	A	292	282	283	278	280	283	284	284	277	277	280	279	279	280	290	299	305	306	305	302	299	296	296	294	289
MEAN	Q	288	286	286	286	286	287	288	291	289	289	286	283	278	277	281	286	283	296	298	296	293	290	288	287	288
MEAN	D	288	258	265	244	249	267	263	254	227	236	258	261	285	288	323	334	332	330	324	320	312	308	305	296	285

HORIZONTAL INTENSITY

TABLE 34   ST JOHN S   H = 17000 PLUS TABULAR VALUES IN GAMMAS   DECEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	654	653	652	653	653	653	654	654	653	653	648	643	635	628	621	621	626	634	641	649	653	655	654	654	646
2		654	653	653	653	653	653	653	654	654	655	653	648	647	641	640	641	646	659	659	654	653	654	654	653	652
3		650	640	652	651	651	651	651	646	649	657	652	646	639	632	626	628	633	635	640	646	650	646	647	645	644
4		645	646	646	646	646	647	651	650	651	652	651	646	639	632	626	628	633	642	651	655	651	636	633	631	643
5		631	628	627	633	632	639	638	636	638	655	660	652	644	633	620	612	620	631	634	639	644	646	647	651	637
6		650	645	645	645	644	641	639	630	635	646	650	645	630	611	593	600	606	619	628	637	637	639	641	645	633
7		645	644	645	639	645	644	639	643	649	646	645	643	625	619	619	621	624	632	634	642	643	631	630	617	636
8	D	625	604	615	609	605	620	625	625	643	654	637	632	611	591	603	607	609	617	626	617	626	632	637	638	621
9		634	632	633	636	634	632	640	642	640	637	634	632	630	618	607	610	617	625	637	644	643	643	644	643	633
10	Q	644	644	644	643	643	642	643	644	644	648	647	639	624	617	616	618	622	624	631	633	636	637	639	641	636
11	Q	644	643	642	642	643	644	645	646	647	650	645	642	632	624	621	619	619	623	631	640	644	645	647	645	638
12		643	643	646	644	643	647	648	649	650	650	654	650	643	637	629	630	630	637	643	648	651	652	650	649	644
13		649	648	643	643	644	646	646	648	646	646	643	639	636	630	630	637	644	647	643	647	649	654	656	647	644
14	D	650	650	653	654	636	559	466	97	342	561	557	596	589	590	587	586	533	594	585	597	598	600	597	604	564
15	D	602	615	598	604	603	596	598	603	608	622	614	613	609	590	591	589	595	609	611	616	621	623	623	621	607
16		624	622	621	617	616	617	617	619	618	619	618	616	612	607	598	603	606	614	623	632	635	638	640	635	619
17	Q	634	640	637	637	636	635	635	636	640	639	636	633	630	625	621	629	629	630	634	640	636	638	639	642	635
18		642	642	640	638	638	638	636	641	641	640	636	632	628	621	622	621	623	625	629	636	639	642	648	646	635
19		642	636	636	635	640	641	642	645	640	648	643	634	630	629	629	631	634	639	635	640	642	634	628	629	637
20		635	630	629	635	638	636	635	636	635	647	642	641	635	627	621	621	621	622	626	624	627	629	630	632	631
21		635	634	630	630	634	633	635	638	642	640	636	631	628	624	623	622	629	635	635	636	636	634	631	630	632
22		632	634	634	629	629	630	633	635	641	647	643	639	629	624	629	636	642	648	653	653	659	655	649	650	640
23		649	648	652	649	648	649	654	660	664	663	660	656	655	654	649	646	644	647	647	648	653	651	653	653	652
24	D	642	616	614	607	617	627	623	627	623	626	629	629	627	625	622	626	629	630	638	642	640	642	641	640	628
25		641	637	640	636	636	635	636	635	635	634	632	629	629	628	623	627	632	640	642	644	647	648	650	648	637
26		651	647	646	642	636	631	634	636	636	636	634	630	626	618	616	624	633	640	646	646	648	647	648	647	637
27		648	647	643	636	639	642	643	642	642	643	642	642	635	620	623	630	637	645	646	653	649	634	637	634	640
28	D	629	621	623	622	629	629	629	635	634	630	632	634	624	627	625	616	616	622	622	629	629	628	616	606	625
29		616	627	625	629	623	625	629	632	629	634	631	629	622	612	616	632	641	650	648	646	650	649	636	607	631
30		615	617	608	614	618	629	632	638	643	642	636	635	630	624	621	627	621	622	639	647	648	647	645	645	631
31	Q	647	646	643	645	643	646	648	649	649	649	648	646	636	629	625	630	636	647	654	658	660	657	655	653	646
MEAN	A	639	636	636	635	635	634	632	622	631	641	638	636	629	622	619	621	625	632	636	640	642	641	640	638	633
MEAN	Q	644	645	644	644	643	644	645	646	647	648	645	640	632	625	621	623	626	631	638	644	646	646	647	647	640
MEAN	D	629	621	621	619	618	606	588	517	570	619	614	621	612	604	605	605	609	614	616	620	623	625	623	622	609

DECLINATION

TABLE 35 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES DECEMBER 1970

HOUR UT / DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	21.3	21.4	21.0	20.6	20.5	20.5	20.9	21.1	21.3	21.5	22.0	22.8	23.4	22.5	19.9	18.2	16.1	15.8	17.1	18.6	19.6	20.4	20.5	21.0	20.3
2		21.3	21.4	21.3	21.2	20.8	20.6	20.7	20.7	21.4	21.7	21.9	22.3	22.6	21.8	20.5	18.7	16.8	15.5	16.4	16.9	17.6	18.6	19.7	20.6	20.0
3		21.5	23.7	23.6	21.4	20.7	20.6	20.7	20.5	20.4	22.5	22.6	22.9	23.3	22.4	20.6	18.2	16.7	17.2	17.6	18.3	19.3	19.7	20.2	20.4	20.6
4		21.6	21.7	21.2	20.6	20.6	20.5	20.6	20.4	20.7	21.4	22.4	23.6	23.8	22.6	20.7	18.5	16.7	15.9	16.7	17.8	18.2	17.6	18.2	20.2	20.1
5		22.7	23.0	23.8	22.8	21.3	20.3	19.7	20.5	20.4	20.6	20.5	21.7	23.6	23.6	20.5	17.4	15.8	14.7	15.9	17.6	18.7	19.6	19.9	20.5	20.2
6		20.8	21.6	19.9	21.7	20.9	20.4	21.0	22.3	19.2	22.9	21.4	22.6	23.8	22.8	19.3	15.9	12.8	12.2	13.5	14.0	16.0	18.0	19.6	20.6	19.3
7		20.6	21.6	21.4	21.0	19.9	20.5	19.0	20.8	21.6	20.9	21.8	22.7	22.8	20.0	16.3	13.7	12.6	13.3	15.3	16.5	15.2	17.9	19.8	23.2	19.1
8	D	23.0	24.0	30.3	31.2	27.0	23.8	19.9	22.3	20.8	20.6	18.6	17.7	20.8	20.1	19.2	17.7	15.8	15.1	14.8	15.3	16.7	18.3	20.3	20.9	20.6
9		22.0	22.1	21.7	20.6	20.5	19.6	20.9	20.3	21.7	21.4	20.8	20.8	22.9	21.6	18.0	16.0	14.8	16.0	17.5	18.7	19.6	19.9	20.1	20.6	19.9
10	Q	21.3	21.1	21.1	21.2	21.1	21.0	21.1	21.5	21.6	21.0	21.7	22.4	22.1	20.1	17.7	16.4	15.9	16.2	17.1	18.5	19.6	19.6	20.0	20.6	20.0
11	Q	20.9	20.9	21.0	21.3	21.1	20.7	20.6	21.8	22.2	22.1	22.1	22.5	23.1	23.2	20.8	18.1	17.2	17.7	18.4	19.2	20.0	20.1	20.6	20.9	20.7
12		20.9	21.0	21.8	21.7	21.2	20.9	21.1	21.6	21.9	20.7	21.8	22.3	22.2	21.0	18.1	17.1	17.1	16.9	17.7	19.0	20.0	20.0	20.0	20.4	20.3
13		21.4	22.1	21.9	22.0	22.0	21.8	21.8	22.0	22.8	22.5	22.6	23.1	23.7	22.6	21.0	19.6	18.1	17.9	18.9	19.8	20.5	20.8	20.3	21.8	21.3
14	D	22.0	22.3	24.1	21.8	20.2	13.5	43.0	37.3	31.4	26.1	27.1	23.3	22.0	20.2	18.2	16.1	15.4	15.2	15.2	14.3	15.1	17.8	18.1	21.4	21.7
15	D	22.1	24.6	23.2	22.4	20.9	18.5	19.3	18.0	19.4	19.1	19.9	21.3	23.8	21.7	17.5	14.4	13.2	13.4	14.7	17.3	18.9	19.9	20.4	21.1	19.4
16		21.9	22.3	22.7	21.9	21.1	20.9	21.8	22.3	22.1	21.9	22.2	23.8	24.4	23.3	20.3	18.9	17.4	16.7	17.0	18.4	19.5	19.5	20.2	21.0	20.9
17	Q	22.0	22.4	22.0	21.8	21.3	21.1	21.1	21.8	22.0	22.3	22.4	23.5	24.1	22.2	20.0	18.9	18.1	18.0	18.4	19.4	20.2	20.4	21.1	21.8	21.1
18		21.9	22.0	21.9	21.8	21.4	20.4	20.6	21.2	21.6	21.9	22.6	23.2	24.0	23.4	20.9	19.1	18.0	17.2	17.9	19.0	20.1	21.0	21.2	22.1	21.0
19		22.3	22.2	22.4	22.9	22.1	21.2	20.2	21.2	21.3	22.3	24.1	24.5	25.6	24.2	22.2	20.4	19.3	19.2	18.4	19.3	20.1	20.3	25.1	22.3	21.8
20		22.5	23.2	23.3	21.8	21.2	22.2	22.1	20.3	17.0	17.4	18.4	21.3	24.1	23.0	19.3	17.4	17.6	18.1	18.3	19.0	19.2	19.7	20.7	21.4	20.4
21		23.3	23.3	23.4	22.8	22.4	22.1	22.4	23.5	24.2	22.6	22.1	24.0	24.4	23.3	21.0	18.6	17.7	18.5	19.5	20.3	20.6	20.3	20.4	21.2	21.7
22		22.1	23.3	23.8	23.3	22.6	22.6	23.4	23.7	21.3	21.8	23.2	24.1	24.3	22.5	20.2	19.3	18.6	18.5	18.4	18.7	19.3	20.3	21.2	22.1	21.6
23		22.5	23.3	20.2	23.2	23.6	22.2	22.2	22.4	21.7	21.7	22.8	22.3	22.6	21.0	19.7	19.0	18.5	19.3	19.2	20.5	21.4	21.5	21.5	21.2	21.4
24	D	23.8	25.4	26.5	27.5	25.0	25.0	26.3	23.8	23.5	23.4	22.7	23.3	24.3	23.4	20.9	19.6	17.7	17.6	18.6	19.5	20.3	20.4	21.6	22.3	22.6
25		23.0	21.9	22.5	23.0	22.6	22.5	22.6	23.1	22.6	22.7	22.7	23.5	23.7	21.7	19.9	18.4	17.9	18.2	19.6	19.7	19.9	20.6	21.0	21.6	21.4
26		22.0	22.5	22.6	21.7	22.5	21.6	24.4	24.3	23.5	23.2	22.7	23.4	23.5	22.0	20.0	18.0	16.9	17.8	19.5	20.4	20.9	21.3	21.6	21.9	21.6
27		22.7	23.0	23.3	24.5	23.5	23.4	23.6	23.9	24.5	23.3	23.9	24.6	24.3	22.7	19.8	16.9	14.9	14.8	17.5	17.3	17.1	16.8	14.7	19.8	20.9
28	D	21.6	23.0	24.5	26.5	25.3	24.9	25.2	23.6	22.6	23.5	23.4	25.4	24.6	20.7	17.5	16.6	14.2	13.4	13.5	15.1	17.1	15.0	18.7	23.9	20.8
29		23.0	23.5	22.8	23.0	23.2	23.8	22.8	22.7	21.7	21.6	23.6	25.3	24.6	22.5	18.9	15.9	15.3	16.2	17.0	19.7	20.8	20.7	21.0	22.9	21.4
30		24.7	26.4	25.7	27.6	25.6	22.5	22.8	22.6	22.8	23.2	23.5	24.0	24.7	23.7	21.8	19.8	17.6	18.4	18.6	20.1	21.2	21.7	22.5	23.0	22.7
31	Q	23.0	22.7	22.1	21.9	21.7	21.7	21.7	21.8	22.0	22.7	23.5	24.3	24.8	23.6	19.9	18.5	18.6	19.0	19.6	20.5	21.5	22.3	22.7	22.5	21.8
MEAN	A	22.1	22.7	22.8	22.8	22.1	21.3	22.4	22.4	22.0	21.9	22.3	23.0	23.6	22.2	19.7	17.8	16.6	16.6	17.4	18.3	19.2	19.7	20.4	21.5	20.9
MEAN	Q	21.7	21.7	21.4	21.4	21.2	21.0	21.1	21.6	21.8	21.9	22.3	23.1	23.5	22.3	19.7	18.0	17.2	17.3	18.1	19.2	20.2	20.6	21.0	21.4	20.8
MEAN	D	22.5	23.9	25.7	25.9	23.7	21.1	26.7	25.0	23.5	22.5	22.3	22.2	23.1	21.2	18.7	16.9	15.3	14.9	15.4	16.3	17.6	18.3	19.8	21.9	21.0

VERTICAL INTENSITY

TABLE 36 ST JOHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS DECEMBER 1970

DAY		0 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	Q	283	281	281	281	280	281	282	283	283	282	281	279	274	266	267	273	279	286	289	289	287	287	286	283	281
2		281	279	279	278	278	279	280	281	281	280	280	279	273	272	269	271	290	285	283	287	281	281	280	281	279
3		281	274	274	279	279	279	279	281	278	274	279	277	273	272	273	280	291	283	284	286	283	282	283	287	279
4		284	283	284	283	281	281	281	281	281	280	281	279	279	281	283	288	299	290	289	291	287	291	297	294	285
5		290	283	274	275	275	279	281	281	276	272	282	281	278	275	283	291	299	303	295	291	287	287	285	284	284
6		288	283	279	281	288	287	281	279	277	267	276	273	272	267	281	300	306	312	311	310	298	292	288	287	287
7		288	290	289	290	288	287	288	280	282	283	277	274	274	281	289	295	297	305	303	303	303	293	296	295	290
8	D	303	238	259	243	284	295	296	275	281	287	280	281	273	281	305	307	309	314	315	313	305	299	294	291	289
9		288	290	288	291	290	289	289	290	283	284	281	279	273	266	273	288	297	303	299	296	289	287	283	282	287
10	Q	281	283	283	287	289	290	290	289	287	281	278	274	272	273	281	289	295	295	297	298	293	290	287	285	286
11	Q	283	282	283	283	287	289	288	287	283	283	281	279	271	267	272	280	283	290	291	290	287	283	281	280	283
12		279	276	273	275	280	282	282	285	283	281	273	271	272	267	275	285	297	295	295	291	290	288	290	287	282
13		283	280	279	279	281	283	284	283	281	282	280	275	267	265	267	279	293	281	281	282	283	283	289	287	280
14	D	283	281	281	287	261	176	73	145	196	297	268	333	311	311	306	311	313	313	324	341	328	321	347	290	280
15	D	304	263	243	283	287	267	248	242	257	265	279	283	282	276	291	295	303	307	304	295	299	296	297	296	282
16		295	291	289	289	290	290	288	292	295	296	295	291	287	282	281	291	295	300	303	299	297	291	294	295	292
17	Q	292	288	287	285	284	283	287	288	288	287	287	287	282	280	283	292	295	294	291	289	284	287	289	289	288
18		288	287	285	284	282	283	283	284	286	285	284	286	281	279	287	291	294	295	290	289	285	285	282	283	286
19		281	283	281	281	283	281	286	274	273	259	267	279	274	277	281	288	291	292	297	290	289	289	289	305	283
20		290	289	289	291	287	279	272	269	263	257	268	277	281	278	281	290	290	289	291	290	291	290	291	291	283
21		288	289	288	290	288	289	281	274	273	283	287	283	281	281	287	290	297	296	297	295	290	289	291	289	287
22		289	279	283	287	289	288	288	287	290	281	281	279	275	275	283	292	295	291	290	289	288	283	279	284	285
23		281	281	273	271	281	287	283	281	281	281	275	279	271	265	275	282	293	284	289	283	281	279	281	287	280
24	D	257	268	288	289	315	303	291	295	289	292	297	291	281	275	279	289	295	296	298	296	289	287	283	282	289
25		283	286	283	283	286	288	287	287	286	284	282	279	273	271	278	289	293	299	291	289	288	283	285	281	285
26		281	280	281	287	288	290	281	287	283	287	288	283	282	281	287	296	302	303	297	295	291	288	287	283	288
27		281	282	283	281	290	289	289	287	284	288	279	279	279	274	283	290	297	300	295	303	303	312	327	311	291
28	D	310	305	297	295	300	293	291	298	296	290	295	286	279	276	282	289	301	315	325	328	326	339	327	312	302
29		310	293	288	289	287	289	295	296	298	303	298	293	287	283	295	305	303	299	296	291	292	296	295	307	295
30		297	275	256	240	290	312	304	305	299	297	296	293	288	281	287	298	304	302	304	299	297	296	295	291	292
31	Q	289	289	289	288	289	289	291	291	294	291	288	287	283	280	286	291	297	295	291	289	289	288	289	289	289
MEAN	A	287	282	280	281	286	283	278	279	280	283	282	283	278	276	282	290	295	297	297	296	293	292	293	290	286
MEAN	Q	285	285	285	285	286	286	287	288	287	285	283	281	277	273	278	285	290	292	292	291	288	287	286	285	285
MEAN	D	291	271	274	279	294	267	240	251	264	286	284	295	285	284	293	298	304	309	313	315	309	308	309	294	288

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY-ALL DAYS

TABLE 37 ST JCHN S H = 17000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEE	MAR	APR	MAY	JUN	JLL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	563	574	563	583	602	620	618	620	631	637	638	639	607	615	603	603
1-2	563	574	568	580	600	615	615	618	630	635	636	636	606	612	603	602
2-3	561	573	564	576	600	610	612	615	629	633	634	636	604	609	600	601
3-4	561	573	561	574	600	607	612	606	628	634	631	635	602	606	599	600
4-5	560	572	564	570	598	606	602	593	624	632	627	635	599	600	598	599
5-6	561	572	565	570	596	605	594	591	624	635	631	634	598	596	598	600
6-7	562	573	566	575	595	606	573	604	625	635	634	632	598	594	600	600
7-8	565	573	564	576	594	606	589	599	625	636	634	622	599	597	600	599
8-9	567	574	566	576	594	604	595	603	626	638	632	631	601	599	602	601
9-10	568	573	566	571	590	600	595	600	623	641	633	641	600	596	600	604
10-11	565	570	561	565	582	593	588	589	614	635	630	638	594	588	594	601
11-12	559	563	556	558	572	584	580	580	604	623	624	636	587	579	585	596
12-13	552	554	548	543	560	572	575	572	591	609	616	629	577	570	573	588
13-14	544	548	534	535	553	570	568	568	583	600	607	622	569	565	563	580
14-15	541	545	516	541	557	574	575	573	584	599	604	619	569	570	560	577
15-16	544	546	526	550	567	584	588	584	592	604	607	621	576	581	568	580
16-17	550	551	539	567	583	601	604	600	606	615	615	625	588	597	582	585
17-18	557	558	556	584	600	620	622	620	624	629	625	632	602	615	598	593
18-19	561	565	572	595	609	633	632	635	635	641	630	636	612	627	611	598
19-20	565	570	586	601	617	640	634	635	639	642	635	640	617	632	617	602
20-21	566	572	587	606	619	639	640	631	637	643	638	642	618	632	618	605
21-22	566	575	585	597	616	634	640	632	635	644	639	641	617	630	615	605
22-23	566	575	579	590	610	627	634	630	633	641	639	640	614	625	611	605
23-24	565	574	569	584	607	621	628	624	631	640	639	638	610	620	606	604
MEANS	560	567	561	574	592	607	605	605	620	630	628	633	598	602	596	597

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION-ALL DAYS

TABLE 38 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	13.9	16.0	16.8	17.4	17.8	16.2	18.2	16.8	16.9	18.6	19.9	22.1	17.5	17.2	17.4	18.0
1-2	13.6	16.3	16.6	17.5	17.6	16.4	17.9	17.7	16.9	18.8	20.7	22.7	17.7	17.4	17.4	18.3
2-3	13.9	16.3	16.4	18.2	17.6	16.7	18.1	17.1	17.0	19.2	20.2	22.8	17.8	17.4	17.7	18.3
3-4	13.6	16.4	17.0	18.2	17.3	16.9	18.3	18.3	17.3	19.3	20.4	22.8	18.0	17.7	18.0	18.3
4-5	13.4	15.7	17.4	17.9	17.4	16.7	17.5	18.8	18.1	19.4	20.1	22.1	17.9	17.6	18.2	17.8
5-6	13.7	16.1	17.3	18.6	18.0	17.3	17.7	18.4	18.5	19.3	20.2	21.3	18.0	17.9	18.4	17.8
6-7	13.8	16.6	17.6	18.8	18.1	17.7	17.7	17.4	19.4	19.9	20.6	22.4	18.3	17.7	18.9	18.3
7-8	13.9	16.8	17.1	19.6	18.9	17.7	18.7	19.0	19.1	19.4	20.3	22.4	18.6	18.6	18.8	18.3
8-9	13.8	17.1	17.1	19.5	20.7	19.7	19.5	20.0	18.7	19.1	19.5	22.0	18.9	20.0	18.6	18.1
9-10	13.8	17.2	16.7	20.0	22.6	22.1	22.0	21.4	19.7	19.4	19.0	21.9	19.7	22.0	19.0	18.0
10-11	13.6	16.8	16.5	20.4	23.5	23.4	23.2	23.1	20.9	20.4	19.0	22.3	20.3	23.3	19.6	17.9
11-12	13.8	16.5	17.4	21.0	23.8	23.6	23.0	23.2	20.9	21.2	20.4	23.0	20.7	23.4	20.1	18.4
12-13	13.1	16.6	18.3	19.8	22.4	22.3	22.6	21.9	19.8	20.8	20.7	23.6	20.1	22.3	19.7	18.5
13-14	11.4	14.9	17.4	16.5	18.7	18.9	19.6	18.6	17.2	18.3	19.5	22.2	17.8	19.0	17.3	17.0
14-15	9.8	12.9	15.1	13.4	14.1	15.2	16.1	14.7	14.0	15.3	17.2	19.7	14.8	15.0	14.5	14.9
15-16	8.5	11.2	11.3	11.0	10.9	12.0	12.9	11.2	11.2	12.6	15.3	17.8	12.2	11.7	11.5	13.2
16-17	7.8	10.1	8.8	9.4	9.1	9.2	10.6	9.3	10.0	11.3	14.0	16.6	10.5	9.6	9.9	12.1
17-18	8.3	10.1	8.2	9.7	9.2	8.9	10.1	9.8	10.5	11.5	14.0	16.6	10.6	9.5	10.0	12.3
18-19	9.7	11.5	9.0	11.5	11.2	9.8	10.9	11.6	12.5	12.4	15.2	17.4	11.9	10.9	11.3	13.4
19-20	10.8	13.2	11.2	13.8	13.7	11.1	12.4	13.7	14.6	14.1	16.7	18.3	13.6	12.7	13.4	14.7
20-21	11.5	14.3	12.1	15.6	15.8	13.7	14.3	15.6	16.2	15.1	18.0	19.2	15.1	14.8	14.7	15.7
21-22	12.1	15.2	13.6	16.9	17.2	15.5	15.9	16.7	16.6	15.4	18.6	19.7	16.1	16.3	15.6	16.4
22-23	12.9	15.5	15.4	17.5	17.4	16.1	16.9	17.1	17.1	17.4	18.7	20.4	16.9	16.9	16.8	16.9
23-24	13.8	16.0	16.3	17.4	17.8	16.2	17.3	17.6	17.1	18.1	19.3	21.5	17.4	17.2	17.2	17.7
MEANS	12.3	15.0	15.0	16.6	17.1	16.4	17.1	17.0	16.7	17.3	18.6	20.9	16.7	16.9	16.4	16.7

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY-ALL DAYS

TABLE 39 ST JOHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	284	289	296	291	286	289	277	287	285	284	292	287	287	285	289	288
1-2	284	288	295	285	285	281	281	283	278	281	282	282	284	283	285	284
2-3	282	286	279	284	284	278	273	278	277	275	283	280	280	278	279	283
3-4	283	285	276	278	282	270	266	266	275	275	278	281	276	271	276	282
4-5	283	285	280	279	278	273	256	261	272	269	280	286	275	267	275	284
5-6	284	285	283	277	278	268	246	266	269	276	283	283	275	264	277	284
6-7	284	285	283	278	282	272	248	271	272	272	284	278	276	268	276	283
7-8	282	285	279	279	282	275	257	270	273	273	284	279	277	271	276	283
8-9	280	284	278	281	283	268	263	277	272	274	277	280	276	273	277	280
9-10	281	284	280	278	277	267	264	278	273	278	277	283	277	272	277	281
10-11	282	283	280	277	273	267	270	273	270	277	280	282	276	270	276	282
11-12	279	281	279	277	270	269	270	274	269	273	279	283	275	271	275	280
12-13	277	276	279	279	272	268	277	281	273	272	279	278	276	275	275	278
13-14	279	277	280	287	282	281	283	291	280	275	280	276	281	284	280	278
14-15	284	280	280	297	295	294	297	300	290	280	290	282	289	297	287	284
15-16	288	288	296	308	304	306	308	311	300	289	299	290	299	307	298	292
16-17	292	295	309	319	311	313	313	319	308	297	305	295	306	314	308	297
17-18	295	299	316	323	315	316	316	326	313	304	306	297	311	318	314	299
18-19	293	298	322	323	312	316	316	327	310	311	305	297	311	318	317	298
19-20	290	295	320	318	309	314	314	316	306	310	302	296	307	313	313	296
20-21	288	293	305	311	306	308	312	307	299	306	299	293	302	308	305	293
21-22	288	292	311	306	301	302	310	304	297	306	296	292	300	304	305	292
22-23	287	291	302	304	298	299	304	301	293	295	296	293	297	301	298	292
23-24	285	291	298	296	293	294	292	295	289	289	294	290	292	293	293	290
MEANS	285	287	292	293	290	287	284	290	285	285	289	286	288	288	289	287

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY-QUIET DAYS

TABLE 40 ST JOHN S H = 17000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	567	577	582	595	604	621	619	619	633	647	647	644	613	616	614	609
1-2	567	576	581	597	602	618	613	618	633	647	645	645	612	613	615	608
2-3	566	576	580	591	601	615	614	619	634	646	644	644	611	612	613	608
3-4	565	575	579	590	601	616	628	617	633	646	643	644	611	616	612	607
4-5	565	575	579	588	601	613	614	616	631	646	643	643	610	611	611	607
5-6	565	575	578	589	599	611	612	615	629	646	644	644	609	609	610	607
6-7	565	576	578	589	597	611	613	614	630	647	644	645	609	609	611	607
7-8	568	576	578	591	597	611	611	614	631	647	643	646	609	608	612	608
8-9	568	576	578	590	598	609	609	612	627	647	643	647	609	607	610	609
9-10	567	573	577	587	596	605	603	607	625	646	643	648	607	603	609	608
10-11	564	567	573	580	586	595	598	595	615	640	640	645	600	594	602	604
11-12	559	559	563	568	573	587	594	583	604	630	635	640	591	584	591	598
12-13	552	549	553	554	561	578	586	577	593	616	627	632	581	576	579	590
13-14	545	544	543	545	553	572	581	574	586	605	620	625	574	570	570	583
14-15	539	543	539	548	556	577	583	577	587	603	616	621	574	573	569	580
15-16	544	545	545	559	566	585	595	589	594	609	616	623	581	584	577	582
16-17	551	550	550	574	582	600	608	605	609	620	621	626	591	599	588	587
17-18	560	559	562	592	594	618	626	620	624	632	630	631	604	615	602	595
18-19	566	568	574	598	608	627	632	631	636	643	639	638	613	624	613	602
19-20	568	570	583	598	617	632	635	633	638	648	645	644	618	629	617	607
20-21	571	574	586	600	618	633	635	631	640	651	650	646	619	629	619	610
21-22	570	577	585	597	618	630	627	626	639	652	650	646	618	625	618	611
22-23	569	577	586	598	616	626	629	624	638	653	650	647	618	624	619	611
23-24	569	579	587	599	611	623	624	624	635	652	649	647	617	621	618	611
MEANS	562	567	572	584	594	609	612	610	623	638	639	640	604	606	604	602

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION-QUIET DAYS

TABLE 41 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	14.0	15.1	15.1	17.3	16.2	15.9	16.9	17.3	16.0	17.9	19.8	21.7	16.9	16.6	16.6	17.7
1-2	13.6	15.1	15.4	17.9	16.5	16.3	16.5	16.9	16.3	17.7	19.8	21.7	17.0	16.5	16.8	17.5
2-3	13.3	14.9	16.2	17.7	16.7	16.1	16.8	17.4	16.4	17.8	19.7	21.4	17.0	16.7	17.0	17.3
3-4	13.0	14.8	16.9	17.8	16.6	16.7	17.4	17.9	16.8	18.1	19.7	21.4	17.2	17.1	17.4	17.2
4-5	12.9	14.4	16.8	18.1	16.7	16.7	17.9	18.2	16.7	18.1	20.0	21.2	17.3	17.4	17.4	17.1
5-6	12.9	14.5	17.0	18.4	16.9	17.1	17.8	18.2	17.5	18.3	20.2	21.0	17.5	17.5	17.8	17.1
6-7	13.2	14.6	17.1	18.7	17.2	17.8	18.1	18.2	18.7	18.8	20.2	21.1	17.8	17.8	18.3	17.3
7-8	13.3	14.8	17.2	18.9	17.8	18.5	18.9	18.6	19.1	18.6	20.6	21.6	18.2	18.5	18.5	17.6
8-9	13.1	15.2	17.8	19.8	19.4	20.6	20.2	19.9	18.7	18.9	20.9	21.8	18.9	20.0	18.8	17.7
9-10	13.2	15.5	18.4	21.3	22.1	22.8	21.7	21.9	19.7	19.2	21.3	21.9	19.9	22.1	19.6	18.0
10-11	13.2	15.7	19.1	22.7	24.1	24.2	23.5	23.6	21.2	20.6	21.7	22.3	21.0	23.9	20.9	18.2
11-12	13.3	16.0	20.1	23.5	24.3	24.7	23.8	24.0	21.7	22.3	22.4	23.1	21.6	24.2	21.9	18.7
12-13	12.8	15.9	19.9	21.9	23.1	23.7	22.8	22.7	20.9	23.1	22.5	23.5	21.1	23.1	21.5	18.7
13-14	11.4	14.5	18.4	18.8	20.2	21.3	20.5	19.6	18.7	21.3	21.3	22.3	19.0	20.4	19.3	17.4
14-15	9.5	12.6	15.8	15.1	15.5	17.5	16.7	15.8	15.7	17.6	19.0	19.7	15.9	16.4	16.0	15.2
15-16	7.7	10.6	12.6	12.4	10.9	13.8	12.8	12.1	13.0	14.4	17.1	18.0	12.9	12.4	13.1	13.3
16-17	7.2	10.0	10.4	10.4	8.2	10.1	10.1	10.5	11.3	12.4	15.9	17.2	11.2	9.8	11.1	12.6
17-18	8.3	10.3	9.9	10.5	8.6	9.0	10.3	10.5	11.9	12.2	15.8	17.3	11.2	9.6	11.1	12.9
18-19	10.0	11.2	11.3	12.4	10.9	9.7	11.3	12.0	13.5	13.4	16.5	18.1	12.5	11.0	12.6	14.0
19-20	11.2	12.5	13.7	14.7	13.4	11.2	12.9	14.2	15.3	15.4	17.5	19.2	14.3	12.9	14.8	15.1
20-21	11.6	13.0	15.6	16.5	15.9	13.9	14.5	16.0	16.5	16.7	18.5	20.2	15.7	15.1	16.3	15.8
21-22	11.9	13.4	16.0	17.3	17.5	16.1	15.8	17.4	16.3	16.8	19.0	20.6	16.5	16.7	16.6	16.2
22-23	12.3	13.7	16.1	17.2	17.7	16.4	16.6	17.5	16.4	17.0	19.5	21.0	16.8	17.0	16.7	16.6
23-24	12.4	14.1	16.2	16.8	17.8	16.2	17.3	16.8	16.0	17.1	19.9	21.4	16.8	17.0	16.5	16.9
MEANS	11.9	13.9	15.9	17.3	16.8	16.9	17.1	17.4	16.8	17.6	19.5	20.8	16.8	17.1	16.9	16.5

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY-QUIET DAYS

TABLE 42 ST JCHN S Z = 50500 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	285	288	289	293	289	292	287	289	287	281	288	285	288	289	288	287
1-2	285	286	288	290	286	289	286	289	286	283	286	285	287	288	287	285
2-3	283	284	287	288	284	283	285	286	286	282	286	285	285	285	286	285
3-4	283	284	286	288	283	282	281	282	285	281	286	285	284	282	285	285
4-5	283	284	288	289	280	279	281	283	283	281	286	286	284	281	285	285
5-6	284	284	290	288	279	281	284	286	279	281	287	286	284	282	284	285
6-7	284	287	291	288	280	282	287	288	282	279	288	287	285	284	285	287
7-8	284	289	291	289	282	285	286	289	280	280	291	288	286	286	285	288
8-9	284	289	290	286	285	282	284	289	285	280	289	287	286	285	285	287
9-10	284	288	289	285	282	282	280	288	283	280	289	285	285	283	284	286
10-11	285	286	286	280	279	279	277	280	278	277	286	283	281	279	280	285
11-12	283	284	281	277	275	277	278	278	276	273	283	281	279	277	277	283
12-13	280	281	278	280	273	276	278	281	276	270	278	277	277	277	276	279
13-14	281	283	280	285	276	283	283	287	281	270	277	273	280	282	279	278
14-15	285	286	284	290	284	296	293	298	289	275	281	278	287	292	285	283
15-16	289	293	289	300	294	305	302	305	300	284	286	285	294	302	293	288
16-17	291	296	294	307	299	310	305	309	306	293	293	290	299	306	300	292
17-18	292	298	301	313	300	309	305	311	308	295	296	292	302	306	304	295
18-19	288	298	301	310	299	306	302	310	306	294	298	292	300	304	303	294
19-20	284	294	299	301	297	302	301	304	297	288	296	291	296	301	297	291
20-21	283	292	294	295	294	297	300	300	295	286	293	288	293	298	293	289
21-22	284	292	292	293	293	291	296	296	291	283	290	287	291	294	290	288
22-23	285	291	291	294	292	292	296	293	291	282	288	286	290	293	290	288
23-24	286	290	289	297	289	291	292	294	289	281	287	285	289	291	289	287
MEANS	285	289	290	292	286	290	290	292	288	282	288	285	288	289	288	287

MEAN VALUES OF MAGNETIC ELEMENTS

HCRIZCNTAL INTENSITY-DISTURBED DAYS

TABLE 43 ST JCHN S H = 17000 PLUS TABULAR VALUES IN GAMMAS 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	552	571	518	566	606	622	615	616	626	609	629	629	597	615	580	596
1-2	555	573	537	559	601	597	622	608	624	602	627	621	594	607	581	594
2-3	551	569	515	556	600	599	616	597	622	599	617	621	589	603	573	590
3-4	552	570	508	550	606	586	606	547	622	609	603	619	582	586	572	586
4-5	549	565	530	538	602	590	568	471	621	613	586	618	571	558	576	580
5-6	552	566	538	539	597	588	535	460	617	620	608	606	569	545	578	583
6-7	553	569	537	567	597	596	427	537	619	621	619	588	569	539	586	582
7-8	559	571	524	570	593	597	507	517	617	622	616	517	567	553	583	566
8-9	567	572	531	563	592	585	550	552	628	625	598	570	578	570	587	577
9-10	574	570	534	549	583	572	552	555	625	635	598	619	580	566	585	590
10-11	566	568	526	531	569	573	547	536	611	630	595	614	572	557	574	586
11-12	556	561	536	537	557	564	537	541	604	608	594	621	568	550	571	583
12-13	544	558	532	522	544	551	544	544	585	595	596	612	561	546	558	577
13-14	537	552	511	509	538	558	529	548	571	587	579	604	552	543	545	568
14-15	530	552	442	526	551	562	549	563	575	587	574	605	551	556	533	565
15-16	529	550	492	540	562	571	573	574	590	585	590	605	563	570	552	568
16-17	535	550	531	579	579	597	594	596	603	596	597	609	580	592	577	573
17-18	547	556	562	604	597	616	615	641	627	615	610	614	600	617	602	582
18-19	554	561	593	616	600	621	637	654	637	649	614	616	613	628	624	586
19-20	556	565	638	626	621	633	636	641	643	639	616	620	620	633	637	589
20-21	555	567	635	655	630	642	656	618	633	633	616	623	622	636	639	590
21-22	558	574	627	614	623	640	672	620	632	627	620	625	619	639	625	594
22-23	556	573	591	583	613	630	645	619	625	612	623	623	608	627	603	594
23-24	550	569	536	555	605	621	624	611	623	609	622	622	596	615	581	591
MEANS	551	565	543	565	590	596	582	574	616	614	606	609	584	585	584	583

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION-DISTURBED DAYS

TABLE 44 ST JOHN S D = 333.0 DEGREES EAST PLUS TABULAR VALUES IN MINUTES 1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	14.0	17.5	16.4	18.9	21.1	16.1	20.3	18.1	17.7	19.3	20.9	22.5	18.6	18.9	18.1	18.7
1-2	13.6	18.3	17.4	17.7	20.9	16.6	19.7	21.0	16.9	21.2	23.7	23.9	19.2	19.6	18.3	19.9
2-3	14.2	18.4	14.0	19.5	19.6	18.0	18.4	15.8	17.5	23.1	21.5	25.7	18.8	18.0	18.5	20.0
3-4	14.5	19.1	18.2	17.8	18.8	18.8	19.2	20.8	17.8	21.3	21.7	25.9	19.5	19.4	18.8	20.3
4-5	13.7	18.1	19.5	18.1	18.7	18.8	15.3	23.0	19.5	19.6	20.6	23.7	19.1	19.0	19.2	19.0
5-6	15.1	18.8	18.2	20.6	19.2	21.5	20.0	24.0	19.4	18.3	22.1	21.1	19.9	21.2	19.1	19.3
6-7	14.6	19.3	19.3	20.4	20.0	20.9	13.9	14.8	21.2	19.9	22.0	26.7	19.4	17.4	20.2	20.7
7-8	14.3	19.3	15.1	20.3	20.9	19.8	16.7	20.3	18.5	19.1	19.7	25.0	19.1	19.4	18.3	19.6
8-9	14.1	19.2	13.8	19.5	24.7	20.6	17.3	19.3	17.9	17.3	13.7	23.5	18.4	20.5	17.1	17.6
9-10	14.3	19.0	13.3	17.7	27.1	21.5	20.2	17.5	19.7	17.3	11.1	22.5	18.4	21.6	17.0	16.7
10-11	13.3	18.2	10.5	15.9	24.3	21.8	20.0	19.5	19.2	20.0	11.5	22.3	18.0	21.4	16.4	16.3
11-12	12.8	16.4	11.4	17.0	25.0	21.3	18.4	17.5	17.3	19.7	16.4	22.2	18.0	20.5	16.4	17.0
12-13	10.9	16.3	15.9	16.0	24.5	20.0	20.1	19.3	16.6	17.7	18.0	23.1	18.2	21.0	16.5	17.1
13-14	8.8	14.2	16.8	13.0	19.6	15.3	15.6	15.8	13.7	14.5	18.3	21.2	15.6	16.6	14.5	15.6
14-15	7.9	12.4	16.5	11.0	14.5	13.2	13.9	13.3	10.7	12.9	16.5	18.7	13.5	13.7	12.8	13.9
15-16	6.8	11.0	9.9	10.6	12.7	9.6	12.0	9.7	8.4	10.8	15.1	16.9	11.1	11.0	9.9	12.5
16-17	6.3	9.0	6.5	10.8	11.2	7.9	10.0	8.5	8.1	9.6	13.7	15.3	9.8	9.4	8.8	11.1
17-18	6.3	8.5	6.1	11.1	10.9	8.6	9.9	9.8	9.8	10.5	13.8	14.9	10.0	9.8	9.4	10.9
18-19	8.3	10.0	6.4	12.9	12.7	9.2	11.1	11.1	12.2	10.3	15.2	15.4	11.2	11.0	10.5	12.2
19-20	9.8	12.5	9.8	15.0	15.1	9.6	12.7	12.2	14.2	12.7	17.2	16.3	13.1	12.4	12.9	13.9
20-21	11.2	14.6	4.0	16.2	17.0	12.2	14.3	13.9	16.8	12.4	19.5	17.6	14.1	14.3	12.3	15.7
21-22	11.1	16.5	6.5	17.4	17.9	13.4	15.6	15.1	17.2	14.2	19.8	18.3	15.2	15.5	13.8	16.4
22-23	13.3	15.8	13.3	17.9	18.1	14.5	17.0	16.8	18.0	19.9	19.2	19.8	17.0	16.6	17.3	17.0
23-24	15.1	17.7	18.1	16.5	17.7	14.8	17.6	19.2	18.8	19.8	20.8	21.9	18.2	17.3	18.3	18.9
MEANS	11.8	15.8	13.2	16.3	18.8	16.0	16.2	16.5	16.1	16.7	18.0	21.0	16.4	16.9	15.6	16.7

MEAN VALLES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY-DISTURBED DAYS

TABLE 45 ST JCHN S   Z = 50500 PLUS TABULAR VALUES IN GAMMAS   1970

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0-1	283	290	291	282	279	292	270	283	283	291	288	291	285	281	287	288
1-2	288	285	292	255	279	271	298	266	270	279	258	271	276	278	274	276
2-3	282	283	231	270	283	273	271	254	272	255	265	274	268	270	257	276
3-4	278	282	220	249	278	235	244	194	275	270	244	279	254	238	253	271
4-5	276	284	241	251	268	248	203	165	274	251	249	294	250	221	254	276
5-6	279	285	261	244	272	247	170	181	260	277	267	267	251	217	261	275
6-7	284	285	251	262	275	250	184	218	257	260	263	240	253	232	257	268
7-8	276	283	237	268	265	248	199	195	251	265	254	251	249	227	255	266
8-9	262	282	237	269	272	225	216	251	242	266	227	264	251	241	253	259
9-10	273	282	247	270	274	234	222	254	254	282	236	286	260	246	263	269
10-11	280	281	257	263	268	243	244	242	257	280	258	284	263	249	264	276
11-12	275	280	264	273	258	252	244	266	257	277	261	295	267	255	268	278
12-13	276	276	274	275	263	240	269	292	263	284	285	285	273	266	274	281
13-14	281	277	274	287	287	275	274	316	274	287	288	284	284	288	280	282
14-15	285	278	249	308	308	294	297	319	290	289	323	293	294	304	284	295
15-16	291	289	302	332	311	315	315	341	307	300	334	298	311	320	310	303
16-17	299	296	341	359	322	326	325	349	317	317	332	304	324	330	334	308
17-18	311	307	343	363	322	334	329	374	325	339	330	309	332	340	342	314
18-19	307	302	370	362	316	333	338	379	325	369	324	313	337	341	357	312
19-20	299	302	361	351	324	332	346	343	327	352	320	315	331	337	348	309
20-21	298	295	292	325	332	328	355	316	320	341	312	309	319	333	320	304
21-22	300	294	345	306	326	322	359	315	321	345	308	308	321	330	329	303
22-23	293	294	307	309	317	313	323	315	305	300	305	309	308	317	305	300
23-24	288	290	292	277	306	303	284	298	293	301	296	294	294	298	291	292
MEANS	286	287	282	292	292	281	274	280	284	295	285	288	286	282	288	287

THREE-HOUR RANGE INDICES, ST. JOHN'S, 1970

Table 46

	January D	January H	January K	February D	February H	February K
1	0210 2212	0110 1222	0210 2222	2100 1012	2100 0013	2100 1013
2	2343 3233	2343 3333	2343 3333	2322 2245	1312 2133	2322 2245
3	2232 1102	2112 1002	2232 1102	2212 1000	2211 0001	2212 1001
4	0010 1101	0001 0102	0011 1102	0112 2122	1111 2222	1112 2222
5	1011 0113	1011 1111	1011 1113	2311 2203	2210 2112	2311 2213
6	1001 1110	1001 1110	1001 1110	0110 0000	0100 0010	0110 0010
7	1100 0111	1100 0121	1100 0121	0000 0000	0000 0000	0000 0000
8	2110 1221	2101 1321	2111 1321	0000 1110	0000 0110	0000 1110
9	3121 1012	3120 1011	3121 1012	0121 1100	0100 0000	0121 1100
10	3000 1100	3000 1110	3000 1110	0110 1210	0011 1110	0111 1210
11	1010 1001	0001 1002	1011 1002	0000 0100	0001 0100	0001 0100
12	4111 0111	3101 0111	4111 0111	0001 1100	0000 1111	0001 1111
13	1000 2100	1111 1111	1111 2111	0201 2110	0211 1121	0211 2121
14	0200 0002	1300 0011	1300 0012	2213 2210	1312 1211	2313 2211
15	2210 0110	2210 0101	2210 0111	1322 1110	1121 1121	1322 1121
16	3223 2223	3133 2123	3233 2223	0021 1100	0011 0101	0021 1101
17	2421 0110	2422 1110	2422 1110	0002 2232	1001 1232	1002 2232
18	3121 0210	2110 0210	3121 0210	1311 1112	1211 1122	1311 1122
19	0001 1102	0000 1112	0001 1112	2011 1100	1001 1111	2011 1111
20	1102 2121	1101 2121	1102 2121	0000 1100	0000 1101	0000 1101
21	1122 2112	0012 2011	1122 2112	0001 0010	0000 0111	0001 0111
22	2100 1110	1100 0011	2100 1111	0001 0100	0001 0100	0001 0100
23	2211 2002	1101 0001	2211 2002	0000 0010	0000 0031	0000 0031
24	2022 1112	2012 1111	2022 1112	0221 2330	1211 1430	1221 2430
25	1100 0100	0000 0000	1100 0100	1010 1110	1111 0110	1111 1110
26	1100 0100	1100 0000	1100 0100	1222 3120	1111 2200	1222 3220
27	1101 1101	1000 0011	1101 1111	0111 2123	0010 1122	0111 2123
28	1001 0122	1001 0122	1001 0122	4121 2220	3111 1222	4121 2222
29	1021 2001	1021 1011	1021 2011			
30	1131 1332	2131 1332	2131 1332			
31	2101 1110	2101 1110	2101 1110			

	March D	March H	March Z	April D	April H	April Z
1	1244 3221	2233 3221	2244 3221	2201 1001	2200 0002	2201 1002
2	4433 2212	3223 2222	4433 2222	0012 1111	1111 1111	1112 1111
3	1122 2213	1022 2222	1122 2223	2232 2210	2332 2111	2332 2211
4	3222 2224	3223 2213	3223 2224	3122 2100	2122 2211	3122 2211
5	2131 2233	1011 2232	2131 2233	0022 3210	0012 2222	0022 3222
6	5232 2125	5122 2235	5232 2235	2344 2222	2334 2213	2344 2223
7	5434 2334	5323 3444	5434 3444	2133 2100	2132 1210	2133 2210
8	3454 6588	3444 7789	3454 7789	3213 3211	3211 2121	3213 3221
9	5613 3334	6612 3523	6613 3534	1344 4211	1233 3113	1344 4213
10	3012 1110	2001 1110	3012 1110	1001 2101	1001 1111	1001 2111
11	0001 1101	0000 0011	0001 1111	2123 3111	2112 2111	2123 3111
12	1113 2100	1112 2211	1113 2211	0112 1100	0112 1111	0112 1111
13	0023 2110	0012 2121	0023 2121	0012 2100	0001 2210	0012 2210
14	2001 1100	2000 0110	2001 1110	0012 1100	1002 1000	1022 1100
15	2222 1110	2111 1110	2222 1110	0002 2121	1011 1232	1012 2232
16	0001 1100	0001 1010	0011 1110	3321 1133	3322 1244	3322 1244
17	0011 2210	0001 2111	0011 2211	6323 2134	5323 3343	6323 3344
18	1001 1112	1001 1211	1001 1212	0013 5223	1012 4123	1013 5223
19	0011 1101	1001 1121	1011 1121	3453 2211	3344 2211	3454 2211
20	0001 2111	0000 1111	0001 2111	1413 4222	1303 4333	1413 4333
21	1100 1100	1100 0000	1100 1100	3344 4398	3355 4697	3355 4698
22	0011 1000	0001 1100	0011 1100	5632 3110	5633 2111	5633 3111
23	0012 1110	1101 1111	1112 1111	3122 3123	2122 3232	3122 3233
24	0000 0100	0000 0021	0000 0121	2432 2112	2321 2232	2432 2232
25	0011 1100	0000 1110	0011 1110	3322 3223	3323 2243	3323 3243
26	2111 0110	1100 0110	2111 0110	4221 2123	3211 2132	4221 2133
27	0034 3223	0023 2223	0034 3223	3332 1101	2221 1122	3332 1122
28	3423 2123	3323 2222	3423 2223	2110 1000	3110 0110	3110 1110
29	3331 2223	3331 1233	3331 2233	2101 1111	1111 1132	2111 1132
30	3132 2221	2122 2222	3132 2222	3333 2212	3223 2222	3333 2222
31	1355 5435	1354 5544	1355 5545			

THREE-HOUR RANGE INDICES, ST. JOHN'S, 1970

Table 46

May	D	H	Z	D	H	Z
						June
1	1131 3112	1121 2234	1131 3234	2324 4222	1533 4223	2534 4223
2	3222 2112	1122 1232	3222 2232	2321 3222	3211 2222	3321 3222
3	1012 3123	1111 2233	1112 3233	1322 2221	1211 2223	1322 2223
4	2011 3211	1011 2221	2011 3221	3222 2211	2121 1222	3222 2222
5	1113 3222	1113 2223	1113 3223	2322 1111	1322 1111	2322 1111
6	1000 1221	1000 1221	1000 1221	1221 0000	1111 0000	1221 0000
7	1112 2220	2102 1321	2112 2321	0211 1213	0110 1233	0211 1233
8	0001 1110	0000 1121	0001 1121	3322 1111	3322 1122	3322 1122
9	1000 1100	2100 0110	2100 1110	1011 1111	1000 1122	1011 1122
10	0111 0000	0000 1000	0111 1000	2032 2211	1011 2222	2032 2222
11	0001 0102	0000 0012	0001 0112	2021 0110	2000 0211	2021 0211
12	1223 3223	3113 2344	3223 3344	1112 0111	2111 1022	2112 1122
13	3212 1001	2211 1122	3212 1122	0122 3201	1123 2222	1123 3222
14	3232 2124	3122 2233	3232 2234	1211 1111	2111 1132	2211 1132
15	4123 1111	4112 1212	4123 1212	2332 3212	3232 3223	3332 3223
16	1112 2111	1111 1221	1112 2221	2222 3112	2211 2223	2222 3223
17	2423 2101	1322 2111	2423 2111	1033 3223	1023 2234	1033 3234
18	2222 1100	1111 1111	2222 1111	2233 3224	2223 3324	2233 3324
19	0132 1101	0112 1122	0132 1122	1221 1112	2220 1222	2221 1222
20	2222 3122	2312 2232	2322 3232	3332 2232	2332 1233	3332 2233
21	2012 1122	1111 1231	2112 1232	5322 2101	4332 2312	5332 2312
22	2122 1111	2111 2122	2122 2122	1012 1211	1011 1122	1012 1222
23	0022 1112	1111 1223	1122 1223	1011 1101	2101 0211	2111 1211
24	1012 3102	2112 1121	2112 3122	2011 2210	1000 1132	2011 2232
25	2332 1100	2111 1111	2332 1111	2122 1111	2111 1113	2122 1113
26	0000 0001	0000 0102	0000 0102	1232 3221	1222 2333	1232 3333
27	0222 3223	2123 2233	2223 3233	3444 5221	1254 4331	3454 5331
28	4315 5222	4224 4232	4325 5232	2322 2111	3212 1121	3322 2121
29	3352 2121	2331 2231	3352 2231	0231 2221	0111 1122	0231 2222
30	2333 2220	1122 2311	2333 2321	0032 1211	0121 1221	0132 1221
31	0011 2101	0112 2211	0112 2211			

July	D	H	Z	D	H	Z
						August
1	2233 3221	2121 3221	2233 3221	2111 0101	1101 0111	2111 0111
2	1143 3211	1243 2211	1243 3211	2112 2100	2212 1111	2212 2111
3	2343 2114	2333 1124	2343 2124	0112 2010	1112 1010	1112 2010
4	5452 2111	5552 1111	5552 2111	0012 0101	0010 0120	0012 0121
5	1432 3211	2521 1223	2532 3223	0101 1000	0100 0011	0101 1011
6	4244 3110	3233 3121	4244 3121	0012 1112	0111 1232	0112 1232
7	0012 1112	0011 0222	0012 1222	1111 1213	1011 1234	1111 1234
8	1211 1112	1122 1124	1222 1124	3345 3124	2235 2333	3345 3334
9	3643 5335	2753 5456	3753 5456	5223 2121	5212 2232	5223 2232
10	5212 2332	5211 2443	5212 2443	2212 2111	2222 1221	2222 2221
11	3122 3223	3112 1233	3122 3233	2312 3113	2112 2122	2312 3123
12	3223 3222	2212 2332	3223 3332	2313 1122	2212 0133	2313 1133
13	2322 2211	2212 1232	2322 2232	1122 2112	1110 1123	1122 2123
14	3223 2222	2221 1222	3223 2222	1221 2211	1210 1311	1221 2311
15	1112 2101	1111 1121	1112 2121	1112 2112	1110 1133	1112 2133
16	2111 1110	2101 1121	2111 1121	2111 1115	2100 1116	2111 1116
17	1011 2113	1111 1132	1111 2133	5775 4344	5985 4663	5985 4663
18	1212 1201	0112 1222	1212 1222	5433 3322	5423 3333	5433 3333
19	1111 1111	1201 1222	1211 1222	5323 3210	5212 2211	5323 3211
20	0111 1112	1101 0122	1111 1122	0022 1111	0021 1222	0022 1222
21	3334 4233	3224 4333	3334 4333	2211 1100	1110 1111	2211 1111
22	3223 1113	2222 1223	3223 1223	0112 2101	0111 1221	0112 2221
23	3232 2111	2111 2221	3232 2221	1331 2101	1221 2122	1331 2122
24	2332 3223	3342 3323	3342 3323	0212 0101	1100 0010	1212 0111
25	4765 4224	5975 5335	5975 5335	1232 2112	0112 2123	1232 2123
26	5333 2204	5443 2224	5443 2224	3333 3212	1432 2233	3433 3233
27	1323 3232	1312 2232	1323 3232	3332 2211	2311 2222	3332 2222
28	1011 1111	1001 1112	1011 1112	0231 2212	1211 2133	1231 2233
29	3443 5320	3453 5542	3453 5542	1432 1100	2322 1110	2432 1110
30	0322 2112	1212 1112	1322 2112	2221 0100	2111 0011	2221 0111
31	2332 2223	2221 2234	2332 2234	0232 3221	1232 2332	1232 3332

THREE-HOUR RANGE INDICES, ST. JOHN'S, 1970

Table 46

	September D	September H	September Z	October D	October H	October Z
1	0034 4232	0034 3343	0034 4343	3212 2113	3101 1132	3212 2133
2	3223 3112	3113 2332	3223 3332	3112 2121	3011 1221	3112 2221
3	0323 2223	0323 2333	0323 2333	2212 2234	2211 1233	2212 2234
4	1123 2221	1112 2232	1123 2232	3443 3212	2433 3231	3443 3232
5	2211 1113	1110 2223	2211 2223	3122 1121	3231 1121	3232 1121
6	0111 1122	0111 1132	0111 1132	1112 1112	2111 1022	2112 1122
7	1001 1111	1011 1122	1011 1122	0012 1000	0011 1111	0012 1111
8	0122 2121	0111 1331	0122 2331	1100 1100	1010 0010	1110 1110
9	0112 1111	0112 1221	0112 1221	0001 2000	0000 1000	0001 2000
10	3111 0100	3200 0100	3211 0100	0221 1123	0121 1113	0221 1123
11	0000 0010	0000 0021	0000 0021	2243 2123	2223 1122	2243 2123
12	0331 1010	1221 0010	1331 1010	3442 2110	3431 1110	3442 2110
13	0333 3223	1323 2333	1333 3333	0322 2211	0221 1221	0322 2221
14	3223 2221	3123 3331	3223 3331	3211 2112	2211 1111	3211 2112
15	5322 2001	3211 1122	5322 2122	2111 2110	1001 1000	2111 2110
16	2222 2010	2112 1111	2222 2111	0113 4342	0004 4452	0114 4452
17	2342 1111	1221 1112	2342 1112	3233 2256	3232 2236	3233 2256
18	2331 2101	1231 1221	2331 2221	4534 2213	5531 1322	5534 2323
19	1333 2123	0322 2332	1333 2333	2232 0121	2221 1121	2232 1121
20	2333 2113	2212 2233	2333 2233	1323 1100	1222 1110	1323 1110
21	3342 3231	2232 3232	3342 3232	0000 1101	0000 0011	0000 1111
22	3412 1112	3211 1212	3412 1212	2232 2235	2222 2234	2232 2235
23	2122 1100	2011 1111	2122 1111	4432 2234	4432 2333	4432 2334
24	2221 2011	2221 1111	2221 2111	3232 1111	2232 1120	3232 1121
25	0333 1110	0322 1121	0333 1121	1212 2110	1221 2210	1222 2210
26	1211 1113	1311 1112	1311 1113	3101 1100	1200 1111	3201 1111
27	3333 2212	2332 2223	3333 2223	0111 2002	0101 1112	0111 2112
28	3102 1110	2101 1121	3101 1121	2231 3113	3221 3122	3231 3133
29	0011 1101	0111 0112	0111 1112	1112 3233	1121 2232	1122 3233
30	1331 1201	1220 1212	1331 1212	3322 1100	3211 1201	3322 1201
31				0112 2110	0201 1110	0212 2110

	November D	November H	November Z	December D	December H	December Z
1	0011 1100	1001 1000	1011 1100	0000 1100	0000 0000	0000 1100
2	0023 2000	0012 1011	0023 2011	0000 1110	0000 1221	0000 1221
3	2211 1112	1211 1112	2211 1112	3011 1101	2011 1101	3011 1101
4	2112 1111	2111 1112	2112 1112	0001 1012	0001 0022	1212 2210
5	3122 2122	2221 1122	3222 2122	1212 2110	1212 1210	2132 2210
6	3333 2111	3221 2111	3333 2111	2132 2210	1121 2110	2132 2210
7	4654 4244	4665 4332	4665 4344	0121 2123	1111 1112	1121 2123
8	4302 1110	2212 1110	4312 1110	4433 2112	3333 3121	4433 3122
9	1112 1122	1201 1122	1212 1122	1112 2100	1112 1010	1112 2110
10	3213 3221	4213 3221	4213 3221	1001 1000	0001 1000	1001 1000
11	4333 1313	3222 2332	4333 2333	0010 1000	0000 0000	0010 1000
12	2221 2210	1122 2210	2222 2210	1102 1001	1001 1101	1102 1101
13	1211 1111	1111 1111	1211 1111	1000 0002	1000 0102	1000 0102
14	2121 1220	2111 1120	2121 1220	2564 3236	2594 3235	2594 3236
15	0001 1110	0001 1111	0001 1111	3332 2111	3221 2111	3332 2111
16	0001 1210	1001 1100	1001 1210	1111 1001	1100 0001	1111 1001
17	2201 1100	1201 1100	2201 1100	1001 1000	1000 1010	1001 1010
18	1101 3214	0101 3224	1101 3224	0110 1001	0000 1002	0110 1002
19	5331 1100	4332 1000	5332 1100	0122 1114	1122 0122	1122 1124
20	0001 1001	0000 0001	0001 1001	1133 2111	1121 1010	1133 2111
21	2255 4311	2234 4321	2255 4321	1111 0000	1011 0000	1111 0000
22	3323 2221	3312 2121	3323 2221	2122 1001	1011 1101	2122 1101
23	3233 2223	3223 2322	3233 2322	3221 1010	1111 1101	3221 1101
24	1221 2231	1222 1231	1222 2231	3321 1211	3311 1121	3321 1221
25	3122 1221	2112 1231	3122 1231	1001 1011	0000 1101	1001 1111
26	2101 1211	1101 1221	2101 1221	0220 1110	1111 0111	1221 1111
27	1122 2112	1111 2122	1122 2122	0112 1213	0101 2212	0112 2213
28	1211 2100	1101 1111	1211 2111	3322 2334	2211 1123	3322 2334
29	0100 0100	0000 0110	0100 0110	2112 1322	2100 1223	2112 1323
30	0000 0000	0000 0000	0000 0000	3301 2210	3311 1211	3311 2211
31				0001 1100	0101 1111	0101 1111

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a three-component aeromagnetic survey of the canadian arctic

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Abstract. A three-component airborne magnetic survey of the Canadian Arctic was carried out in late 1970, at an average altitude of 3.7 km. The survey data are in the form of averages over 30 seconds of time, or approximately 3.5 km of flight track. The International Geomagnetic Reference Field (IGRF) was removed from these data, and the resulting residuals plotted as profiles. A 3rd-degree polynomial was fitted to the survey data by least-squares to determine how well the IGRF represents the average regional field over the area. The polynomial was also used to obtain vector residuals.

Résumé. L'arctique canadien a fait l'objet, à la fin de 1970, d'un levé magnétique aérien à trois composantes, d'une altitude moyenne de 3.7 km. Les données du levé ont la forme de périodes de plus de 30 secondes en moyenne, ou environ 3.5 km de ligne de vol. De ces données on a exclu le Champ de référence géomagnétique international (CRGI) et restitué le reste en profils. Par la méthode des moindres carrés, on a adapté un polynôme du 3^{e} degré aux données du levé pour déterminer le degré de représentation du CRGI, du champ moyen régional de la région. Le polynôme a servi également pour obtenir des résidus de vecteur.

Introduction

In 1970, between October 17 and December 11, a three-component aeromagnetic survey of the Canadian Arctic was carried out by the Earth Physics Branch, Department of Energy, Mines and Resources. An index map of the survey area is shown in Figure 1.

The aircraft used was a DC-6, chartered from Pacific Western Airlines. Approximately 93,000 line-kilometres were flown, of which about 20,000 were ferry and calibration flights. The average flight-line spacing was 74 km (40 nautical miles), and the area covered was 4.2 x 10^6 km^2. Flight altitudes ranged from 2.4 to 5.8 km above sea level, the average being 3.7 km (or 12,000 ft).

The platform, magnetometer, and data-acquisition system

The geomagnetic declination D, horizontal intensity H, and vertical intensity Z are measured by a fluxgate magnetometer with a three-component sensing head. The head is mechanically linked to a gyro-stabilized platform so as to align the H and D sensors in a horizontal plane and to hold the Z sensor axis in alignment with the vertical. Both the sensing head and the platform are pivoted on two gimbal axes that are parallel to the aircraft's roll and pitch axes. The complete assembly, shock mounted to a box-like wooden base, is shown in Figure 2.

In order to measure H and Z with an accuracy of 50 gammas or better, the instrumental system must be capable of finding the direction of the true vertical with an error less than three minutes or arc. This requirement presents a problem when the system is to operate aboard an aircraft in flight and is therefore subjected to other accelerations as well as gravity. Even under flight conditions normally considered to be steady, smooth and level, time-varying accelerations are present which will deflect the apparent vertical (level bubble) by one or two degrees. In a DC-6 aircraft flying straight and level under constant power, these perturbing accelerations vary with periods of 120 seconds or less. Over the duration of several of the longest periods involved, the net effect must of course be nil; in other words the alternating accelerations average out to zero.

Accordingly, the position of the apparent vertical is averaged over a time interval longer than any acceleration periods encountered in straight and level flight; this average is represented mechanically by the output axes of two gyros, one acting in a plane normal to the platform's pitch axis, the other acting in a roll plane. The platform is then held by servos in a plane which is normal to both gyro output axes.

More specifically, the stabilization method outlined above is implemented as follows. Accelerations in the plane of the platform are resolved in the fore-and-aft and transverse directions by two orthogonally-mounted accelerometers. The electrical analog output from each accelerometer consists of an AC component due to motions of the aircraft and possibly a DC component due to platform tilt. This output is passed through an integrator, then through an error-rate stabilization circuit, and finally applied to the torque motor of the corresponding gyro (also mounted on the platform) to precess the gyro's output axis and maintain it in the required upright position. When the platform begins to deviate from the normal plane an error signal from the appropriate gyro activates a corresponding servo to correct the incipient misalignment.

The system is designed to have a natural period of 2π minutes, and it acts as a filter to attenuate the effect of periodic accelerations which occur within the expected range of frequencies. For example, if the aircraft is subjected to an oscillation mode of acceleration which swings the apparent vertical with an amplitude of 1.0 degree and a period of one minute, the platform will respond with deflections of the same period but with an amplitude of 0.03 degree.

Better filtering could be achieved by increasing the period of the system. However, the chosen value of 2π minutes imposes a waiting time of approximately 10 minutes while the platform recovers from deflections caused by long-sustained

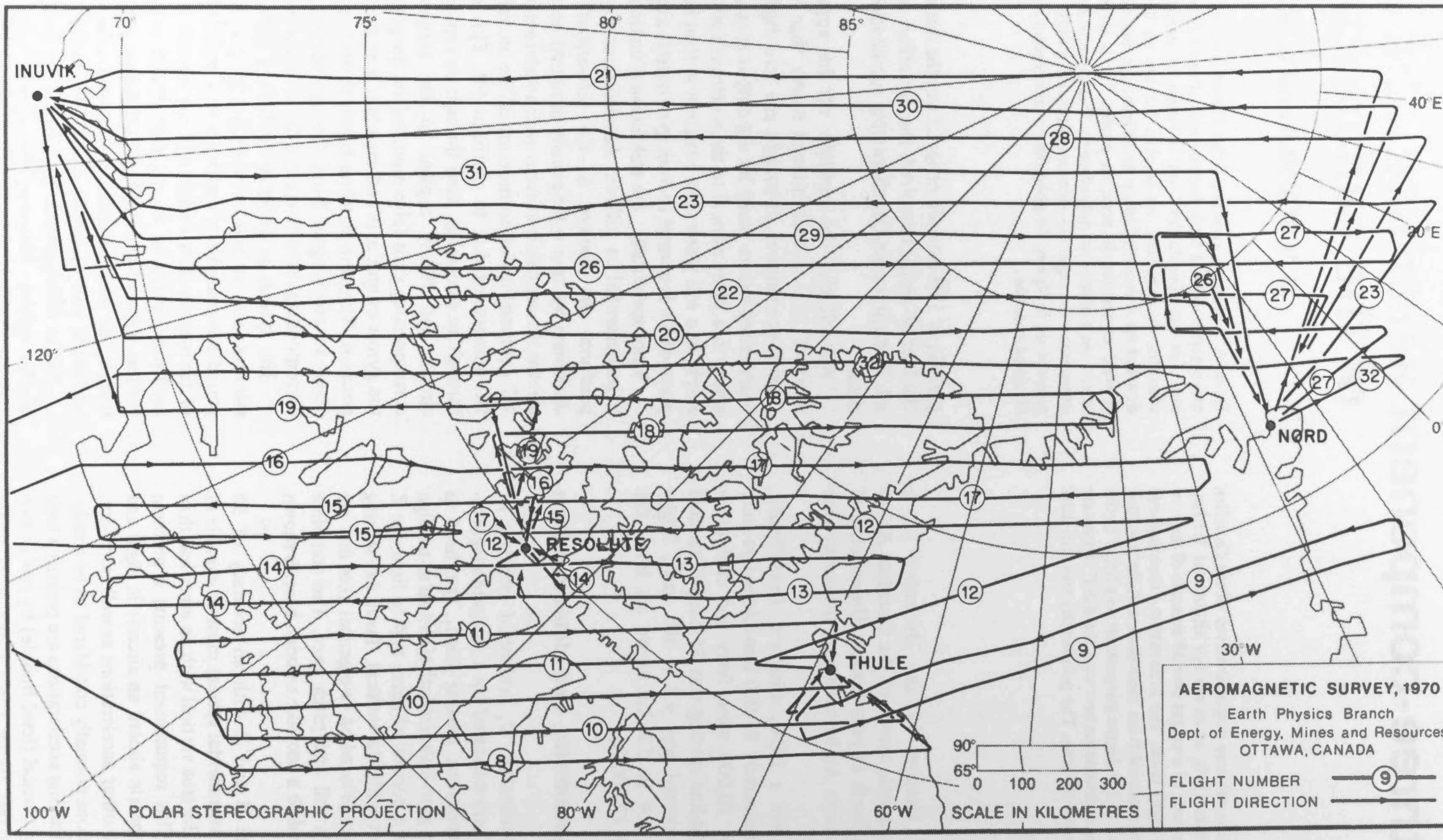


Figure 1. Flight lines of the Canadian Arctic aeromagnetic survey, 1970. Flight numbers are circled and arrowheads indicate the direction of travel.

Figure 2. The gyro-stabilized platform and fluxgate sensor assembly.

accelerations when the aircraft is climbing, descending or turning. This recovery time would also increase if the natural period of the platform was made longer, and therefore 2π minutes was chosen as the most acceptable compromise.

A third gyroscope is mounted on a turntable so that its output axis lies in a plane parallel to the platform and thus provides a directional reference for the measurement of D and of the aircraft's heading. Error signals from this gyro control a servo which drives the turntable to hold the gyro in alignment with its output axis, notwithstanding the yawing motions or turning of the aircraft.

Periodic yawing of the aircraft forces oscillations of the platform about its roll axis. To reduce these oscillations the centrifugal accelerations are computed in analog form and subtracted from the roll accelerometer signals at the input to the roll integrator. The analog computation is achieved by driving a rate generator at a speed proportional to that of the directional gyro turntable to obtain an output voltage representing the aircraft's rate of turn, and this voltage is multiplied by a factor proportional to ground speed on a servo-driven potentiometer controlled by signals from a Doppler system.

Similarly, forced oscillations about the pitch axis are reduced by differentiating the Doppler ground speed voltage (or alternatively, the output from an airspeed sensor) and, after appropriate scaling, the result is subtracted from the output of the pitch accelerometer.

A small correction to compensate for Coriolis force is also subtracted from the roll accelerometer output.

As the earth rotates at a rate of 15° per hour, the horizontal component of this rotation, at latitude θ, is $15^\circ \cos\theta$ per hour. In the two planes normal to the pitch and roll axes this rate is resolved according to the true heading of the aircraft and corresponding precession torques are applied to the pitch and roll gyros. The latitude factor is manually set and a sine-cosine resolver automatically follows the aircraft's heading to produce the desired precession torques in pitch and roll. Thus the controlled precession rate of both vertical gyros is continously adjusted while the aircraft is making a turn, to avoid the transient which would otherwise occur because of an intolerable lag in the control exercised by the accelerometers alone.

A synchro-servo system drives the horizontal circle of a periscopic sextant to follow the rotation of the directional gyro turntable with respect to the aircraft. The angle in azimuth between the directional gyro's reference axis and an astronomical body is thus indicated. Several sextant observations are made after each 15- to 20-minute interval, to determine the gyro's true azimuth and drift rate. If necessary, the drift rate is adjusted to keep it below 2 degrees per hour.

The periscopic sextant is hung in a stabilized mount which is driven by pitch and roll synchro-servo systems to follow the attitude of the platform.

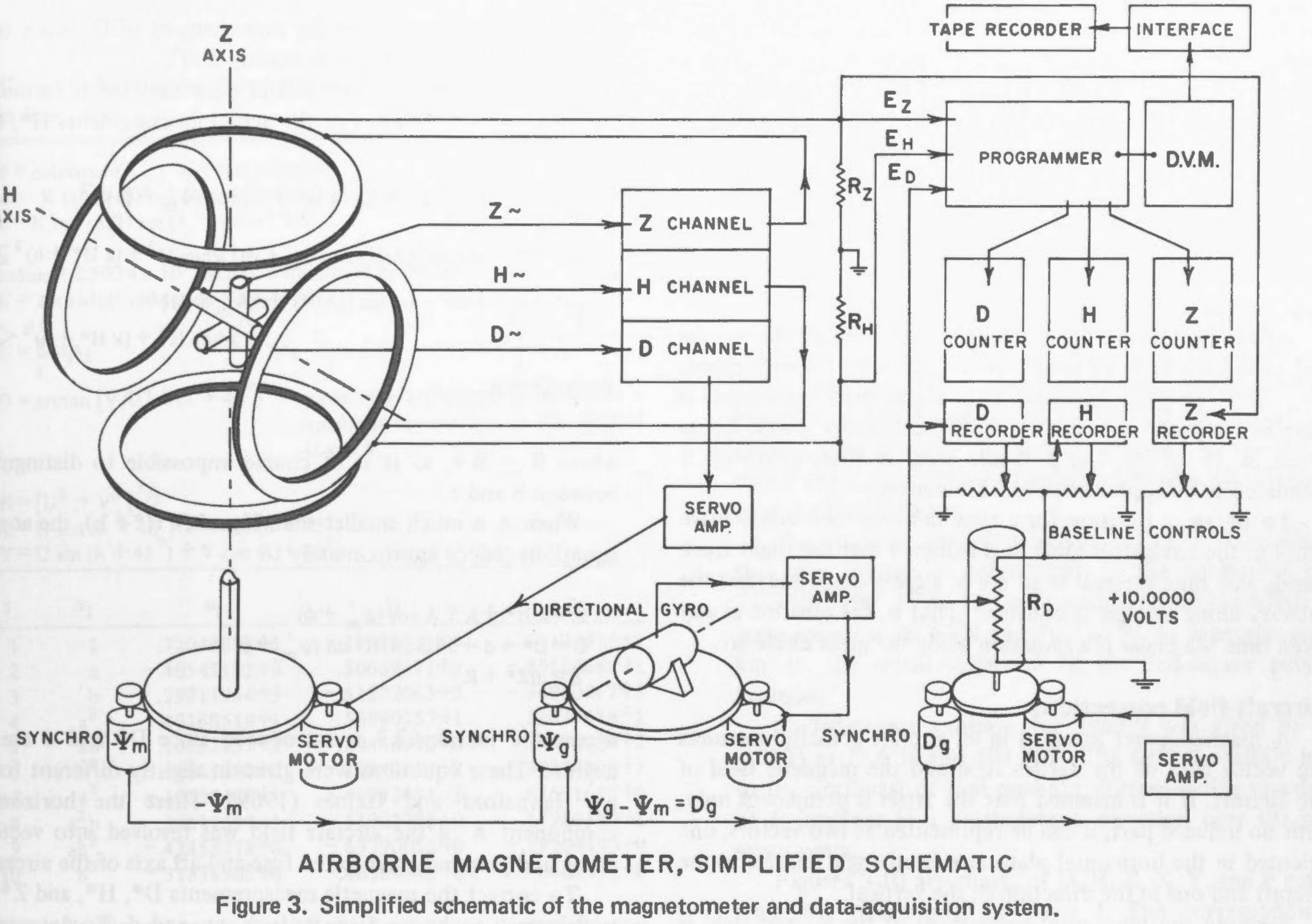
The three fluxgate sensors are orthogonally mounted at the centre of an orthogonal pair of field-cancelling coils; one for Z and the other for H. The sensing head is seen in Figure 2 at the far end of a $2\frac{1}{2}$-inch diameter horizontal shaft. It is this shaft which transmits rotation from the roll gimbal of the platform to the sensors. The same shaft and roll gimbal also form the top side of a parallelogram. The bottom side is an aluminum connecting rod which transmits the pitch motion from the lower end of a downward arm on the platform (front side of the parallelogram) to the lower end of the sensor assembly (rear side). The sensor assembly consists of the sensing head, which is rotated in azimuth at the top end of a vertical shaft and, at the opposite end of this shaft, a servo drive controlled by the output of the D fluxgate to hold it at a null. Consequently the H fluxgate and field-cancelling coil are aligned with magnetic north.

In an area around the magnetic pole where H is diminished to approximately the same magnitude as the horizontal component of the aircraft's magnetic field, their vector sum may become small enough to keep the D fluxgate's error signal output below the noise level. Under such conditions there is no control on the azimuthal alignment of the sensing head; the observed D becomes indeterminate and the measurement of H is invalid. Since the north magnetic pole is in the area covered by the survey which is the subject of this report, pre-survey tests were made under conditions simulating low values of H. As the simulated H was reduced during these tests, the sensing-head servo would become sluggish and the accuracy of alignment was severely degraded before a useful D error signal was lost. This problem was removed by introducing a circuit whereby the voltage gain of the sensing-head servo is made inversely proportional to H and thus the overall gain of the system remains constant. As a result the sensing-head orientation remained stable over the full range of H, except for a few very brief periods in the immediate area of the pole. The longest of these lapses covered approximately 15 kilometres of a flight line.

Figure 3 is a simplified schematic diagram of the magnetometer and data-acquisition system. The azimuth angle between the H-axis of the sensing head and the directional gyro is transmitted via synchrosignals to a servo-driven potentiometer which produces the voltage analog. This voltage is continuously recorded and later converted to D when the azimuth-vs-time curve of the directional gyro is determined with final accuracy.

During the survey an unforseen problem arose at very high geomagnetic latitudes where local anomalies may cause a very large change in D. Under these circumstances the top speed of the servo driving the D-analog potentiometer was sometimes inadequate for following the rapid change and, because of the gear ratios involved, the potentiometer would suddenly lag by 10 degrees. It was sometimes impossible to determine the number of 10-degree lags which occurred when they came in rapid succession, and in such cases a section of D information was lost.

The feedback currents which cancel the field inside the H and Z coil systems are passed through precision resistors, giving DC voltages proportional to the horizontal and vertical components of the magnetic field.



AIRBORNE MAGNETOMETER, SIMPLIFIED SCHEMATIC

Figure 3. Simplified schematic of the magnetometer and data-acquisition system.

The three components D, H, and Z are recorded in both analog and digital form. For analog recording, each of the three voltages is fed directly to a strip chart recorder. The records are kept on scale by manually selecting an appropriate reference voltage from a very accurate incremental voltage divider.

For digital recording, the three voltages are fed into a clock-controlled programmer unit, which switches from D to H to Z every 3 seconds. Thus, the digital voltmeter (D.V.M.) measures D, H, and Z 20 times per minute, and outputs this to a magnetic tape recorder. At the end of every minute, the programmer also sends to the tape recorder digital signals representing the year, month, day, and universal time.

The programmer unit also channels pulses from the D.V.M. into three counters, and accumulates these pulses for 5 minutes. At the end of the 5-minute period the counters display the accumulated pulse count. This can be read as a 5-minute average by a simple shift of decimal point since there are 20 x 5 = 100 measurements in the 5-minute interval. These 5-minute averages are written down by the operator and can be used in the event of tape-recorder or strip-chart recorder failure.

In addition to the DHZ fluxgate magnetometer, the aircraft carries a proton-precession magnetometer which makes a measurement of total magnetic intensity F, every three seconds. These measurements are synchronized with the digital sampling of D, H, and Z and are recorded on the same magnetic tape. They are also converted to analog form and recorded on a strip-chart. The sensing head of the proton magnetometer is mounted at the end of a "stinger", or long hollow boom, attached to the rear of the aircraft. The stinger extends about 3.5 metres from the end of the fuselage. Unfortunately, the proton magnetometer did not work well during this survey, and was used mainly as a cross-check of the fluxgate measurements.

The design of the stabilized platform, fluxgate magnetometer, and mechanical linkage system has been described in detail by Serson *et al.* (1957). The magnetometer and data-acquisition system was re-designed in 1965, and described by Hannaford *et al.* (1967).

Navigation

Two navigators, supplied as part of the air crew by the charter company, were on duty at all times during flights. The company was required to fly 22 lines at a spacing of 40 nautical miles (74 km) and on grid headings of 135 and 315 degrees. (Grid heading is true heading plus west longitude; on a polar stereographic map it is the clockwise angle from the 180° meridian to the direction of flight.)

The aircraft was fitted with a Marconi Doppler unit, Model CMA621-A, which measures ground speed and drift, and a Doppler computer, Model CMA601, to calculate the distance travelled along and perpendicular to a given track. This track is selected with respect to the directional gyro on the stabilized platform.

Other navigational aids were the standard ones of visual map checks ("pinpoints"), observations on astronomical bodies, radar fixes (bearing and distance from a radar station) and position information from Loran stations.

After the survey, the navigators back-plot all the results and produce a table of positions and altitudes for each flight. The time interval between two consecutive positions is generally around 10 minutes, but occasionally could be as much as 15 or 20. The probable error in these positions is estimated to be approximately 5 kilometres.

To obtain a position for a time between two consecutive times in the navigators table, it is assumed that the flight track during this time interval is an arc of a great circle and that the velocity along this arc is constant. That is, the position at any given time is a linear interpolation along the great circle arc.

Aircraft-field corrections

A magnetometer installed in an aircraft actually measures the vector sum of the earth's field and the magnetic field of the aircraft. If it is assumed that the latter is permanent only, with no induced part, it can be represented as two vectors, one oriented in the horizontal plane at a fixed angle relative to the aircraft and one in the direction of the vertical.

Suppose the horizontal component of the aircraft field is represented as a vector of magnitude A oriented at an angle ϕ with respect to the fore-and-aft axis of the aircraft. Let the declination, horizontal, and vertical components of the earth's field be denoted by D, H, and Z, respectively, and of the apparent field (earth's plus aircraft field) by D', H', and Z'. If the apparent magnetic heading (the clockwise angle from the H' vector to the aircraft's fore-and-aft axis) is denoted by ψ'_m, we have that

$$H = [H'^2 + A^2 + 2AH' \cos(\Psi'_m + \phi)]^{1/2}$$

$$D = \begin{cases} D' + \arcsin[(A/H)\sin(\Psi'_m + \phi)] & \text{when } H^2 + H'^2 \geq A^2 \\ D' + 180^\circ - \arcsin[(A/H)\sin(\Psi'_m + \phi)] & \text{when } H^2 + H'^2 < A^2 \end{cases}$$

$$Z = Z' + B$$

where the principal arc sine is used, lying between -90° and +90°. Note that for a solution of D, it is necessary to have H and hence H'. The correction B comes from the vertical component of the aircraft field, and is independent of aircraft heading.

Now, measurements of the vectors H', D', and Z' are subject to calibration errors in the measuring equipment, and so these vectors can be written

$$H' = k H^* + h$$
$$D' = D^* + d$$
$$Z' = m Z^* + z$$

There is no scaling error in the measurement of D', since one revolution of the D-fluxgate is exactly 360°.

Combining the last two sets of equations yields formulas for H, D, and Z in terms of the actual measurements H^*, D^* and Z^*:

$$H = [(k H^* + h)^2 + A^2 + 2A(k H^* + h)\cos(\Psi'_m + \phi)]^{1/2}$$

$$D = \begin{cases} D^* + d + \arcsin[(A/H)\sin(\Psi'_m + \phi)] & \text{when } H^2 + (k H^* + h)^2 \geq A^2 \\ D^* + d + 180^\circ - \arcsin[(A/H)\sin(\Psi'_m + \phi)] & \text{when } H^2 + (k H^* + h)^2 < A^2 \end{cases}$$

$$Z = m Z^* + R$$

where R = B + z. It is of course impossible to distinguish between B and z.

When A is much smaller than H and $(k H^* + h)$, the above equations reduce approximately to

$$H = k H^* + h + A\cos(\psi'_m + \phi)$$
$$D = D^* + d + 57.3\,(A/H)\sin(\psi'_m + \phi)$$
$$Z = mZ^* + R$$

where the factor 57.3 is introduced since D^* and d are in degrees. These equations were given in slightly different form by Hannaford and Haines (1969). There the horizontal component A of the aircraft field was resolved into vectors along and perpendicular to the fore-and-aft axis of the aircraft.

To correct the magnetic measurements D^*, H^*, and Z^*, it is necessary to know A, ϕ, R, k, h, m, and d. To determine these constants, flights are made over a point where the earth's field is very accurately known. The constants are then determined by least-squares, after the D-values are weighted as H (the equation for D is multiplied by H/57.3 if D is in degrees). Of course, the equations are non-linear in the unknowns and so an iteration method must be used to minimize the residual mean square. The results for this survey are A = 242γ, ϕ = -95°, h = 11γ, d = 2.0°, R = 374γ, where k and m were taken to be exactly 1, since the least-square solution for each was found to be not significantly different from 1.

The main field

The magnetic data were reduced to sea-level by the "inverse-cube" relationship, where it is assumed that a component P diminishes as $1/r^3$, r being the distance from the centre of the earth to the point of observation. The derivative of P then diminishes as 3P/r, and the correction to P for a change in altitude of h kilometres is given by

$$\Delta P = 4.6 \times 10^{-4}\, Ph.$$

By the method of least-squares, 3rd-degree polynomials in each of three orthogonal components were then obtained by using every tenth ½ minute average in the survey area. The resulting coefficients and the formulae for their use are given in Table I.

Table I. 3rd-Degree Polynomial Reference Field for 1970.9, at Sea Level

θ = colatitude λ = east longitude

$a = -K \tan(\theta/2) \cos(\lambda + 45^\circ) + 5.5$

$b = K \tan(\theta/2) \sin(\lambda + 45^\circ) + 5.5$

radius = 2.5024×10^8 inches; reduction = 6,000,000

K = 2 x radius/reduction = 83.41333

$U = \sum_1^{10} u_i x_i$ $V = \sum_1^{10} v_i x_i$ $Z = \sum_1^{10} z_i x_i$

$D = \arctan[V/U] + (\lambda + 45^\circ)$ where the arctangent is chosen in a quadrant appropriate to the signs of U and V.

$H = [U^2 + V^2]^{1/2}$

$X = U \cos(\lambda + 45^\circ) - V \sin(\lambda + 45^\circ)$

$Y = U \sin(\lambda + 45^\circ) + V \cos(\lambda + 45^\circ)$

i	x_i	u_i	v_i	z_i
1	1	.72043887+3	−.15436631+4	.57138975+5
2	a	−.40545122+3	.30669471+3	−.85584689+1
3	b	.29811754+3	−.51372663+3	−.34020267+3
4	a^2	.40168518+1	.56890757+1	.32637618+1
5	ab	.16752137+2	.84448970+0	.27592084+2
6	b^2	−.41661182+0	.10843077+2	−.30234890+1
7	a^3	−.10335480+1	−.49953631−3	.61591658+0
8	a^2b	.38611397−1	−.51902791+0	.17989560+1
9	ab^2	−.42458778+0	−.63390055+0	−.28204490+0
10	b^3	−.31818905+0	−.48364142+0	.40652571+0

Note: Coefficients are in floating point notation, a decimal fraction followed by a power of ten.

The standard deviations of the least-squares fit for 1st, 2nd, 3rd, and 4th degree polynomials are given in Table II. It can be seen that there is a considerable reduction in the standard deviations in going from the 2nd to 3rd degree, but very little in going on to the 4th degree. The component V is in the direction of the "x-axis" of the maps, or from left to right, and the component U is in the direction of the "y-axis", or from the bottom to the top of the maps.

The International Geomagnetic Reference Field (IGRF) is an 8th order spherical harmonic reference field adopted by the International Association of Geomagnetism and Aeronomy in

Table II. Standard Deviations of the Observed Minus Polynomial Field, for 1st, 2nd, 3rd, and 4th Degree Polynomials. Sample size = 1495 (every tenth $\frac{1}{2}$ minute average).

Degree	Coefficients	U	V	Z
1	3	290.8γ	322.5γ	499.1γ
2	6	152.4	154.8	172.9
3	10	139.3	124.1	147.7
4	15	136.0	124.0	143.9

Note: $U = H \cos[D - (\lambda + 45^\circ)]$ and $V = H \sin[D - (\lambda + 45^\circ)]$. The polynomials are in the two variables a and b defined in Table I.

1969. The differences between components computed from the 3rd-degree polynomials of Table I and those from the IGRF are shown in Figure 4. It can be seen that there are large biases in the IGRF, as was found on a previous survey (Haines and Hannaford, 1972). In the case of Z there is a feature, parallel to and just north of the Arctic mainland, of approximately 2,000 km wavelength and about 150γ amplitude.

It is also striking that the vertical field increases by about 300γ when coming onto the Canadian Shield from the Arctic Ocean and Sverdrup Basin. This is quite vividly displayed in Figure 2 of Riddihough *et al.* (1973). The same characteristic appears over British Columbia (Haines and Hannaford, 1972) where the Z field over the Canadian Shield is 400γ higher than over the Pacific Ocean.

The magnetic dip pole position (for 1970.9) obtained from the two 3rd-degree polynomials in the horizontal plane is 75°53′N, 100°23′W. The pole position from the IGRF for the same epoch is 76°45′N and 101°45′W, or approximately 100 km to the north-northwest of the 3rd-degree polynomial position.

A 3rd-degree position for 1963.9 was given by Haines (1967) as 75.6°N and 101.3°W. The 1970.9 position is 40 km to the northeast of that position, corresponding to a drift rate of 6 km/year in a northeasterly direction over the previous seven years.

Figures 5-10 are charts of D, H, Z, X, Y, and F computed from the polynomial of Table I. The corresponding pole position is shown on the D, H, X, and Y maps.

The anomaly field

Notwithstanding the large biases in the IGRF, as indicated by Figure 5, this reference field was still used in plotting residual profiles (Figures 11-15). This is because the IGRF is an international standard, with which most countries are now familiar and which provides a standard method for presentation of short-wavelength or anomaly fields.

The residuals are the observed values (corrected of course for aircraft fields) minus the corresponding IGRF values at the altitude of observation. They are plotted toward the top of the map when positive and toward the bottom when negative.

Since residual declination values in areas close to the pole are very sensitive to the main-field pole position, the 100-km error in the IGRF pole position distorts the true D-anomaly field in these areas. The effect, in Figure 11, is the appearance of large positive anomalies west of the magnetic pole and large negative anomalies east of the pole. When the 3rd degree polynomial of Table I is subtracted for the observations, the anomaly field shown in Figure 16 results. Here the distorting effect of the IGRF pole position has been removed, and the result is a clearer indication of the validity of compass readings in the Arctic area.

The anomaly field can also be represented in vector form. In order that this form of representation bear any significance, however, it is necessary that the reference field fit the data well enough that the residuals have nearly zero mean. Hence for computing vector residuals, the 3rd degree polynomial was again used. Vector residuals in the horizontal plane are shown in Figure 17. Those in a vertical plane through the "x-axis" of the map are rotated 90° about this axis and plotted in Figure 18. (The "x-axis" is the axis of almost all the flight lines in the diagram.) Components of these two-dimensional vectors are plotted to the top and right of the map when positive, to the bottom and left when negative.

A contoured Z-residual map has been published by Riddihough *et al.* (1973). It was derived mainly from Figure 13 but also uses some data from two previous (1963 and 1965) aeromagnetic surveys over the same area. The authors discuss the major tectonic features of the area, and relations between the Canadian Shield, the Innuitian Region, and the oceanic ridges of the Arctic Basin.

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Serson, P.H., S.Z. Mack and K. Whitham. 1957. A three-component airborne magnetometer. *Pub. Dom. Obs.*, Vol. XIX, No. 2, 15-97.

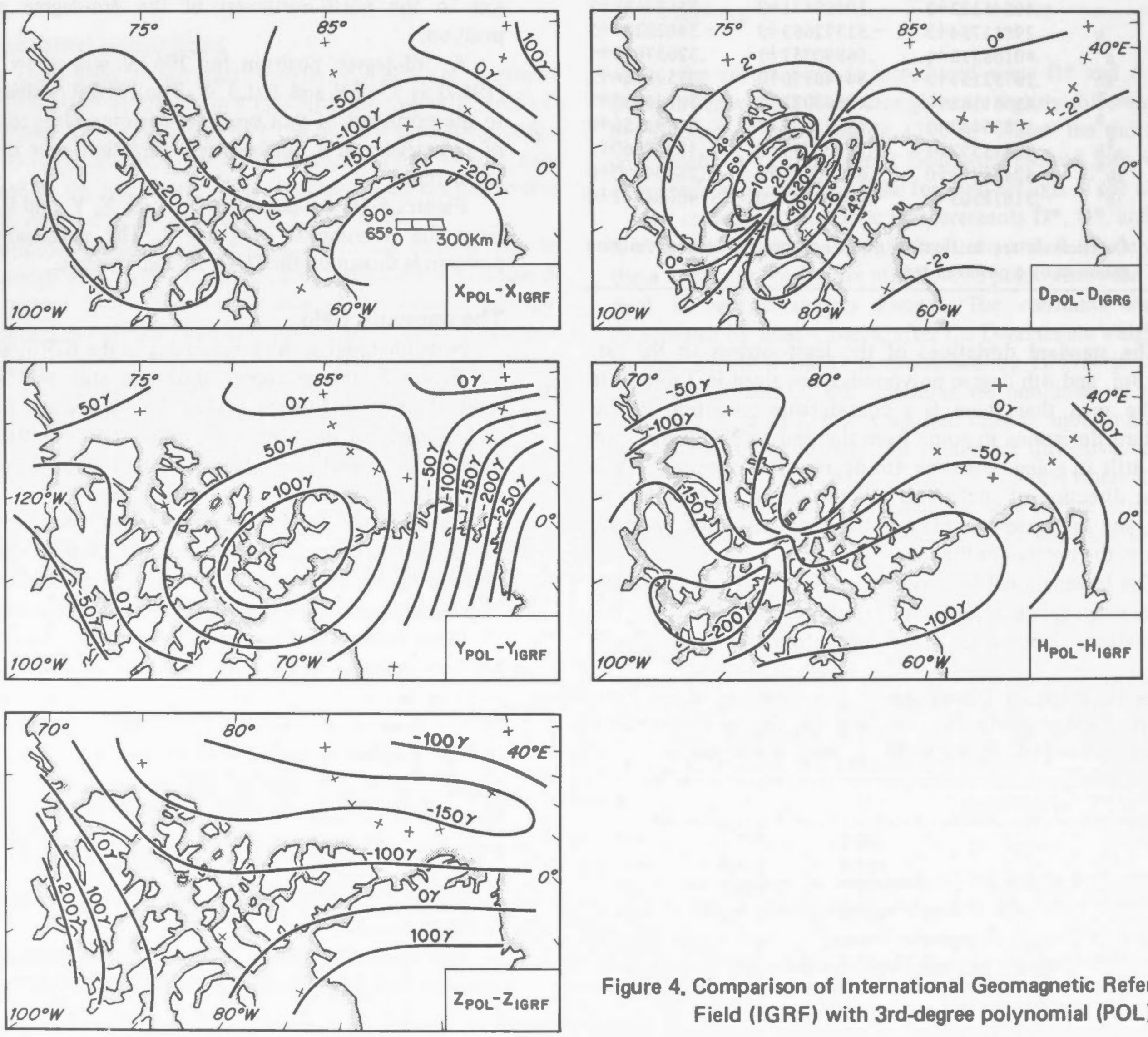

Figure 4. Comparison of International Geomagnetic Reference Field (IGRF) with 3rd-degree polynomial (POL).

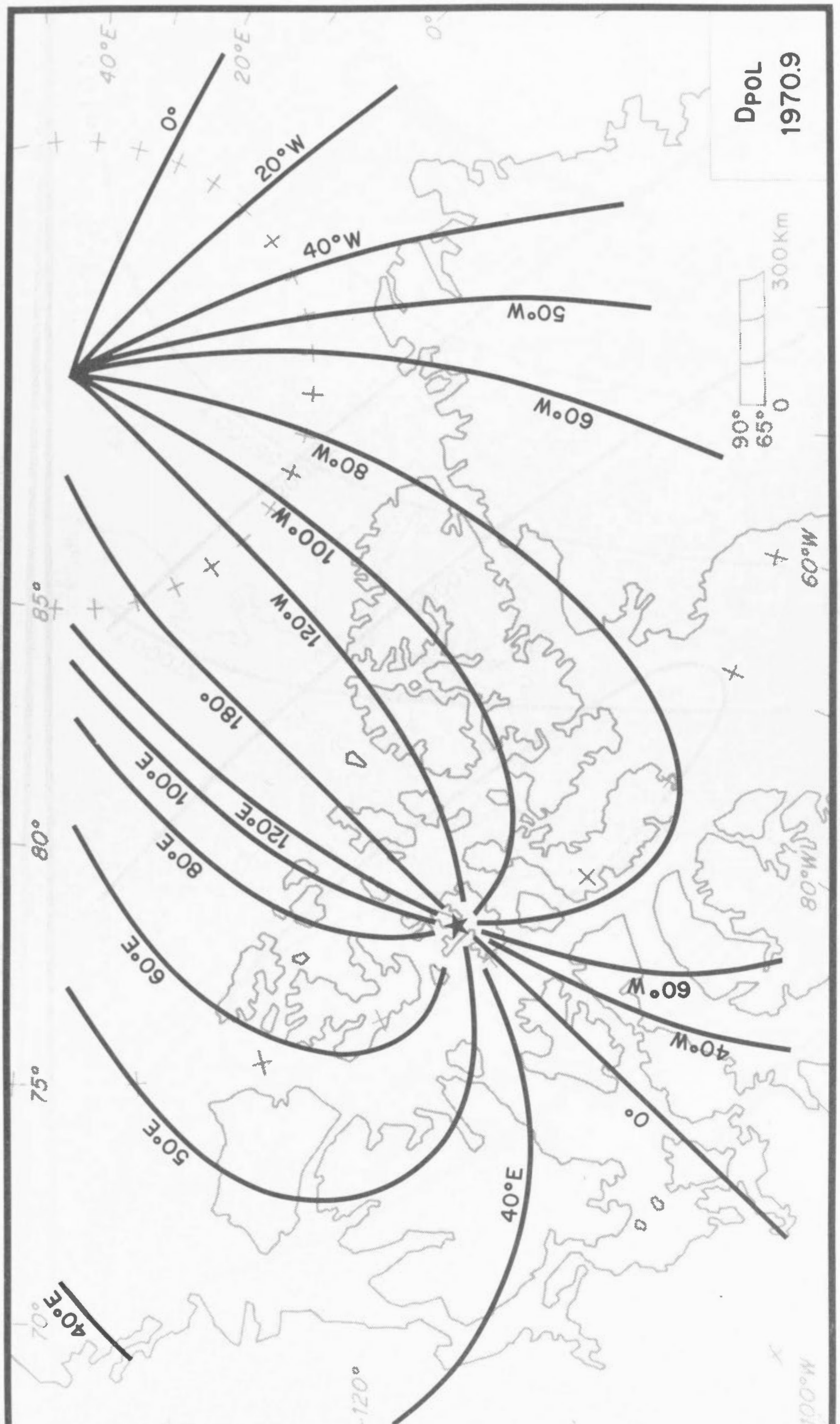

Figure 5. Declination D from 3rd-degree polynomial. Dip pole position from this polynomial is indicated by a star.

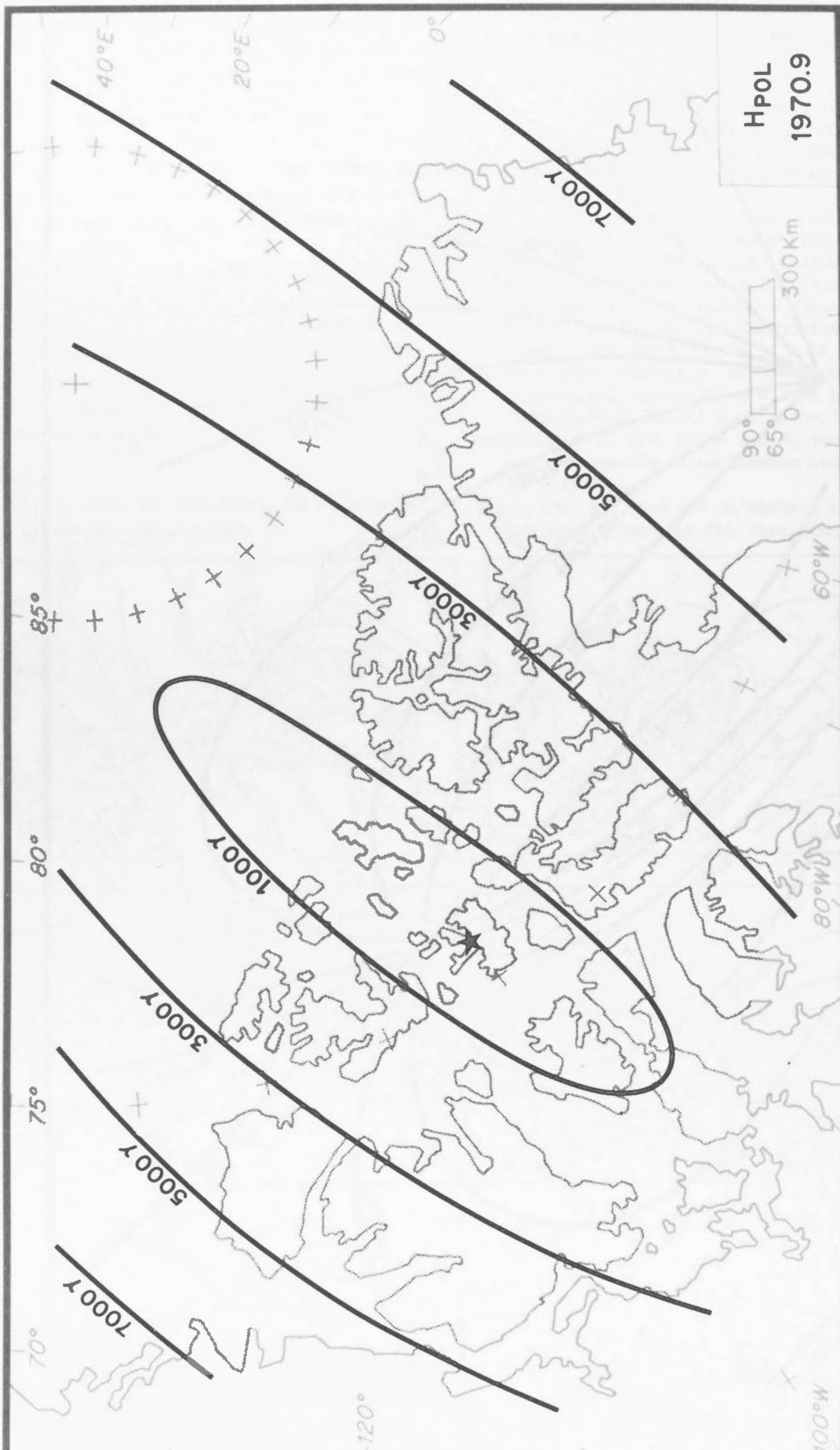

Figure 6. Horizontal intensity H from 3rd-degree polynomial.

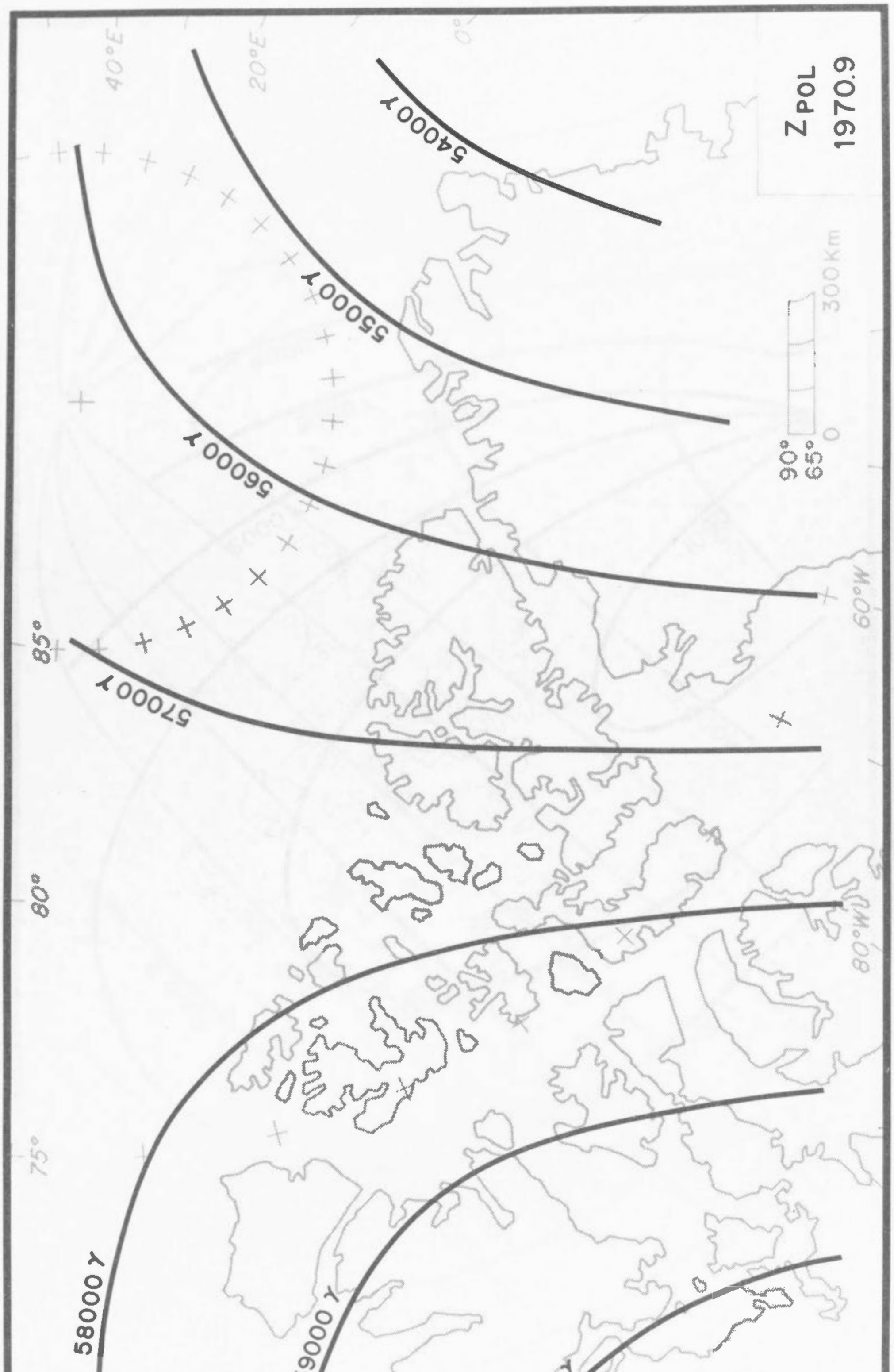

Figure 7. Vertical intensity Z from 3rd-degree polynomial.

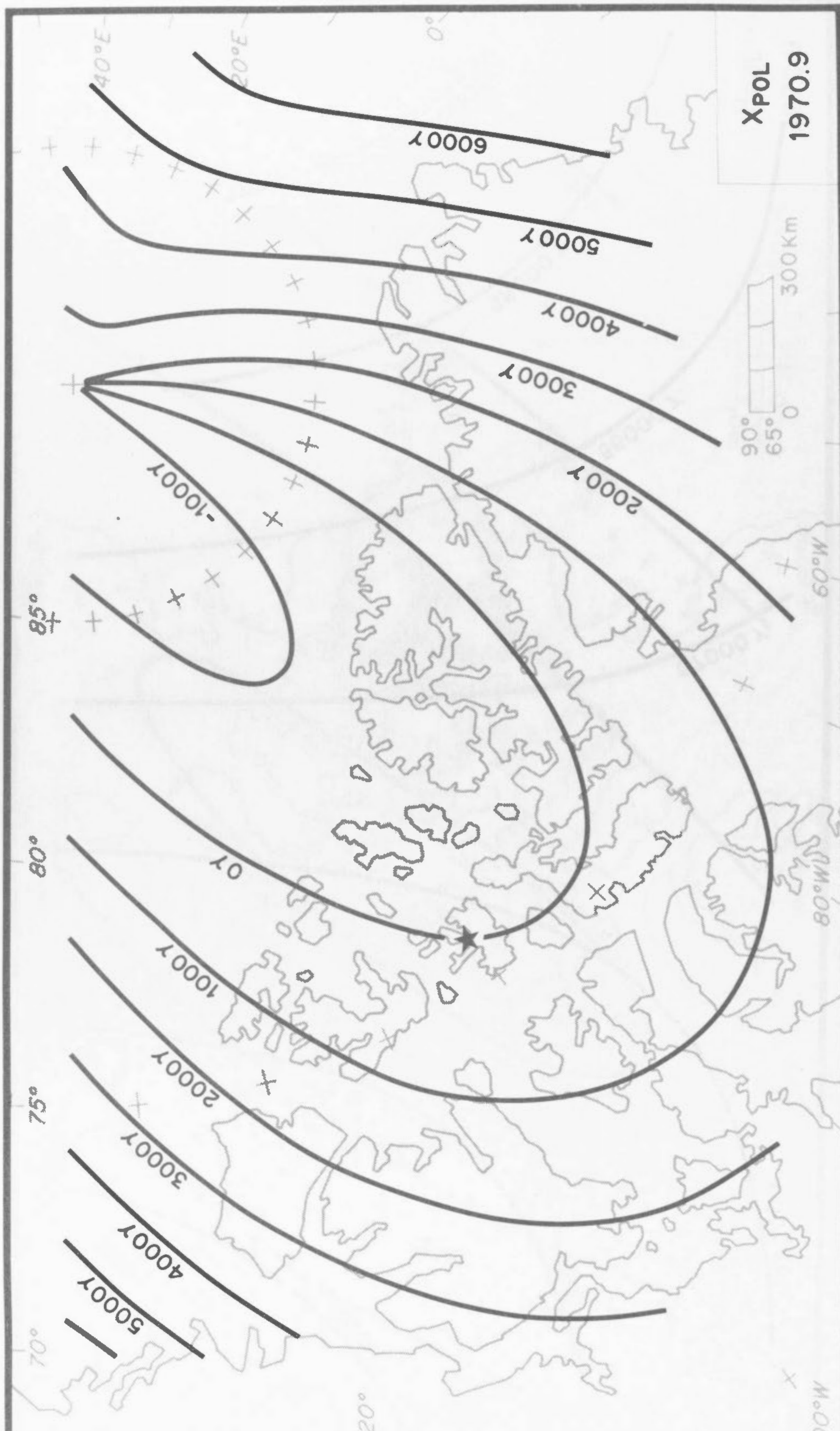

Figure 8. Geographic north component X from 3rd-degree polynomial.

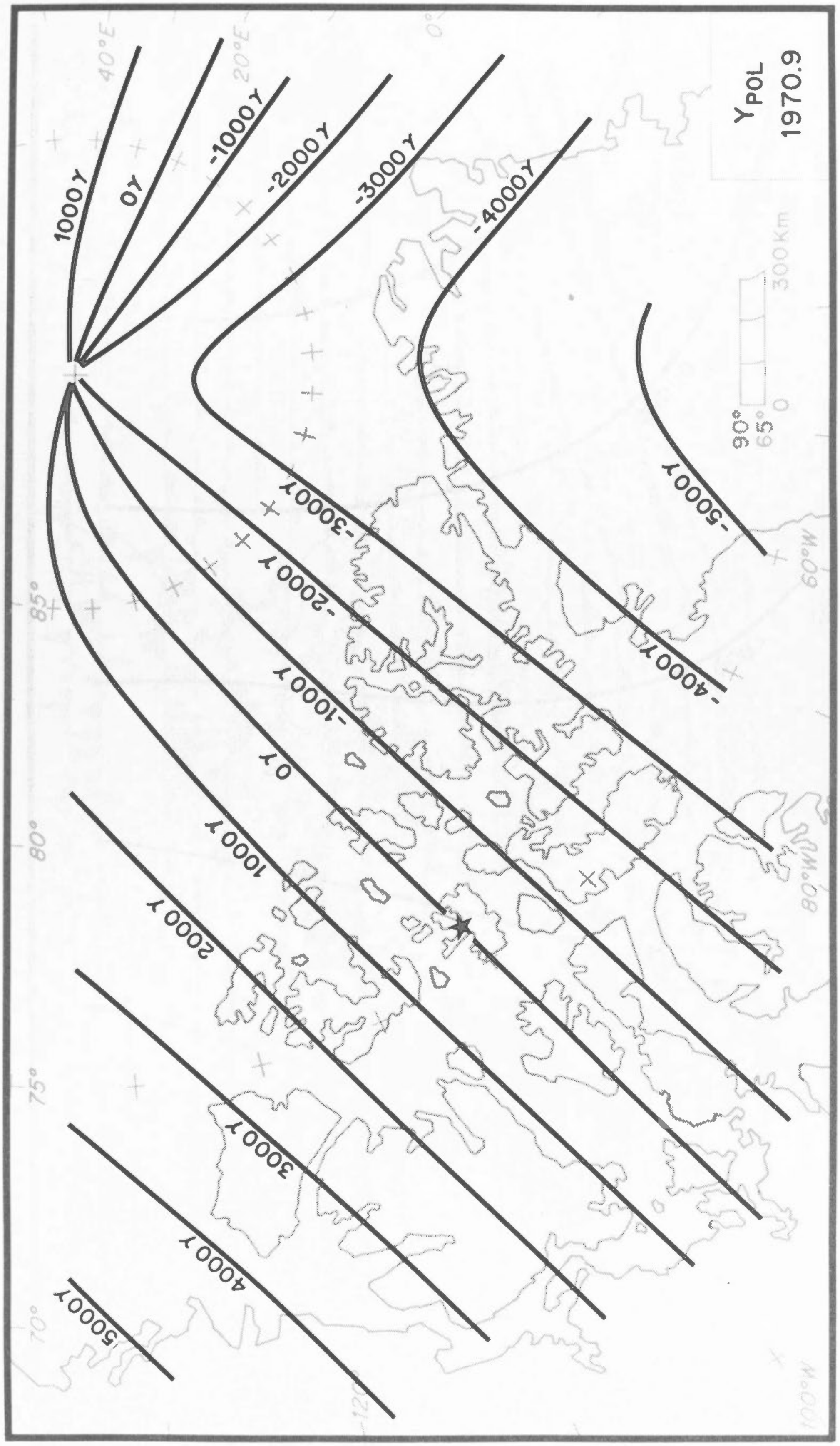

Figure 9. Geographic east component Y from 3rd-degree polynomial.

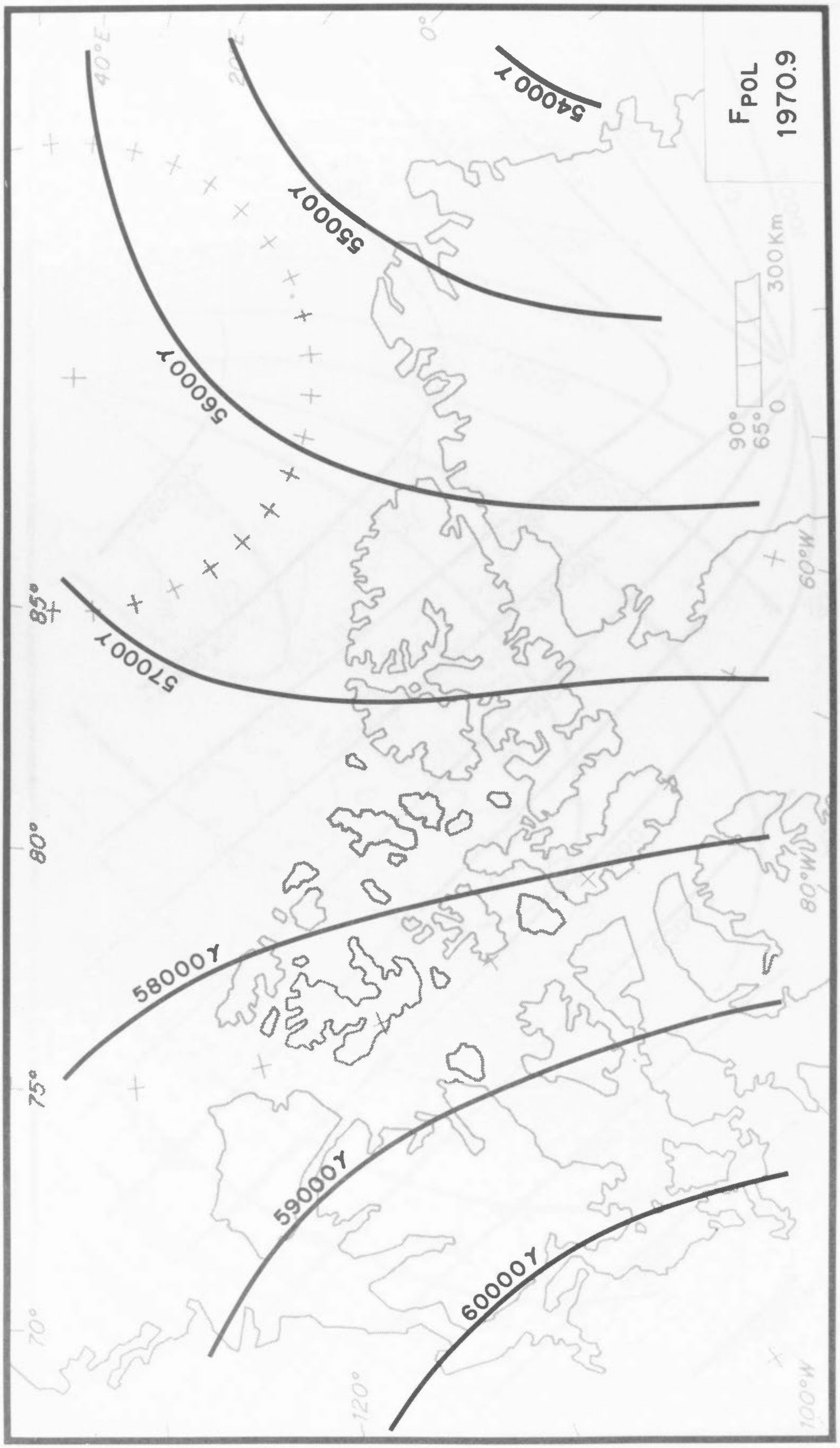

Figure 10. Total field F from 3rd-degree polynomial.

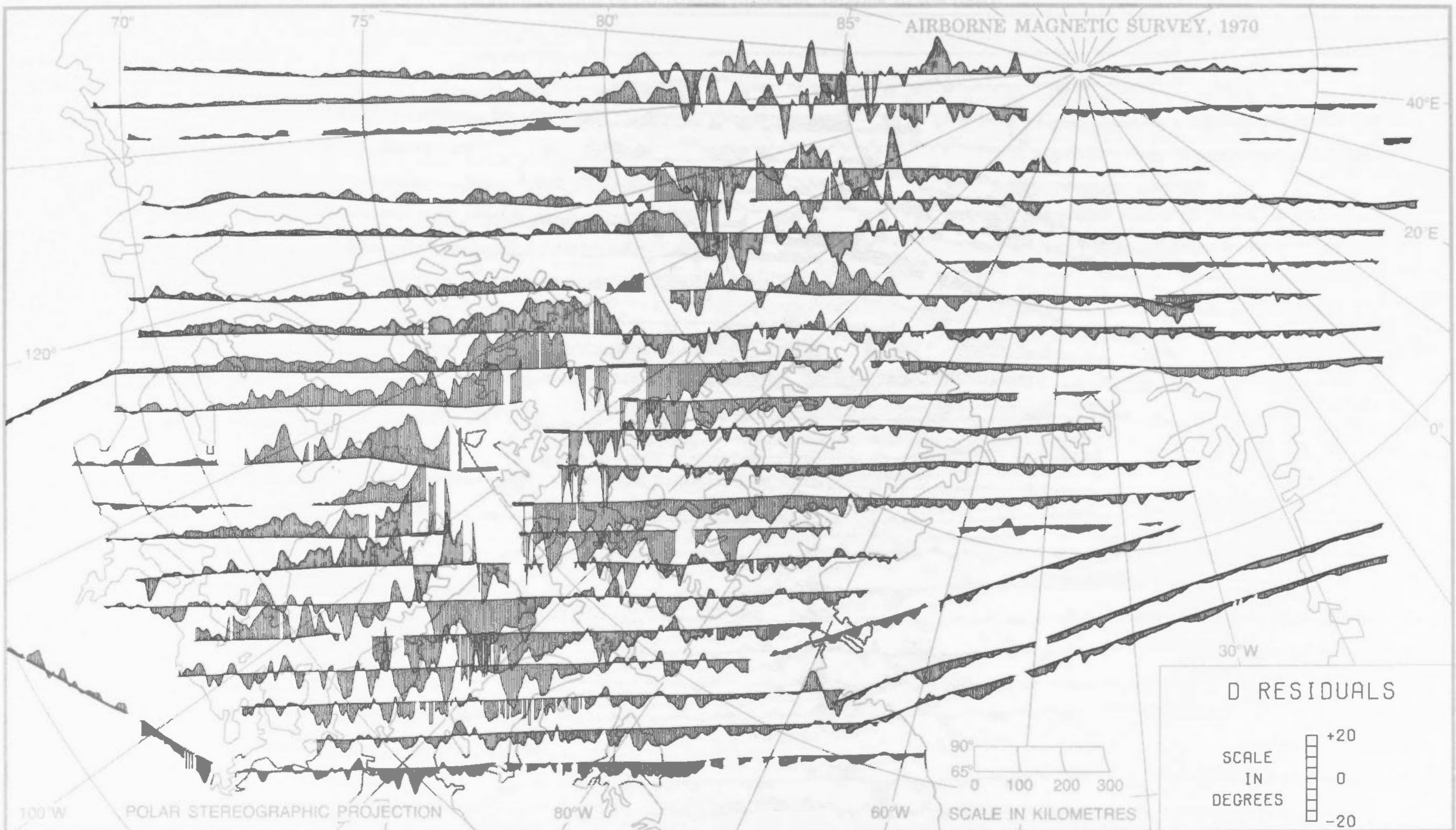

Figure 11. Residual profiles of declination, relative to the International Geomagnetic Reference Field (IGRF). A residual is an observed value minus the reference field value. Positive residuals are plotted toward the top of the map, negative toward the bottom.

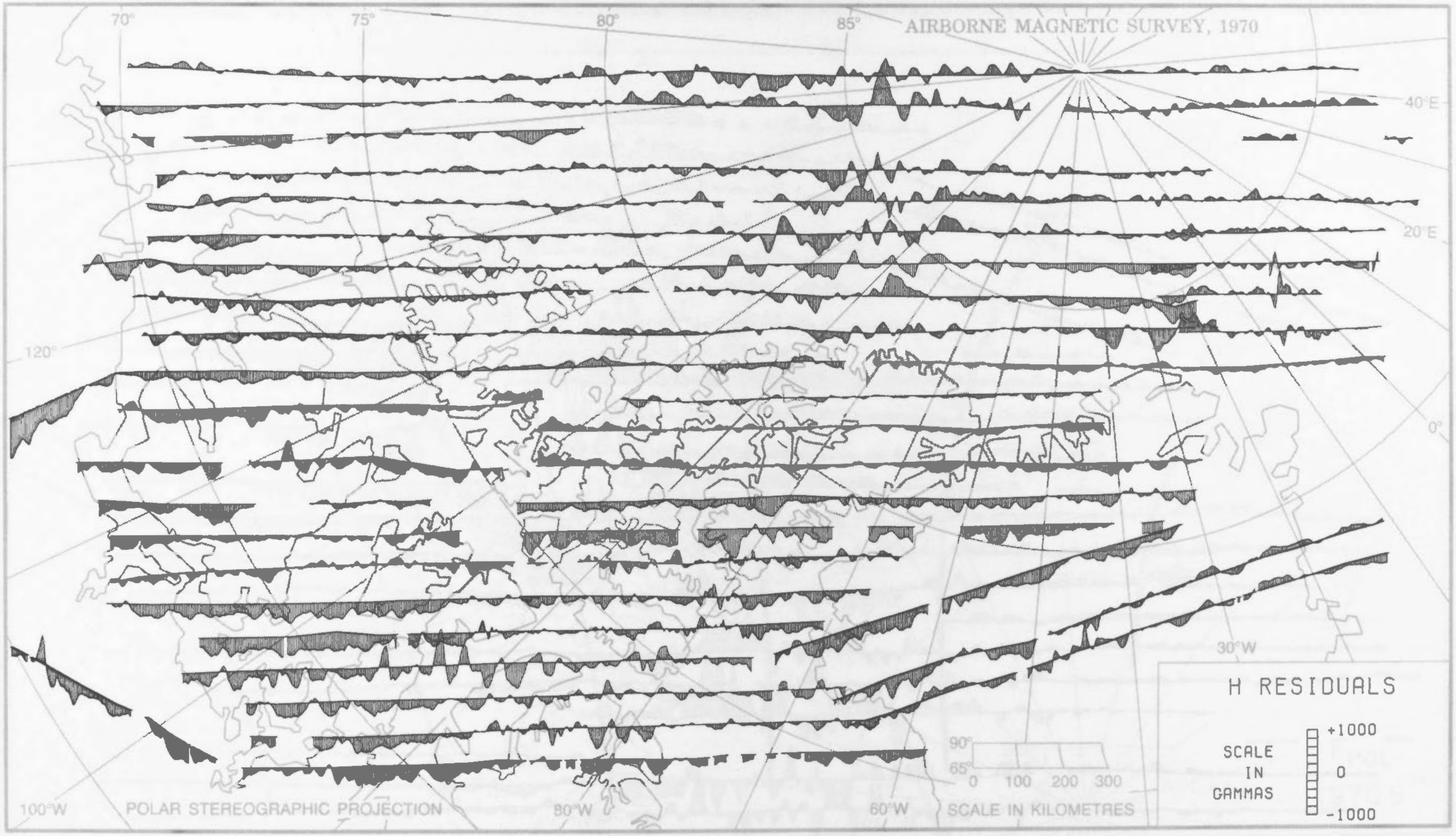

Figure 12. Residual profiles of horizontal intensity, relative to the IGRF.

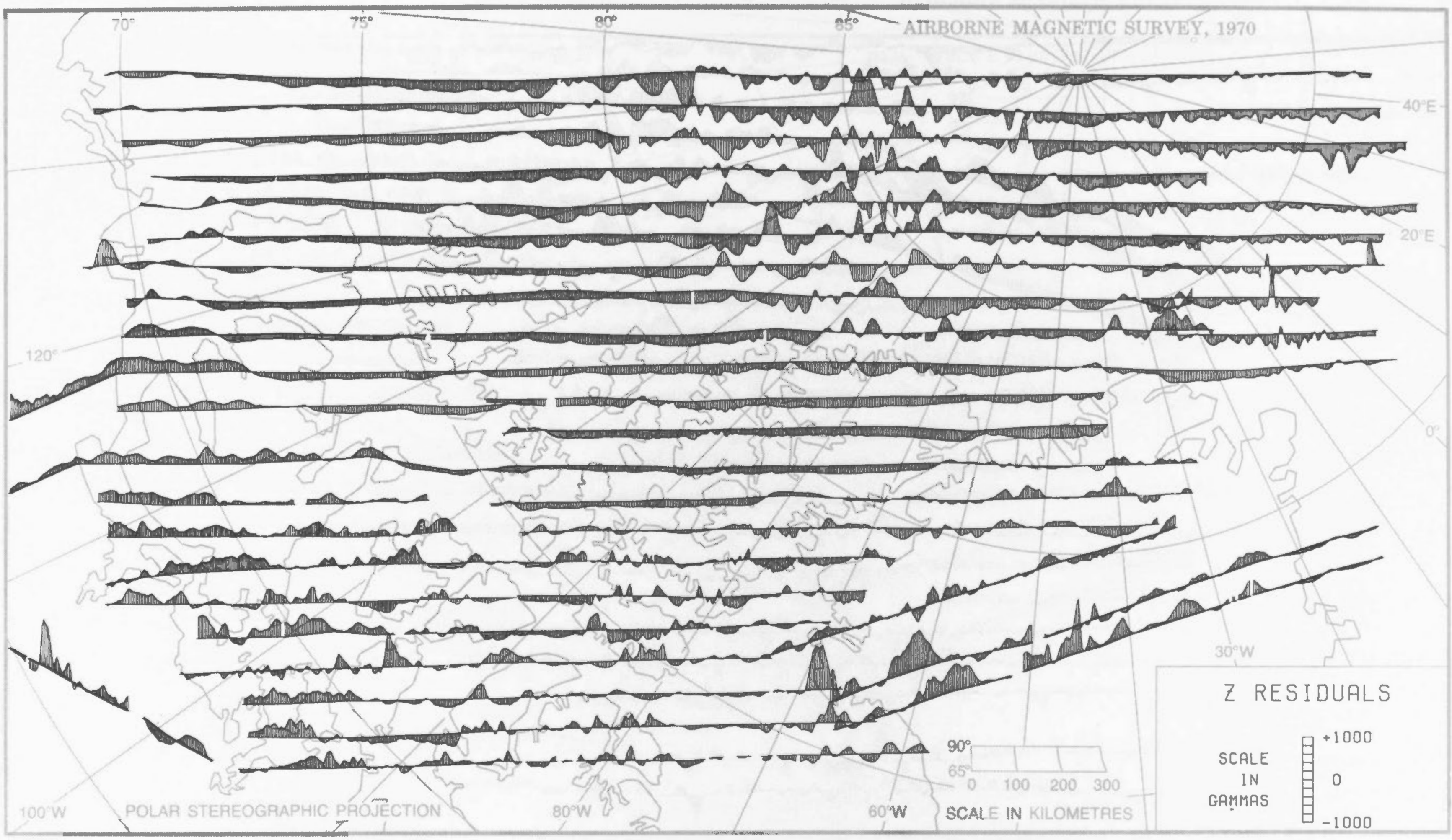

Figure 13. Residual profiles of vertical intensity, relative to the IGRF. Because of the high geomagnetic latitude of the area, total intensity residuals would be practically identical to these.

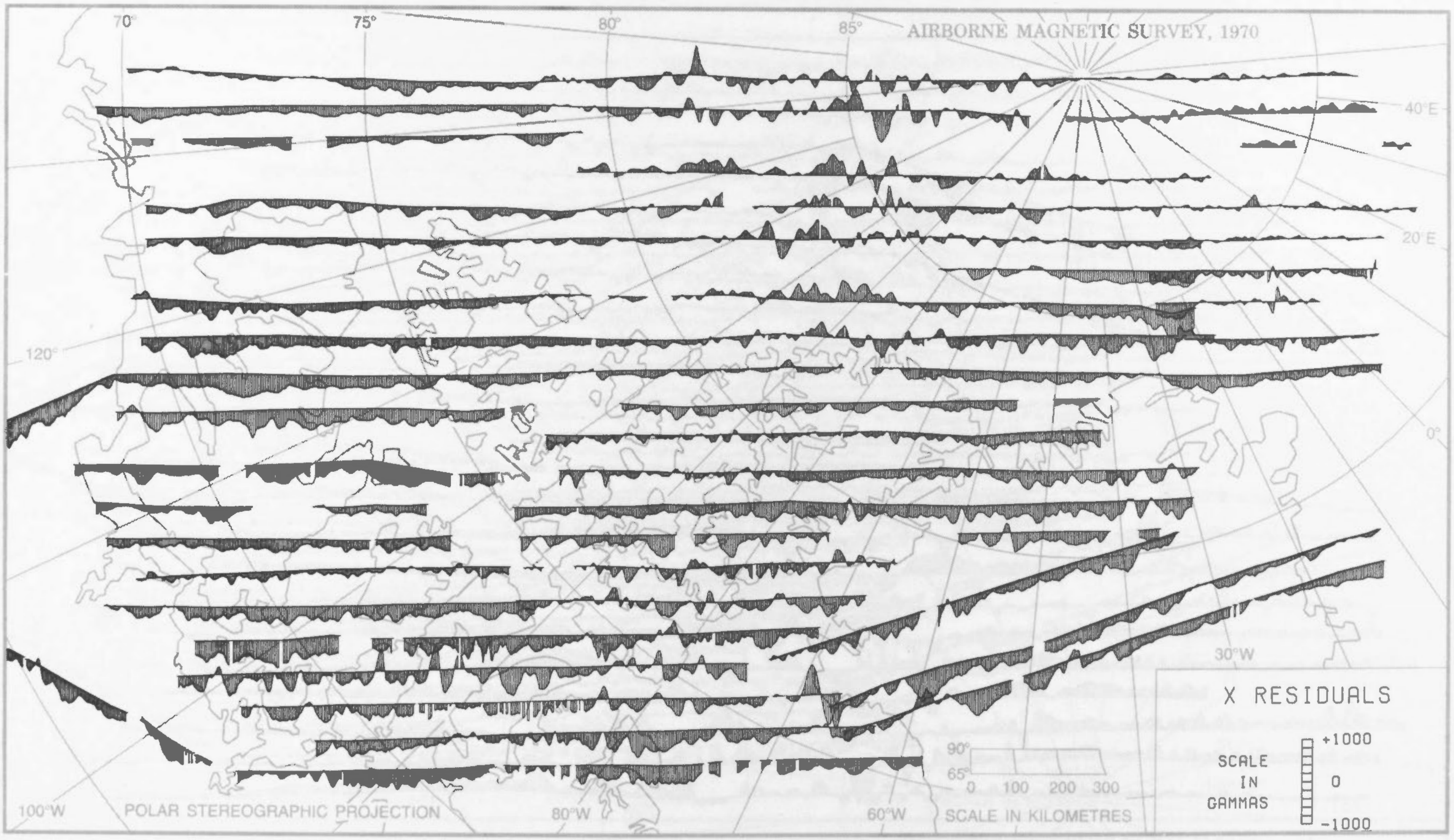

Figure 14. Residual profiles of the geographic north component, relative to the IGRF.

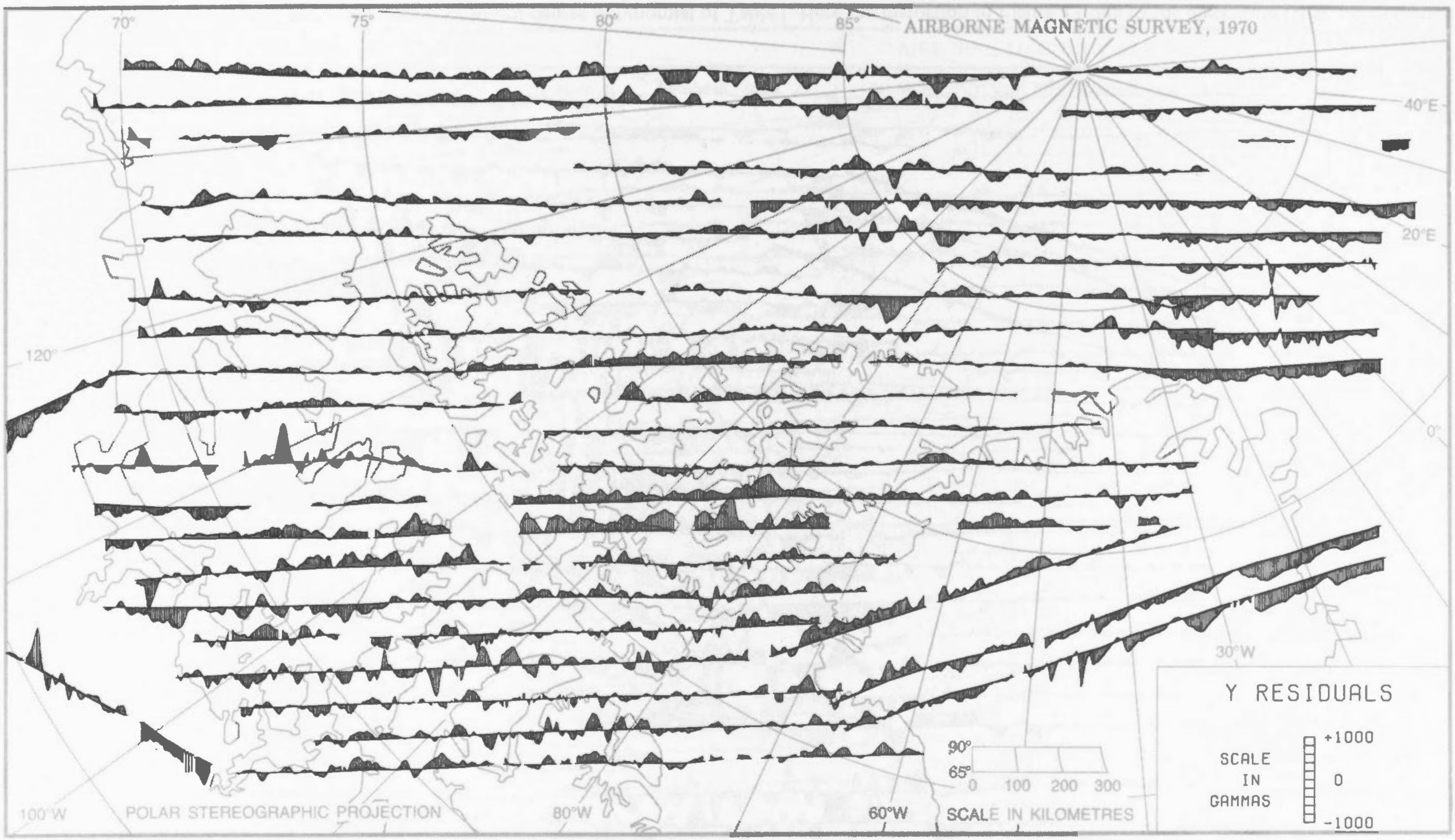

Figure 15. Residual profiles of the geographic east component, relative to the IGRF.

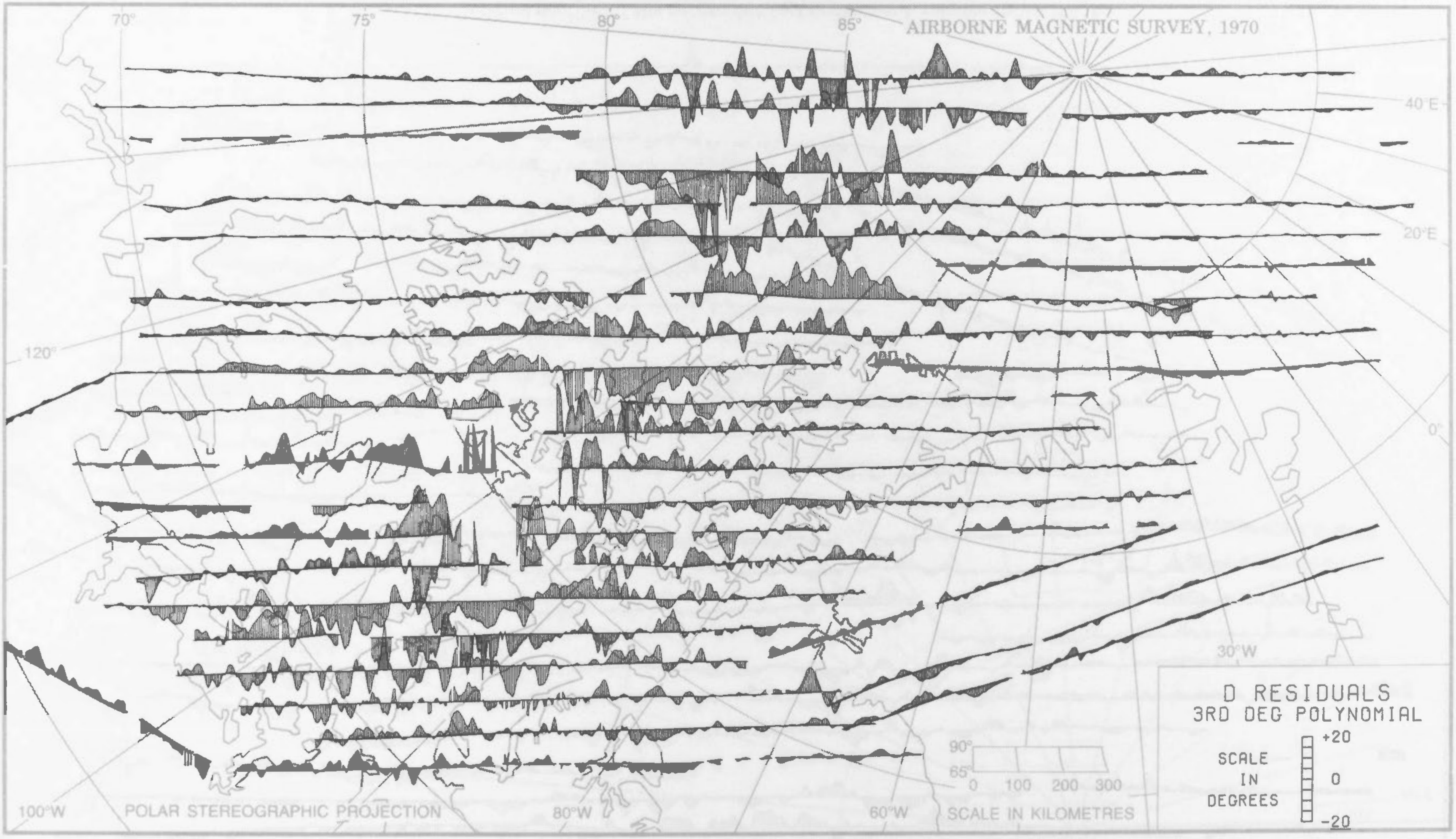

Figure 16. Residual profiles of declination, relative to 3rd-degree polynomial of Table I. Here the distortion in Figure 11 due to the inaccurate IGRF pole position has been removed.

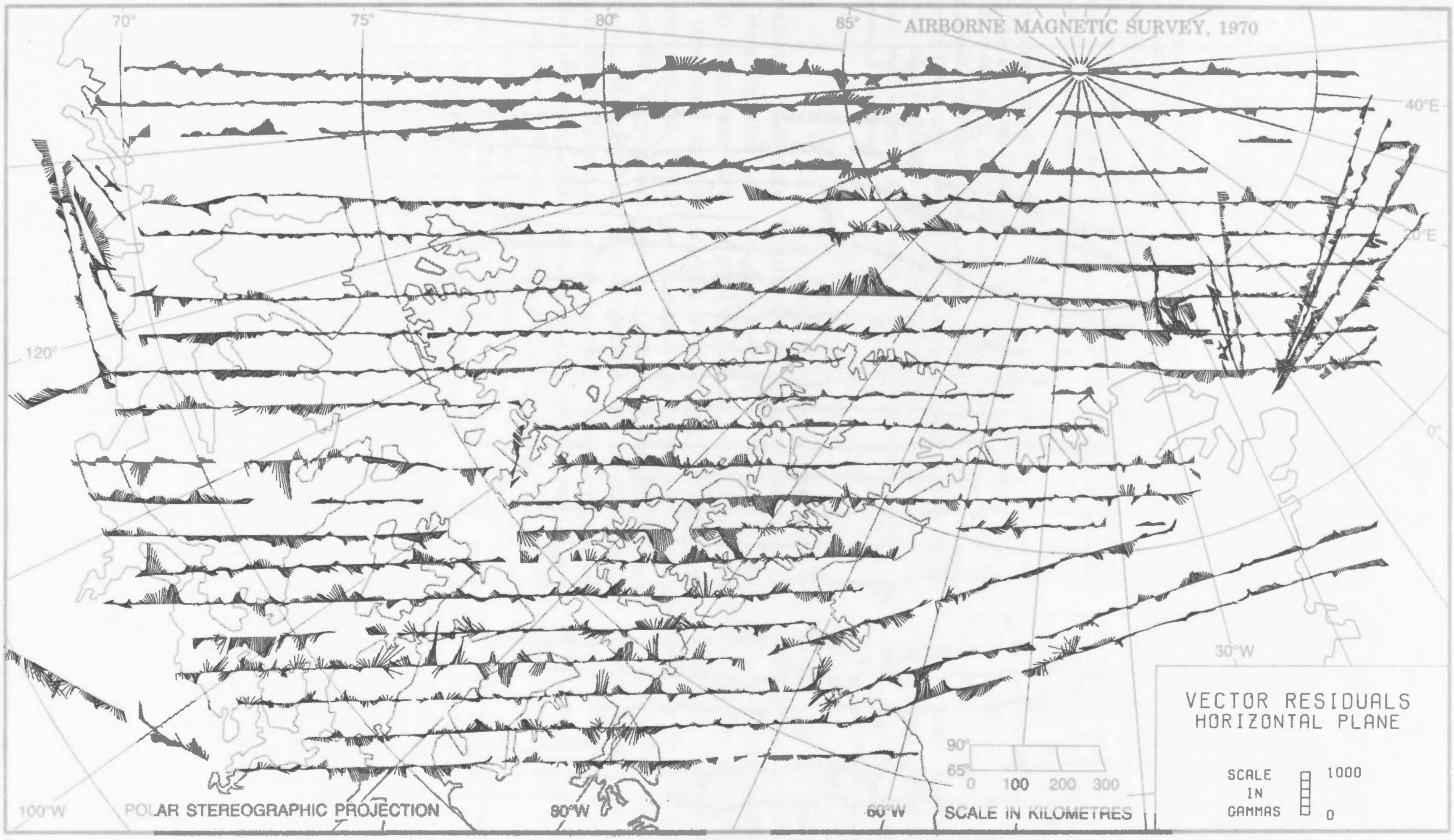

Figure 17. Projection of total residual vector onto horizontal plane. Residual vector is taken relative to 3rd-degree polynomial. Components of vector are plotted toward the top and right of map when positive, toward the bottom and left when negative.

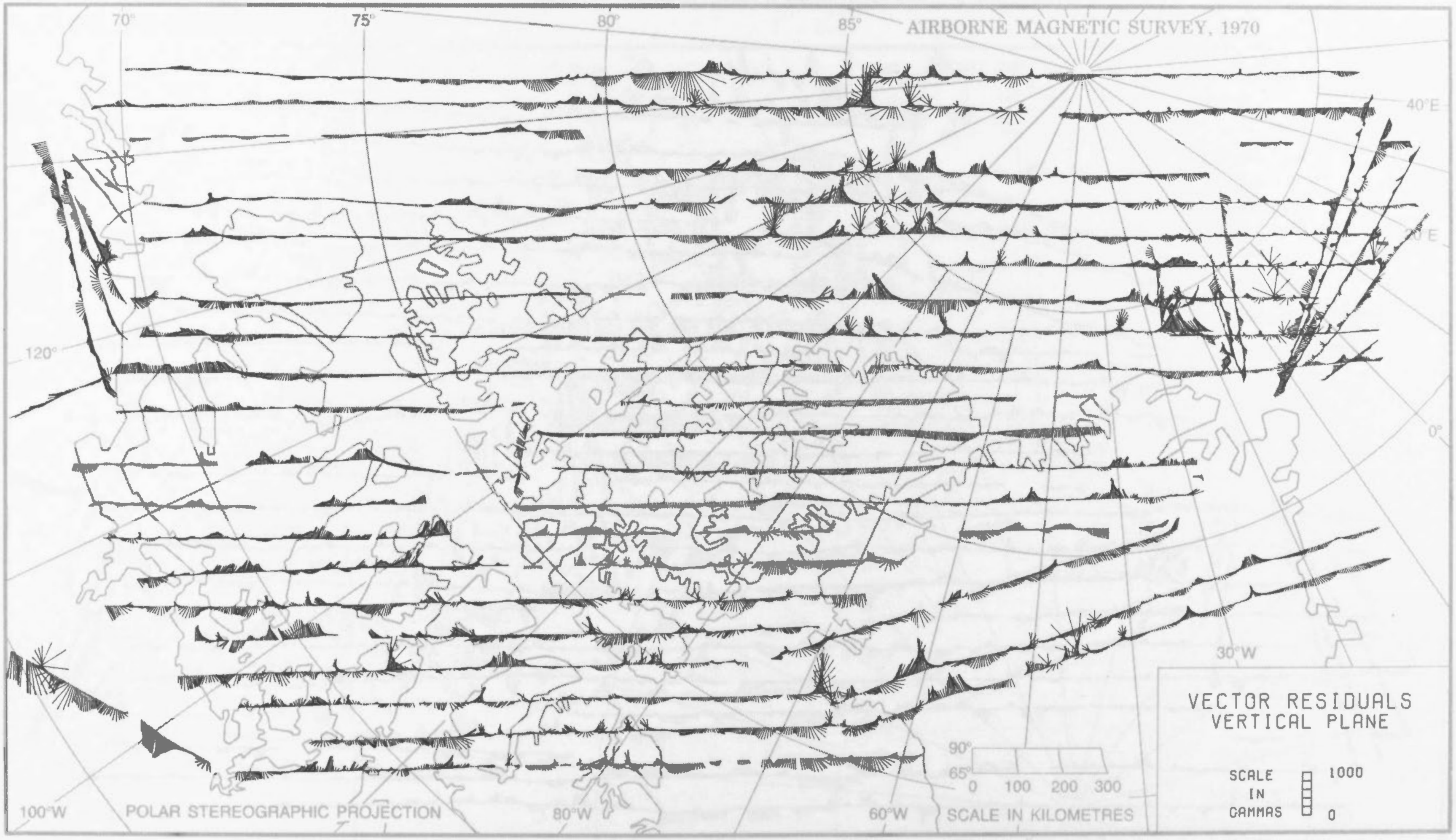

Figure 18. Projection of total residual vector onto vertical plane parallel to x-axis (from left to right, in figure). Residual vector is relative to 3rd-degree polynomial.

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editing and evaluating digitally recorded geomagnetic components at canadian observatories

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editing and evaluating digitally recorded geomagnetic components at canadian observatories

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Abstract. Automatic magnetic observatory systems (AMOS) incorporating a fluxgate sensor and a proton precession magnetometer are in operation at 10 Canadian observatories. Values of the field (H, D, Z, F) are recorded each minute on digital magnetic tape. Computer programs edit the data and reduce AMOS values to absolute observatory piers. Comparison of AMOS mean hourly values with similar values scaled from RUSKA magnetograms, and other tests, support the adoption of AMOS systems as primary recorders at Canadian observatories.

Résumé. Des systèmes automatisés d'observatoires magnétiques incorporant un détecteur à solénoïde à noyau saturable et un magnétomètre à protons sont en opération à 10 observatoires canadiens. Les valeurs du champ (H, D, Z, F) sont enregistrées numériquement chaque minute sur ruban magnétique. Les données sont imprimées sur programme de calculateur qui réduit les valeurs de ces systèmes à des seuils d'observation absolus. La comparaison des valeurs moyennes horaires de ces systèmes avec des valeurs semblables mises à l'échelle à partir des magnétogrammes de RUSKA, et autres essais, vient à l'appui de l'adoption de ces systèmes comme enregistreurs primaires dans les observatoires canadiens.

1. Introduction

Automatic magnetic observatory systems (AMOS) recording the geomagnetic elements in digital form have been designed and constructed by the geomagnetic laboratory of the Earth Physics Branch in order to improve the methods of geomagnetic data collection and to overcome many of the deficiencies in the present method of photographic recording (RUSKA) and manual processing. These systems are now in operation at ten Canadian observatories (Table I) of which two are new primary stations, namely Cambridge Bay, and Yellowknife. The automatic system was described in reports presented to the Madrid (IAGA, 1969) and Moscow (I.U.G.G., 1971) meetings. A detailed description of AMOS has been given by F. Andersen (1969).

The AMOS records quasi-instantaneous values of D, H, Z, and F once every minute on digital magnetic tape in a format which can be processed by a computer. The elements D, H, Z are derived from three fluxgate sensors mounted inside a square Helmholtz coil system. One pair of coils continuously nulls H and the other pair Z so that the fluxgates operate in essentially zero field. A proton precession magnetometer (PPM), with its sensor 3 metres from the fluxgates, measures F. The minute values of D, H, Z, or F for a ten-minute period together with the time (measured every ten minutes) and station identification constitute one physical record. Variations in D, H, and Z are also recorded continuously by an analogue (strip-chart) recorder. The resolution of the automatic instrument is ±1 gamma, and of the PPM ±0.1 gamma.

2. AMOS alignment

Although the instrument is designed to measure D, H, Z, it can be aligned as an X, Y, Z instrument at locations where a horizontal component is small, and less than 1000γ approximately. In the present network of automatic stations, X, Y, Z are recorded at Churchill and Baker Lake ($Y < 500\gamma$) and Resolute ($X \sim 200\gamma$).

To achieve the maximum separation between various observatory instruments, the AMOS fluxgate sensors are placed in a seldom used corner of an observatory building. This makes it difficult to use the orientation of a wall of the building as a reference in aligning the sensors in the D, H or X, Y coordinate system.

The following technique has been adopted in aligning the AMOS D, H (X, Y) sensors by assuming that the AMOS is in itself an absolute instrument. Absolute observations of the angles D and I are made with the standard observatory D and I instrument and the total field value F is observed from the AMOS proton precession magnetometer. Values for H or X and Y are then calculated and the AMOS sensor rotated in azimuth until the AMOS output coincides with the calculated absolute values of the components. This rotation is valid since the fluxgate unit is mounted on a rigid platform which can be levelled, the Z axis is perpendicular (within half-degree) to this platform and D, H (X, Y) axes are constructed orthogonally (within half-degree) to the vertical and to each other.

This alignment procedure was successful at all stations where no large gradients existed between the D and I pier and the AMOS sensors (see Section 8 on tests for misalignment).

3. Editing digital data

Frequently, unattended electronic data acquisition systems do not create on magnetic tape digital data which are compatible with the restrictions imposed by the computer's standard programming routines. Such problems as power failures, electronic device breakdowns, mechanical troubles and other unpredictable difficulties, can cause data gaps, bad coding, parity errors and irregular physical record lengths. Further, the component values themselves may not be the expected ones; for example, in the F readings, numerous spurious values are recorded because of the nature of the proton sensor itself and are hence unavoidable. Therefore, an editing program is required which will test for the various

Table I
Canadian Magnetic Observatory Network 1973

Station	Coordinates: Geographic Lat. N.	Geographic Long. E.	Geomagnetic* Lat. N.	Geomagnetic* Long. E.	Photographic Recording (RUSKA)	Low Sens. Stand-by Recorder	AMOS	TVS
Baker Lake	64.3	264.0	73.9	314.8	X Y Z	Fluxgate	X Y Z Nov. 1971	
Cambridge Bay	69.1	255.0	76.7	294.0	not installed	(Fluxgate 1973)	H D Z April 1972	June 1972
Fort Churchill	58.8	265.9	68.8	322.5	X Y Z	Fluxgate	X Y Z Sept. 1971	July 1972
Great Whale River	55.3	282.25	66.8	347.2	H D Z	Fluxgate	H D Z Nov. 1972	
Meanook	54.6	246.7	61.9	300.7	H D Z	Lacour	H D Z Nov. 1970	Aug. 1972
Mould Bay	76.2	240.6	79.1	255.4	X Y Z	Fluxgate	not installed	
Ottawa	45.4	284.45	57.0	351.5	H D Z	RUSKA Fluxgate	H D Z Sept. 1970	Aug. 1972
Resolute Bay	74.7	265.1	83.1	287.7	X Y Z	Fluxgate	(X Y Z) (1973)	
St. John's	47.6	307.3	58.7	21.4	H D Z to July 31/72	Fluxgate	H D Z Dec. 1969	Jan. 1972
Victoria	48.5	236.6	54.3	292.7	H D Z	Askania Fluxgate	H D Z Nov. 1970	Mar. 1972
Yellowknife	62.4	245.6	69.1	292.8	not installed	(Fluxgate 1974)	H D Z (1973)	

*** Assuming geomagnetic pole 78.3°N, 291.0E (Finch and Leaton, 1957).**

Note: Agincourt observatory ceased operation March 31, 1969.
Alert observatory ceased operation September 30, 1972.

errors in the data, recover all possible component values, correct erratic readings and store the results on magnetic tape. The essential features of this program will now be described.

As a preparatory step, the AMOS raw data tapes (200 bpi) are copied using a special purpose machine language program (IBM OS/360 Assembler) in order to generate records (at 800 bpi) consistent (in parity) with the standard input routines of higher level languages (COBOL). This program also deletes noise records and substitutes unrecognizable characters with zeros.

The data acquisition system was designed to create physical records of 336 characters containing ten consecutive sets of four geomagnetic components (D, H, Z, F) measured at each minute, and followed by time (day, hour, minute) and by identification (year, station number). The editing program logically organizes these data into 20-minute blocks or groups with a ten-minute overlap from group to group. Since the number of readings on the raw data tape must agree with the incrementation (in minutes) of the clock, extraneous values can be detected and deleted, and missing values are filled in with a string of 9's. It should be noted that the clock rarely malfunctions, since it is driven by a trickle-charged battery.

Each value of D, H, Z is now tested to lie within a certain range of control values provided by the program. The control values are the means of the previous 20-minute group of values. For the first 20-minute set of values of the data tape, these control values must be supplied via data cards during program execution. The ten-minute overlap from group to group guarantees that the means reflect the level of disturbance in the current 20-minute block being tested. The level of disturbance within any group is usually similar to that of the previous group. However, in cases when these levels from block to block are dissimilar the ten-minute overlap prevents the means from stepping erratically. Whenever large SSC's and magnetic storms occur, large jumps in the means cannot be prevented, so that the range, mentioned above, is changed (simple card inputs) to conform to the magnetic disturbance levels. If the test fails the value tested is replaced with a string of 9's.

The F values however are not tested in the above procedure to lie within a certain interval. Spurious readings of F are readily apparent from data listings.

These spurious readings occur because of radio signal pickup, power line transients and other external noise signals which occur during the measurement of the precession frequency of the PPM. However the F values can be expected to differ from $(D^2 + H^2 + Z^2)^{1/2} = F^*$ by an amount which will be a constant (to the nearest gamma) within any 20-minute grouping. The difference $\Delta F = (F-F^*)$ will generally not be zero owing to pier separation, temperature drifts in the fluxgate electronics and of course spurious readings of F. The values F* have already been tested and accepted according to the procedure outlined in the previous paragraph. On generating departures of the ΔF's about a mean $\overline{\Delta F}$ for the 20-minute group, the maximum discordant value greater than 2 times the standard deviation of the departures is a spurious reading in F and is therefore discarded. These same rules are then applied to the remaining values, and are re-applied cyclically until all spurious readings are rejected. This procedure is known as Chauvenet's criterion (Tuttle and Satterly, 1925). New values of F are simply generated with $F = F^* + \overline{\Delta F}$ for each discarded value of F where $\overline{\Delta F}$ is the mean of those ΔF's in the 20-minute group which have not been discarded. The ten-minute overlap from group to group guarantees that no more than 10 consecutive values are discarded within any 20-minute group. This is true because these 10 values have already been accepted (or generated by $F = F^* + \overline{\Delta F}$) by the application of Chauvenet's criterion to the previous 20-minute set of values. Finally, as a further check, the F values themselves are tested against the mean F of the previous 20-minute group as has been done for D, H, Z. Obviously, this is required to test those values of F when F* is missing in which case the corresponding F value is not included in the grouping of values for Chauvenet's test.

As noted above a non-zero ΔF results also from temperature drifts (see Section 5) of the fluxgate magnetometer and from the separation between the PPM and the fluxgate sensors. These effects must be removed to ensure that F−F* will be less than 1 gamma. Therefore, multiplying the D, H and Z values by F/F* reduces these values to the PPM pier and removes the temperature dependency of the fluxgate readings. The total force computed from these corrected values of D, H, Z is now equal to F to within 1 gamma.

No attempt as yet has been made to fill missing values (a string of six 9's). Gaps covering a full hour are not processed and such "missing hours" are not written on the archival tapes; these occurrences are rare. The most frequent gaps in the data occur during tape changes each month, being at best less than 10 minutes and at worst 20 minutes. Eventually these missing values should be filled by transcribing the data from strip-chart recordings.

The edited values of D, H, Z, and F are now stored temporarily on magnetic tape for further processing as discussed in next section. The above discussion provides however only an outline of the editing program. The programming logic which is required to handle data gaps (because of power failures, etc.), and those records not equal to 336 characters, and other problems, is quite extensive, but a discussion of such logic is not essential in this paper. What is important is that the procedure given above approximates that of a geomagnetician scanning simultaneous listings of D, H, Z, and F. For example, Tables IIa and IIb provide a listing of the original raw data (at St. John's) and the corresponding corrected values for a selected set of 20 values. It is easily observed in Table IIa how D, H, Z varies smoothly from minute to minute whereas F contains four erratic values which differ greatly from the remaining values. The remaining ΔF values however have a small variation from −11 to −14 gammas; Chauvenet's criterion removes this variation in ΔF's. Hence, the corrected version of F is given in Table IIb in which the ΔF's are less than 1 gamma.

Table IIa
Original Values (in gammas)

D	H	Z	F	F*	ΔF
36	17584	50826	53768.9	53781.8	− 12.9
37	17584	50825	53742.9	53780.8	− 37.9*
38	17582	50824	53766.4	53779.2	− 12.8
39	17583	50824	53767.4	53779.6	− 12.2
38	17583	50825	53767.4	53780.5	− 13.1
40	17582	50823	53765.5	53778.3	− 12.8
40	17581	50822	53762.8	53777.0	− 14.2
40	17581	50824	53766.2	53778.9	− 12.7
39	17582	50823	53643.6	53778.3	−134.7*
39	17583	50825	53768.9	53780.5	− 11.6
40	17581	50824	53766.2	53778.9	− 12.7
41	17580	50822	53765.1	53776.7	− 11.6
41	17580	50822	53764.9	53776.7	− 11.8
42	17580	50822	53676.3	53776.7	−100.4*
42	17580	50821	53764.3	53775.8	− 11.5
44	17580	50822	53763.8	53776.7	− 12.9
45	17579	50821	53332.0	53775.4	−443.4*
46	17578	50819	53761.7	53773.2	− 11.5
46	17576	50817	53758.0	53770.7	− 12.7
46	17575	50817	53757.6	53770.3	− 12.7

A 20-minute section of uncorrected values from St. John's observatory for March 29, 1970, 2008 UT to 2028 UT. $F^* = (D^2 + H^2 + Z^2)^{1/2}$ and $\Delta F = F - F^*$.

The four ΔF values marked with asterisks are erratic and we wish to remove them. The remaining values vary between −11 to −14 gammas, the mean of which represents the separation between the PPM and fluxgate sensor.

Table IIb
Corrected Values (in gammas)

D	H	Z	F	F*	ΔF
36	17580	50814	53768.9	53769.1	−0.2
37	17580	50813	53767.8	53768.2	−0.4*
38	17578	50812	53766.2	53766.6	−0.4**
39	17579	50812	53766.8	53766.9	−0.1**
38	17579	50813	53767.7	53767.9	−0.2**
40	17578	50811	53765.5	53765.7	−0.2
40	17577	50810	53764.2	53764.4	−0.2**
40	17577	50812	53766.2	53766.3	−0.1
39	17578	50811	53765.5	53765.7	−0.2*
39	17579	50813	53767.7	53767.9	−0.2**
40	17577	50812	53766.2	53766.3	−0.1
41	17576	50810	53763.9	53764.1	−0.2**
41	17576	50810	53763.9	53764.1	−0.2**
42	17576	50810	53764.0	53764.1	−0.1*
42	17576	50809	53763.1	53763.1	0.0**
44	17576	50810	53764.0	53764.1	−0.1**
45	17575	50809	53762.7	53762.8	−0.1*
46	17574	50807	53760.5	53760.6	−0.1**
46	17572	50805	53758.0	53758.0	0.0
46	17571	50805	53757.6	53757.7	−0.1

A 20-minute set of corrected values corresponding to those of Table IIa. The four spurious F values of Table IIa are here indicated by single asterisks. Here these values are replaced using $F = F^* + \overline{\Delta F}$ where $\overline{\Delta F}$ is the mean of the remaining set of ΔF's as outlined in text. Note that ten more values have been changed by (indicated by double asterisks) values up to 1.4 gammas. This represents a slight smoothing of the F values so that the variation in F more closely follows that of F*.

4. Calibration of AMOS data

Additional computer programs have been drafted to plot the components D, H, Z, to make baseline corrections and to store the final, corrected magnetic observations on digital magnetic tape. A CALCOMP plotter is used to generate traces of D, H, and Z, replicating standard-run RUSKA magnetograms. From these plots, any errors in the data not detected by the procedure in previous sections are readily apparent and any sudden baseline shifts are easily observed. Selected listings of corrected D, H, Z, and F values are compared with absolute observations of the magnetic field to determine AMOS baseline values. By comparison of corrected digital magnetometer values of D, H, Z with simultaneous absolute field measurements, an AMOS D baseline is determined together with corrections necessary to reduce the AMOS H and Z values to the values of H and Z measured at the absolute piers.

5. Temperature drifts and pier separations

As is mentioned in Section 3, each component D, H, and Z was multiplied by F/F* $[F^* = (D^2 + H^2 + Z^2)^{1/2}]$ to remove temperature drifts and to correct for pier separation. Although fluxgate values are very stable over short intervals, errors may occur over intervals of several days because of temperature variations. An obvious source of such errors is the thermal expansion of the feedback coils. This temperature effect is reversible and is proportional to the magnitude of the magnetic field component. Hence, since the PPM F values are independent of temperature, the ratio given above is the required proportionality constant. A more troublesome source of error is the abrupt shifts in zero-offset of the order of 1 gamma and these are accumulative to as much as 10 gammas per month. The cause of these shifts is not well understood but it is often associated with temperature changes at the sensor.

The effectiveness of the F/F* correction is illustrated in Figure 1 using St. John's data for January 25 and 26, 1972. The difference between the Z(AMOS) mean hourly value (MHV) and the MHV scaled from the RUSKA magnetograms is plotted for both the corrected and uncorrected values of Z(AMOS). Note that the corrected Z differences all lie within 10 gammas with no long term shifts. Although each point has an uncertainty of about 4 gammas, the two-day average of 4 gammas represents the difference in Z between the PPM and absolute piers. One should remember however that the F/F* correction reduces the Z values from the fluxgate pier to the PPM pier.

It should be noted that the F/F* ratio does not correct the data for the shifts in zero-offset of the fluxgate sensors at least in the case of the smaller components of the geomagnetic field. The ratio also cannot correct for temperature-related changes in level or azimuth of the whole fluxgate assembly. However, it does in practice significantly reduce temperature effects in the data, as the above example has illustrated.

6. AMOS baseline determinations

The procedure for reducing the AMOS values to absolute reference piers is analogous to the calculation of the baseline values of photographic magnetograms from the absolute determinations of D, I and F. F values are measured at the PPM sensor and the D and I total field values are measured at another absolute pier. In the following all fluxgate values, D, H, Z, have been reduced to the PPM pier by multiplication with the factor F/F* as discussed above.

The D (AMOS) sensor is oriented perpendicular to the direction of the average magnetic meridian and measures the magnetic intensity in gammas transverse to the meridian. A D (AMOS) baseline is obtained by calibrating the zero level of the AMOS D against the absolute measurement of D. The output of D (AMOS) in gammas is converted into minutes by using the relationship D (mins of arc) = 3438 x arc sin (D/H). The D (AMOS) baseline is then D (Absolute) −

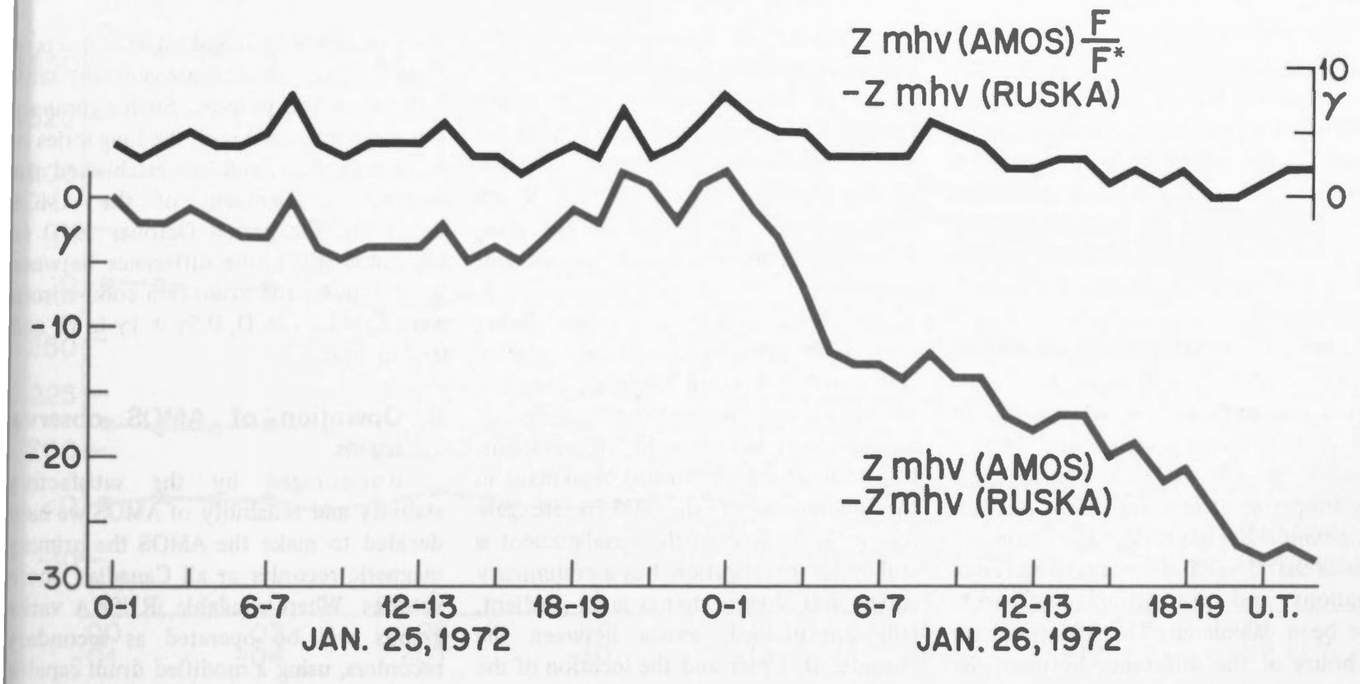

Figure 1. Z MHV (AMOS) – Z MHV (RUSKA) are the uncorrected differences; corrected differences are shown as Z MHV (AMOS) F/F* – Z MHV (RUSKA).

D (AMOS) in minutes of arc. Correctly, instead of (D/H) one should use $(D/(H^2 + D^2)^{1/2}$, where H and D are the AMOS output values. The error introduced by using H rather than $(H^2 + D^2)^{1/2}$ is less than 0.1 min unless D (AMOS) > 3.5 per cent of H. This is frequently the case at the Arctic station at Cambridge Bay (H ~ 3000γ) and will occur at all stations during intense storms. This has been one factor in the decision to express the one-minute values at all stations in the orthogonal system, X, Y, Z, since D (in minutes), $H_T = (H^2 + D^2)^{1/2}$, Z, is not an orthogonal system. The AMOS values H, D are now simply transformed into X and Y using the following rotational equations:

$$X = H_\gamma \cos D_{bl} - D_\gamma \sin D_{bl}$$

$$Y = H_\gamma \sin D_{bl} + D_\gamma \cos D_{bl}$$

where H_γ is H (AMOS) in gammas, D_γ is D (AMOS) in gammas and D_{bl} is the D (AMOS) baseline in minutes of arc as determined above.

For the case where X, Y, Z are recorded, corrections to the absolute reference field require the calculation of absolute values of X and Y from the absolute measurements of D, I, and F. In the following, the subscripts refer to the times of the absolute D, I observations:

$$H_I = F_I \cos I$$

$$H_D = H_I + \Delta H$$

where ΔH is the change in H between the times of the D and I observations. At Baker Lake and Fort Churchill, where D is about 3°, ΔH does not differ significantly from $\Delta X = X_D - X_I$. The value of ΔX is therefore obtained from the AMOS data and we have

$$X\ (\text{Absolute}) = H_D \cos D$$

$$Y\ (\text{Absolute}) = H_D \sin D.$$

The corrections to reduce the AMOS X and Y values to the absolute reference pier are given by

$$X\ (\text{Absolute}) - X\ (\text{AMOS})_D$$

and $Y\ (\text{Absolute}) - Y\ (\text{AMOS})_D$.

Similarly, Z (Absolute) = $F_I \sin I$ and the Z correction is given by

$$Z\ (\text{Absolute}) - Z\ (\text{AMOS})_I.$$

7. Comparison of AMOS data with absolute field measurements

AMOS data at all stations are regularly compared with the absolute field measurements by plotting the AMOS D baseline and the corrections required to reduce AMOS H (X, Y), Z values to the field measured at the absolute piers.

For example, a careful comparison has been made between the corrected AMOS D, H, Z values and the absolute field observations at St. John's observatory for the 12-month period March 1970 to February 1971. For H and Z the differences between the absolute observations and the corresponding AMOS values were plotted, and the straight line segments were fitted to the points. In the interval from March to December 1970, for 84 absolute (QHM) observations, the correction necessary to reduce the AMOS H to the absolute pier, as given by the best straight line fit, was 3.3 gammas with an r.m.s. deviation of 1.6 gammas. The mean adopted correction to the AMOS Z in this period was 5.1 gammas with an r.m.s. of 1.6 gammas. The typical scatter in any month in determining the AMOS D baseline was 0.6 minute or 3 gammas, comparable to the r.m.s. deviation in any one month in the absolute minus AMOS values for H and Z.

The r.m.s. deviation in the observed minus adopted H baselines for the RUSKA for the period March 1970 to December 1970 was 1.6 gammas, or the same as that found for the AMOS H. In general, it is concluded that the AMOS baseline stability is as good as the baseline stability of the RUSKA. Samples of AMOS baseline plots for St. John's are shown in Figure 2.

8. Tests for misalignment of AMOS

A detailed comparison has been carried out between the MHV's derived from AMOS minute data and MHV's scaled from the RUSKA photographic magnetograms at stations where RUSKA equipment is available. For selected periods of 5 and 10 days, regression equations and correlation coefficients have been calculated. The variation over 24 hours of the difference between the two sets of MHV has been plotted. Scale value uncertainties and misalignments between the RUSKA and AMOS systems have been observed in several cases. Any high correlation between the diurnal variation of the AMOS-RUSKA MHV differences in one element and the field of another element indicates misalignment between the AMOS and RUSKA systems. The amount of misalignment can be conveniently calculated from the monograms or formulae given by McComb (1952). For example, a strong correlation was found between the diurnal variation of the (AMOS-RUSKA) MHV in X and of Y, at Baker Lake (Figure 3), indicating a misalignment of the X component amounting to 14 degrees.

A comparison between the Baker Lake MHV given by the RUSKA and by the standby fluxgate recorder, independently aligned, showed no evidence of misalignment between the two systems, suggesting that an error had been made in the alignment of the AMOS fluxgate sensor. The cause of the misalignment is still under investigation, but a preliminary survey has shown that a large gradient, still unexplained, exists between the absolute D, I pier and the location of the AMOS fluxgate sensor. The misalignment is explained by the fact that the AMOS X sensor had been aligned to conform to the X field observed at the absolute pier.

The definitive test however for detecting any misalignment of the AMOS system is the comparison of AMOS values with simultaneous absolute measurements made for different disturbance levels of the field. Forenoon and afternoon sets of absolute measurements are generally satisfactory for this purpose. Such a comparison has been made with the long series of St. John's data, and has established the satisfactory alignment of the AMOS there: for the period October 1970 to December 1971, the difference between the forenoon and afternoon comparisons were 1γ ±1.5γ in D, 0.5γ ± 1γ in H, and 0γ ±1γ in Z.

9. Operation of AMOS observatories

Encouraged by the satisfactory stability and reliability of AMOS we have decided to make the AMOS the primary magnetic recorder at all Canadian observatories. Where available, RUSKA variographs will be operated as secondary recorders, using a modified drum capable of operating for a month without attendance. At sites where RUSKAs are not in operation an independent 3-component fluxgate recording on paper chart will provide a standby analogue recording system. RUSKA magnetograms and/or computer plots of the one minute AMOS data (replicating the RUSKA magnetograms) will be deposited regularly at WDC

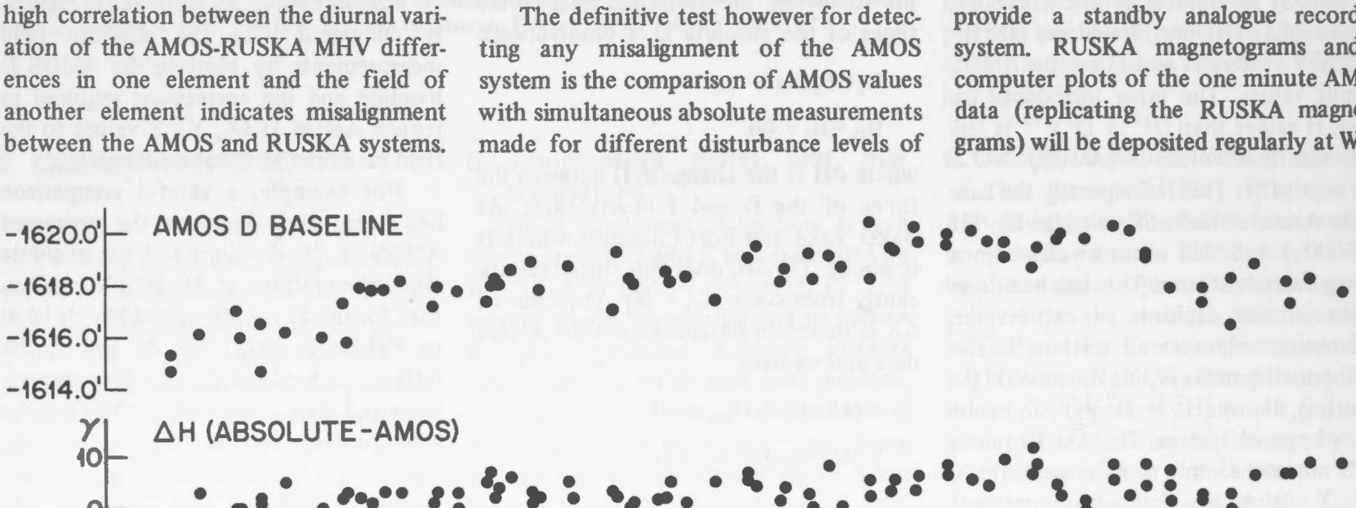

Figure 2. AMOS baseline plot, St. John's.

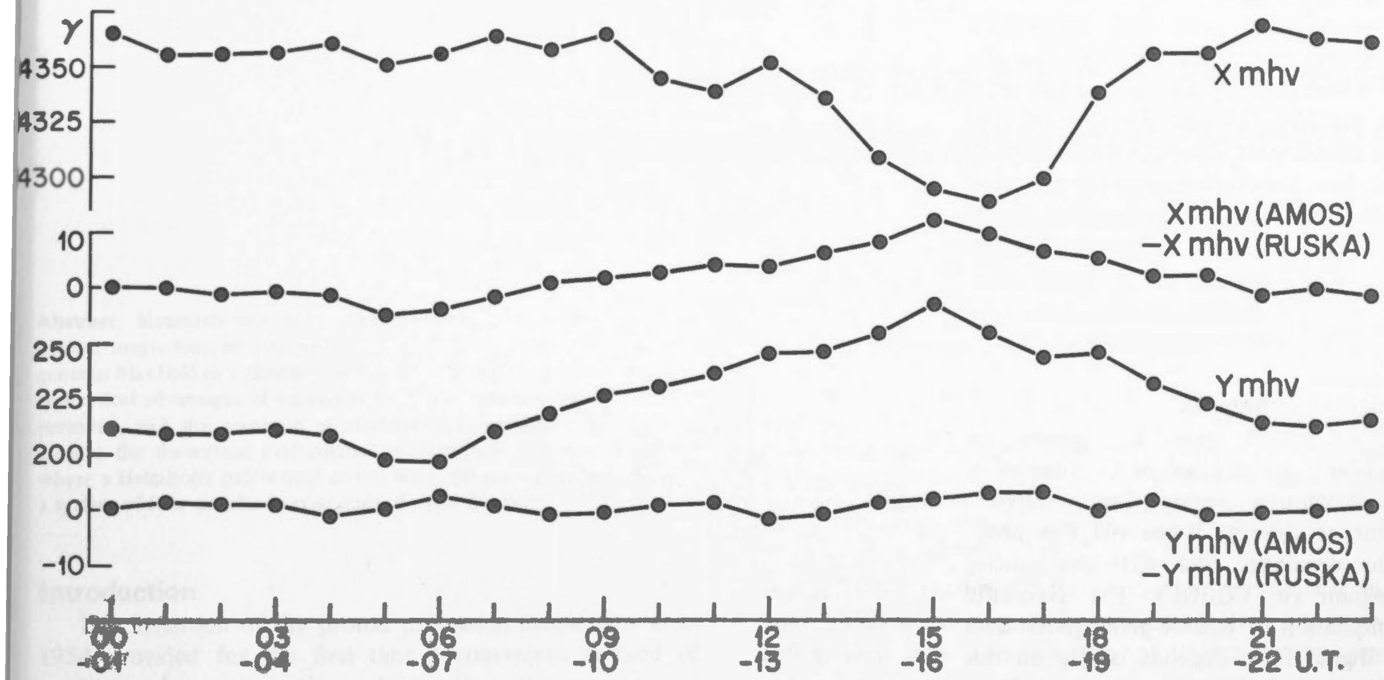

Figure 3. Example of misalignment in X component between RUSKA and AMOS recorders, Baker Lake.

A for distribution to individuals and agencies who request them. MHV tables for inclusion in observatory yearbooks will be compiled from the edited AMOS data. The scaling of MHV from photographic records will be done only for periods for which AMOS data are not available. At permanently staffed observatories additional time will be available to improve the quality and increase the number of absolute field measurements. Stations not permanently staffed, such as St. John's and Cambridge Bay, will require attendance once or twice a week for absolute observations, and instrument and building checks.

Installation and maintenance of AMOS is carried out by electronic technologists located in Ottawa, who travel as required to the AMOS sites. At sites where telephone lines are available, telephone verification systems (TVS) have been installed (Andersen, 1973). These enable the operations controller in Ottawa to check at any time the data being supplied to the tape recorder at any observatory equipped with TVS. In practice, all TVS observatories are interrogated from Ottawa for one or two minutes each day. Frequently an AMOS malfunction can be diagnosed immediately from the TVS check. Replacement modules for the equipment can then be shipped to the stations, dispensing with the necessity of a costly service trip. Use will be made of the new communication satellite Anik I for TVS checks at isolated sites where satellite facilities are available. It is evident that facilities already exist for real-time transmission of observatory data, although such an expensive service cannot be justified at this time.

10. Storage of data

The storage tape containing the final corrected values of X, Y, Z, and F are organized in blocks of records containing one hour of data on digital magnetic tape (800 bpi) as follows:

$(ID,YR,DY,UT)_0$, $(X, Y, Z, F)_1$, $(X, Y, Z, F)_2$, . . ., $(X, Y, Z, F)_{60}$ where ID is 6 digit IAGA numeric station code (longitude and colatitude to the nearest degree).*

YR is 6 digit year

DY is 6 digit day ranging from 1-366

UT is a 6 digit hour ranging from 0-23

*This format will be modified to agree with that recommended by the International Association of Geomagnetism and Aeronomy for magnetic tape storage of one-minute observatory values (IAGA News No. 12, Sept. 1973).

and where the simultaneous X, Y, Z, and F values (each of 6 digits with sign) start at the first minute of the hour and end at the sixtieth minute of the same hour. Each physical record therefore has 1464 characters. The X, Y, Z values are written (as integer constants) to the nearest gamma and the F value to the nearest tenth of a gamma. Each magnetic tape volume has only one station year of data, followed (but separated with an end-of-file mark) by the hourly mean values, component ranges and summary tables.

11. Discussion and conclusion

The automatic magnetic observatory system has proven to be at least as reliable and stable as our RUSKA systems. AMOS has recorded successfully such large storms as that of August 4-5, 1972, during which the field changed by more than 1800γ/min whereas our photographic equipment failed to monitor such a disturbance. The direct recording of one-minute values on digital tape is an improvement over the manual scaling or digitizing of photographic traces. However, the more than 60 fold increase in the amount of data handled over that of

RUSKA MHV data has necessitated computer processing; the text has outlined our procedure which we feel to be the simplest. The AMOS equipment does not circumvent calibration measurements, nor does it reduce manpower and costs (which are increased significantly). AMOS does however create a large data base of reliable geomagnetic field values from which more refined studies of the geomagnetic variations can be undertaken.

Acknowledgments

We cannot stress too greatly the excellent contribution of G. Tunstall of the Computer Science Centre, Department of Energy, Mines and Resources, who developed the extensive editing program (in COBOL). The successful compilation of reliable geomagnetic data in digital form depends largely on this editing program.

The guidance and encouragement of Dr. P.H. Serson during all stages of this work is greatly appreciated.

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compact bias coil systems for geomagnetic measurements

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Abstract. Measurements of the geomagnetic components with the proton magnetometer require a coil system for producting a homogeneous bias field in a direction which can be determined accurately. The theoretical advantages of various symmetrical arrangements of coils are reviewed, and the precision of mechanical construction necessary to achieve the theoretical performance is estimated. It is concluded that where a Helmholtz pair would be too large, the most practical choice is a system of four circular coaxial coils of equal diameter.

Résumé. Les mesures des composantes géomagnétiques effectuées à l'aide d'un magnétomètre à protons exigent l'utilisation d'un jeu de bobines qui produit un champ homogène dévié dans une direction qui peut être déterminée avec précision. L'auteur étudie les avantages théoriques de diverses dispositions symétriques des bobines et il évalue l'exactitude mécanique nécessaire pour atteindre le rendement théorique. Il conclut que lorsqu'une paire de bobines Helmholtz occuperait un espace trop considérable, le choix le plus pratique serait un jeu de quatre bobines circulaires coaxiales de diamètre égal.

Introduction

The invention of the proton precession magnetometer in 1954 provided for the first time a convenient method of measuring the geomagnetic total intensity with an accuracy of 1 nT. Soon, several methods were developed to adapt the proton and other precession-type magnetometers for the absolute measurement of the components of the geomagnetic field (for reviews see Wienert, 1970; Stuart, 1972). Most of these methods require the addition to the geomagnetic field of an artificial magnetic field, of similar order of magnitude, in a known direction. A precession magnetometer measures the magnitude of the resultant, from which the desired component is deduced.

A basic difficulty is that the magnitude of the resultant field must be highly uniform for satisfactory operation of the precession magnetometer. Using free nuclear precession, a difference of a few nT across the sample will cause the precessing nuclei to fall out of phase in a second or so, and the signal decays to the noise level before an accurate measurement of frequency can be made. Other types of precession magnetometers are less susceptible to gradients, but all suffer some degradation of performance in non-uniform fields.

In the following discussion it is assumed that the free proton precession technique is used, with a sample which would fit inside a sphere 10 cm in diameter. Since bias fields as large as 40,000 nT may be required (Bobrov and Trofimov, 1968; Wienert, 1970), we adopt the criterion that within this sphere the components of the bias field must vary by no more than 1 part in 10^4 of the central axial field.

The classical way to produce a uniform magnetic field is by means of a Helmholtz coil system. The above criterion requires a Helmholtz pair about 1 m in diameter. In determining the azimuth of the geomagnetic field, it is necessary to invert the coil system, rotating it about a horizontal axis, and this is very awkward with large coils. Moreover, the external field at a large distance x from a coil system of radius a is approximately $(a/x)^3$ x the field in the centre, so that if the dimensions of the coil system can be reduced, the disturbing effect on other instruments in the same building can be greatly diminished. This paper reviews coil systems more compact than the Helmholtz arrangement, and estimates the accuracy of construction necessary to achieve the theoretical homogeneity.

Magnetic field of a circular current

Consider the scalar magnetic potential V of a current i flowing in a circle of radius a. We take the origin on the axis of the loop at a distance d from the plane of the loop (Figure 1). At a point with polar coordinates (r, θ) where $r^2 < d^2 + a^2$, the appropriate solution of Laplace's equation is

$$V = -\sum_{n=0}^{\infty} A_n r^n P_n (\cos\theta) \qquad \ldots\ldots 1$$

where P_n are Legendre polynomials. The axial and radial components of the field can be written immediately

$$H_x = -\frac{\partial V}{\partial x} = \sum_{n=1}^{\infty} n A_n r^{n-1} P_{n-1} (\cos\theta) \qquad \ldots\ldots 2$$

$$H_y = -\frac{\partial V}{\partial y} = -\sum_{n=1}^{\infty} \sin\theta A_n r^{n-1} P'_{n-1} (\cos\theta) \quad . \ 3$$

where $$P'_n(\cos\theta) = \frac{\partial}{\partial \cos\theta} P_n (\cos\theta) \qquad \ldots\ldots 4$$

Defining $$B_n = (n+1) A_{n+1}/A_1 \qquad \ldots\ldots 5$$

and writing r, P_n and P'_n in terms of $x = r\cos\theta$ and $y = r\sin\theta$

$$H_x = A_1 \left[1 + \sum_{n=1}^{\infty} B_n r^n P_n \cos\theta \right]$$

$$= A_1 \left[1 + B_1 x + \tfrac{1}{2}B_2 (2x^2 - y^2) + \tfrac{1}{2}B_3 (2x^2 - 3y^2)x + \tfrac{1}{8}B_4 (8x^4 - 24x^2y^2 + 3y^4) + + \right] \quad . \ 6$$

$$H_y = -A_1 \sum_{n=1}^{\infty} \sin\theta \frac{B_n}{n+1} r^n P'_n(\cos\theta)$$

$$= -A_1 \left[\tfrac{1}{2}B_1 y + B_2 xy + \tfrac{3}{8}B_3(4x^2 - y^2)y + \tfrac{1}{2}B_4(4x^2 - 3y^2)xy + +\right] \quad \ldots .7$$

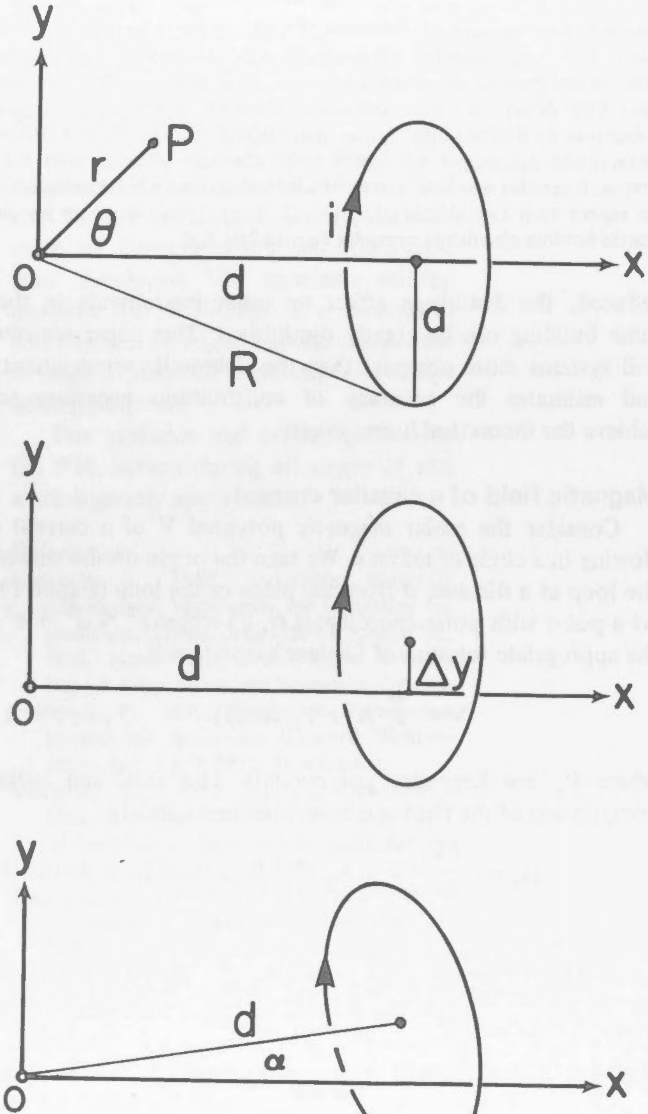

Figure 1. Top: circular current loop and coordinate system.
Centre: current loop displaced in y-direction.
Bottom: current loop tilted about origin.

It is easily verified that Equations 6 and 7 satisfy Laplace's equation in the form

$$\frac{\partial H_x}{\partial x} + \frac{\partial H_y}{\partial y} + \frac{H_y}{y} = 0 \quad \ldots\ldots 8$$

On the axis, Hy = 0 and

$$H_x = A_1\left[1 + B_1 x + B_2 x^2 + B_3 x^3 + B_4 x^4 + +\right] . 9$$

A straightforward although tedious way to find the coefficients A_1 and B_n is to compare Equation 9 with the expression found in textbooks for the induction on the axis of a circular current loop:

$$H = \tfrac{1}{2}\mu_0 i a^2 \left[a^2 + (d-x)^2\right]^{-3/2} \quad \ldots .10$$

where H is in tesla, i is in amperes, and lengths are in metres. Writing R^2 for d^2+a^2, and expanding by the binomial theorem

$$H = \tfrac{1}{2}\mu_0 i a^2 R^{-3}\left[1 - x(2d-x)R^{-2}\right]^{-3/2} \quad \ldots .11$$

we find that

$$A_1 = \tfrac{1}{2}\mu_0 i a^2 R^{-3}$$

$$B_1 = 3dR^{-2}$$

$$B_2 = \tfrac{3}{2}(4d^2 - a^2)R^{-4}$$

$$B_3 = \tfrac{5}{2}(4d^2 - 3a^2)dR^{-6}$$

$$B_4 = \tfrac{15}{8}(8d^4 - 12d^2a^2 + a^4)R^{-8} \quad .12$$

Combinations of current loops

For combinations of coaxial pairs of similar loops spaced symmetrically with respect to the plane $x = 0$, the coefficients B_1, B_3, B_5 etc. will cancel, since they are odd functions of d. With a single pair of loops, there is one free parameter, d/a. By choosing $a = 2d$, B_2 can be made to vanish, and the series for the error in Equations 6 and 7 begin with the fourth power of x and y. Near the origin, the first non-zero term provides a good estimate of the inhomogeneity.

Maxwell (1873), Neumann (1884) and Fanselau (1929) showed that with four loops one can make the fourth-order term vanish as well. Braunbek (1934) pointed out that four loops carrying the same current provide three free parameters, d_1/a_1, d_2/a_2, and a_1/a_2, and showed that it is possible to make B_2, B_4 and B_6 vanish simultaneously. The first non-zero error terms are then of the eighth order.

If one allows unequal currents (or different numbers of turns) an additional parameter is available, and one would hope to be able to cancel the eighth-order term with four loops, but Sauter and Sauter (1944) have shown that no real solution to this problem exists. With four free parameters, however, a great variety of four-loop systems with eighth-order errors are possible. A selection is included in Table I.

The purpose of Table I is to show the overall length and diameter of various arrangements of circular loops required to produce a field uniform to 1 part in 10^4 within a sphere 10 cm in diameter. The calculations are based on the first non-zero term in the axial component (except for the system of Everett and Osemeikhian, 1966, where the full series is used). This procedure is believed to provide a safe estimate of the homogeneity for all the examples shown: the error on the axis is over-estimated. Also, at any point on the sphere the radial component, and the vectorial sum of the radial and axial errors, are no greater than the error on the axis.

Table I
Combinations of Circular Currents with Errors $< 10^{-4}$ Within a Sphere 10 cm in Diameter

System	Number of loops	Order of error	Characteristic	Overall dimensions (cm) length	diameter
Ampere	1	2	–	0	1220
Helmholtz	2	4	–	52	104
Maxwell	3	6	equal *R*	24.6	37.5
Barker	3	6	equal *a*	34.2	45.0
Fanselau	4	6	equal *i*	33.9	37.0
Braunbek	4	8	equal *i*	27.5	32.5
McKeehan	4	8	equal *R*	26.6	33.4
Sauter	4	8	equal *d*	20.7	47.6
Sauter	4	8	equal *a*	27.9	29.7
Garrett	6	12	equal *a*	23.9	20.0
Garrett	8	16	equal *a*	21.2	15.4
Garrett	10	20	equal *a*	20.6	13.5
Braunbek	4	8	equal *i*	27.5	32.5
McKeehan	6	12	equal *i*	22.3	22.5
Garrett	8	16	equal *i*	19.0	17.5
Garrett	10	20	equal *i*	17.6	15.4
Everett	100	2	equal *i,R*	15.0	15.0

Garrett (1967) gives convenient tabulations of the parameters of most of the systems of Table I, with characteristics of the region of uniformity.

The most compact system of Table I is the spherical coil of Everett and Osemeikhian (1966). However, its error on a sphere of 7.5 cm diameter is 10^{-5}, whereas the error of the 10-loop systems would be $(0.75)^{20} \times 10^{-4} = 3 \times 10^{-6}$. Thus the mean inhomogeneity within the proton sample would be less with a 10-loop or even a 6-loop system.

Precision of construction

A subject rarely discussed in the literature of coil systems is the precision of construction necessary to realize the theoretical homogeneity of ideal systems. The only systematic treatment known to the author (Blednov and Rotshteyn, 1972) is unfortunately based on an incorrect version of Equation 7. Here we investigate various distortions one at a time, and calculate the tolerances in dimensions which must be maintained in order to avoid inhomogeneities greater than 10^{-4} on the sphere where the maximum inhomogeneity of the ideal system is 10^{-4}.

The tolerances were calculated by partial differentiation of Equations 6 and 7. The easiest case is when a loop is moved along the axis of symmetry through a distance Δd from its ideal position. The resulting change in field is

$$\Delta H = \frac{\partial H}{\partial d} \Delta d \qquad \ldots\ldots 13$$

Since

$$\frac{\partial H}{\partial d} = -\frac{\partial H}{\partial x} \qquad \ldots\ldots 14$$

$$\Delta H_x = -A_1 \Delta d \left[B_1 + 2B_2 x + \tfrac{3}{2} B_3 (2x^2 - y^2) + 2B_4 (2x^2 - 3y^2)x + + \right] \ldots\ldots 15$$

$$\Delta H_y = A_1 \Delta d \left[B_2 y + 3B_3 xy + \tfrac{3}{2} B_4 (4x^2 - y^2) y + + \right] \ldots 16$$

In these series, and in similar series for other deformations, the second-order terms are comparable in magnitude to the first, and must be included in the calculation. The Helmholtz case is unique in that the coefficient B_2 is zero for each loop individually, making it relatively insensitive to displacements of one loop as far as homogeneity is concerned. However, the diameters of the two loops must be equal to 1 part in 1,000, since here the first-order term does not vanish.

Probably the deformation most likely to occur with the usual method of construction is that the loops are parallel but not coaxial. If one loop is moved so that its axis is a distance Δy from the axis of the others

$$\Delta H_x = -\frac{\partial H_x}{\partial y} \Delta y = A_1 \Delta y \left[B_2 y + 3B_3 xy + \tfrac{3}{2} B_4 (4x^2 - y^2) y + + \right] \ldots\ldots 17$$

$$\Delta H_y = -\frac{\partial H_y}{\partial y} \Delta y = A_1 \Delta y \left[\tfrac{1}{2} B_1 + B_2 x + \tfrac{3}{8} B_3 (4x^2 - 3y^2) + \tfrac{1}{2} B_4 (4x^2 - 9y^2) x + + \right] \ldots\ldots 18$$

It will be noticed that this deformation changes the direction of the central field. First-order terms vanish in the Helmholtz case.

Finally, the effect of tilting one loop, so that its axis still passes through the origin but at an angle α to the axes of the other loops, was investigated by rotating x and y coordinates. Remembering that y is always positive

$$\frac{\partial x}{\partial \alpha} = \pm\, y \qquad\qquad \frac{\partial y}{\partial \alpha} = \pm\, x$$

$$\Delta H_x = \pm\, \alpha \left[\frac{\partial H_x}{\partial x}\, y \pm \frac{\partial H_x}{\partial y}\, x \right]$$

$$\Delta H_y = \pm\, \alpha \left[\frac{\partial H_y}{\partial x}\, y \pm \frac{\partial H_y}{\partial y}\, x \right]$$

with the signs depending on the quadrant of the field point.

The effect on the homogeneity of departures of the loops from true circles was not calculated. Knowing that circular loops can be replaced by square ones with little loss of homogeneity, such effects are assumed to be small provided that some degree of symmetry is maintained.

Table II gives two sets of tolerances. The first tolerances refer to *asymmetrical* deformations, when one loop of a system is varied. The tolerances in brackets apply to *symmetrical* distortions, when both loops of a pair are varied by the same amount. In the coaxial cases, symmetry about the mid-plane is preserved. In the Δy case, the two loops of a pair are moved in opposite directions. In the last case, both loops are tilted in the same sense about the origin. With symmetrical deformations, odd powers of x and y vanish.

Table II
Dimensions and Tolerances for Homogeneity of 10^{-4} on Sphere of Radius r

	Helmholtz	Braunbek	Sauter
r/a_1	.0965	.307	.337
a_1	1.0000 ± 8 (±141)	1.0000 ± 4 (±11)	1.0000 ± 5 (± 8)
a_2		.7639 ± 11 (± 8)	1.0000 ± 6 (± 7)
d_1	.5000 ± 50 (± 28)	.2780 ± 3 (± 3)	.2432 ± 3 (± 4)
d_2		.8457 ± 4 (±11)	.9407 ± 5 (±32)
i_1	1.0000 ± 17	1.0000 ± 9 (± 17)	1.0000 ± 11 (± 17)
i_2		1.0000 ± 8 (± 17)	2.2604 ± 15 (± 38)
Δy_1	.0000 ± 99 (± 56)	.0000 ± 6 (± 7)	.0000 ± 7 (± 8)
Δy_2		.0000 ± 8 (±22)	.0000 ±10 (±63)
α_1	0 ± 6′	0 ± 3′ (± 4′)	0 ± 3′ (± 4′)
α_2		0 ± 3′ (± 4′)	0 ± 2′ (± 4′)

Note: The first tolerances quoted refer to *asymmetrical* deformations; those in brackets refer to *symmetrical* deformations. See text for explanation.

Table II does not include the effects of deformation on the magnitude and direction of the field at the origin. The most troublesome case, as far as rigidity of the system is concerned, is likely to be the Δy deformation. Moving one loop in its own plane by .0003 a will produce a radial field at the origin of 10^{-4} H_x in the Helmholtz case. The four-loop systems are about half as sensitive to the displacement of one loop, since it contributes a smaller fraction of the central field.

Coils with finite cross-section

Practical coil systems usually employ coils of many turns rather than single loops, and the cross-section of the winding is much larger than the tolerance of the dimensions discussed above.

When the required number of turns is not too large, the simplest procedure is to wind them in a single cylindrical layer with the same radius a and mean distance d as the loop of the prototype. In the Helmholtz case, for example, one then has an array of identical Helmholtz pairs distributed along the x-axis. The axial field of the pair located at $d + l_i, -d + l_i$ will be

$$H = 2A_1 \left[1 + B_4(x - l_i)^4 + B_6(x - l_i)^6 + + \right]$$

Adding the field of the corresponding pair at $d - l_i, -d - l_i$, the odd powers of x cancel

$$H = 4A_1 \left[1 + B_4(x^4 + 6l_i^2 x^2 + l_i^4) + + \right]$$

Averaged over $l_i = 0$ to $l_i = l$, the first error term becomes

$$B_4(x^4 + 2l^2x^2 + \tfrac{1}{5}\, l^4)$$

If l is one tenth of the useful radius x, the inhomogeneity is increased by only 2 per cent over that of the prototype.

When more turns are necessary than can be accommodated in a single layer, the breadth and depth of the winding cross-section provide additional parameters which can sometimes be used to advantage. Maxwell (1873, Sect. 713) showed that the Helmholtz loops can be replaced by coils of rectangular cross-section without significant effect on the homogeneity if the ratio of breadth to depth is $(31/36)^{1/2}$ = 0.9280. However, Maxwell's approach has not been very successful with higher order systems; for example, there is no analogous solution for the Braunbek arrangement (McKeehan, 1936). More recently, Garrett (1967) has pointed out that in general any single loop of radius a_o can be replaced by a coil of square cross-section of mean radius a_c without significantly affecting the homogeneity if

$$a_c^2 = a_o^2 - \frac{1}{12}\, D^2$$

where D is the depth of the square cross-section.

Obviously any of the prototype coil systems can be expanded into systems of solenoids with equivalent orders of homogeneity. Thick solenoids are difficult to wind accurately, and do not appear to have any advantages in the present application.

Practical considerations

In most instrument workshops it is difficult to make accurately circular coils larger than 40 cm in diameter, and square coils are often used in the larger sizes. The Helmholtz loops can be replaced by escribed square loops with no significant loss of uniformity (Fanselau, 1956). The appropriate separation is 0.5445 time the length of the side of the square. However, Lee-Whiting (1957) has shown that at least five square coils are required to match the uniformity of the four-coil systems with circular loops. For diameters less than 40 cm, it is probably easier to make circular coils.

When a Helmholtz system would be too large, the best choice for accurate construction is the system of Sauter and Sauter (1944) with four coils of equal diameter. Its only disadvantage relative to the Braunbek arrangement is that the number of turns on the outer coils must be 2.2604 ±38 times the number on the inner coils. This ratio can be approximated by pairs of integers such as 52/23 or 113/50. The currents can be adjusted by resistors in parallel with the coils. In fact, it is a simple matter to trim the system empirically by varying a resistor connected across one or two of the coils and observing the decay of the proton precession signal. Often errors in the geometry can be compensated in this way.

Table II shows that for a coil system 30 cm in diameter tolerances of the order of .05 mm must be maintained. It is not difficult to achieve this precision in the radius of the coil forms, but it is difficult to assemble the system with the required accuracy, especially in the centring of the coils. The best way would seem to be machining the complete form from a single cylindrical tube. As Stuart (1972) points out, the most serious practical problem is in winding uniformly multi-layer coils.

Everett and Osemeikhian (1966) estimated that their spherical coils were constructed with a precision of .05 mm. However, with a sphere 17 cm in diameter they found that the proton signal decayed more quickly than expected, and in their final design they used spheres having diameters of 21 cm and 25 cm, which did not appreciably increase the rate of decay.

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an automatic magnetic observatory system

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Abstract. A digitally recording magnetometer system is designed to replace the standard photographic magnetographs at geomagnetic observatories. The instrument can operate for up to 80 days without attention. Provision is made for immunity to brief power failures.

The elements D, H, and Z are derived from a 3-component fluxgate magnetometer in which all three detectors operate in near-zero field. A simple proton magnetometer measures F.

Voltages proportional to the values of the three elements D, H, and Z are sampled in quick succession by a digital voltmeter, once per minute. Each minute, a measurement of F is also made. The four measurements are recorded on digital magnetic tape. Each ten minutes, the date, time, and station identification are also recorded. A strip-chart recorder produces a visual indication of the variations in D, H, and Z.

The performance of the system is estimated from a comparison of hourly mean values with those of the St. John's Magnetic Observatory.

Résumé. On a conçu un système de magnétomètre à enregistrement numérique pour remplacer les magnétographes photographiques réguliers utilisés dans les observatoires géomagnétiques. Cet instrument peut fonctionner seul pendant 80 jours. Des mesures ont été prises pour remédier aux brèves pannes de courant.

Les éléments D, H et Z sont dérivés d'un magnétomètre à solénoïde à noyau saturable à trois composantes dans lequel les trois détecteurs fonctionnent dans un champ magnétique presque nul. Un magnétomètre à proton mesure F.

Les tensions proportionnelles à la valeur des trois éléments D, H et Z sont relevées en succession rapide à toutes les minutes par un voltmètre numérique. A chaque minute, l'appareil mesure aussi F. Les quatre mesures sont enregistrées en numérique sur une bande magnétique. A toutes les dix minutes, la date, l'heure et l'identification de la station sont aussi enregistrées. Une enregistreuse à bandes indique visuellement les variations produites dans D, H et Z.

On évalue le rendement de ce système en comparant sa moyenne horaire d'indices avec celle de l'Observatoire magnétique de St. John.

Introduction

The Automatic Magnetic Observatory System, hereafter called the AMOS, is designed to replace the standard photographic magnetographs at geomagnetic observatories. Figure 1 is a block diagram of the instrument. Four components of the geomagnetic field are measured. These four may be either the elements D, H, Z, and F or X, Y, Z, and F, depending on the orientation of the magnetic sensors.

Two types of record are produced. A strip-chart recorder continuously records the values of D, H, and Z (or X, Y, Z) relative to appropriate baselines. The other record is on digital magnetic tape. On this record the AMOS records the quasi-instantaneous values of all four elements, with a sampling rate of once per minute. No baselines are involved here except for the element D. The recorded value of D is the instantaneous displacement of D from some arbitrary but fixed baseline close to the mean value of D. In addition, each 10 minutes, the day of the year, the hour of the day, and the minute of the hour are recorded. Following this, a seven-figure station identification number is put on the tape. One tape record then consists of 10 minute-samples of each of the four elements, plus the date and time, and the station identifier. All digital data is in 4-line, bindary-coded-decimal format. Appropriate inter-record gaps are generated after each record so that the tape may be read by digital computers.

The recorders can accommodate sufficient supplies of paper or tape to permit the AMOS to operate for up to 80 days without attention. Provision is made to operate the digital clock from a 12-volt automotive battery whenever power-failures occur. In this way, although no data is recorded during power-failures, when power is restored the data will be properly timed. The entire AMOS may also be operated by a dc-to-ac inverter for complete immunity to power-failures.

A separate but related system has been developed whereby the operation of an AMOS located at some distant point may be monitored by means of connections to commercial telephone circuits (Andersen, 1973).

Basic design considerations

A fluxgate magnetometer was chosen as the basic instrument for several reasons. This type of magnetometer uses only solid-state electronic components. There are no relays or other electromechanical parts. This results in a relatively simple and rugged instrument with a good reputation for reliability. In addition, this instrument can operate successfully in the presence of radio-frequency transmitters, electromechanical switches and other sources of electrical noise.

The basic output of a fluxgate magnetometer is an analog voltage proportional in polarity and magnitude to the magnetic field component along the axis of the field-cancelling coils. In a 3-component instrument each of three geomagnetic elements is continuously represented in this way. The analog outputs are completely independent of one another. Thus at any instant, the analog voltages are valid, real-time representations of the values of the field components existing at that time. This real-time output, with each component being independently represented is of considerable significance. A number of other automatic observatory systems have been proposed in which the component values are calculated from a series of time-spaced measurements. Unless the magnetic field is relatively constant over the course of these measurements,

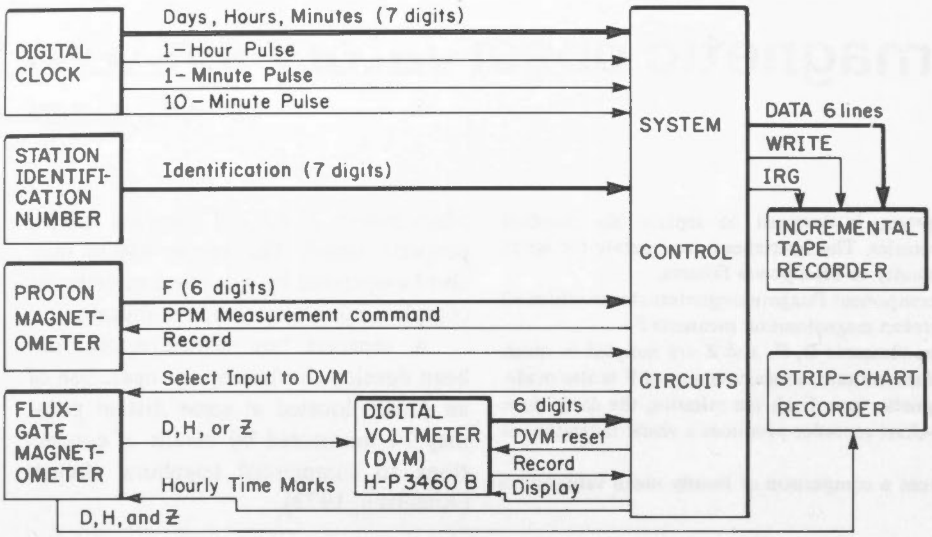


Figure 1. Block diagram of automatic magnetic observatory system (AMOS).

appreciable errors can result (Serson, 1969). For many of the Canadian observatories the level of magnetic activity is so great that this would be an almost constant source of error with these types of instruments. The 3-component fluxgate completely obviates this problem.

Another significant advantage of the 3-component fluxgate instrument is its ability to accommodate very large variations in the magnetic field without the need for adjustments to tuned circuits, bias currents, and oscillator frequencies as is necessary with systems based on proton precession frequency measurements.

There is however, one serious deficiency with the fluxgate instrument. The long-term stability is hardly good enough for a primary observatory instrument. This instability results from changes in the zero offset arising from permanent magnetization and other effects within the fluxgate detector. This drift in zero offset is particularly troublesome since it may be non-linear with time, or even discontinuous. To obviate the deficiencies of the fluxgates, a simple proton precession magnetometer (PPM) measuring only the total field F, is incorporated into the system. While this instrument is much more sensitive to electrical noise, and is generally less reliable than fluxgates, it does offer the significant advantage that, if it can be made to work at all, the resulting measurement can be relied on to an accuracy of better than one gamma. It is almost completely insensitive to changes in temperature, detector alignment, or foundation shifts. Furthermore, the basic output is a frequency, which is easily converted to an accurate digital representation of the field value. In addition, a proton precession magnetometer is a recognized absolute standard in itself. There are no calibrations or baseline measurements involved with its operation.

By frequently comparing the value of F as measured by the PPM with the value of F calculated from the component values supplied by the fluxgate, a very good check is made on the performance of the fluxgate. In practice, the basic measurements of the field components are made once each minute. Thus a check on the performance of the fluxgate can be made as often as once per minute. In this way, non-linear drifts as well as discontinuous shifts of the zero offset are easily detected. It has been found by experiment that the changes in zero offsets are approximately proportional to the field being measured. Thus by applying corrections to the fluxgate measurements porportional to the mean values of the components, it is possible to achieve accuracies quite satisfactory for a primary observatory instrument (DeLaurier *et al.*, 1973).

The primary recording medium chosen for the AMOS is digital magnetic tape operating at a density of 200 bits per inch. Some justification may be in order for the choice of magnetic tape instead of paper tape or cards, and for the choice of the low bit density rather than the more usual 556 or 800 bits per inch. Magnetic tape affords a high speed, computer-compatible recording medium with sufficient storage capacity to permit operation of the AMOS for up to 80 days with standard size reels of tape. In addition, this medium presents less problems with storage. It is also quite durable, being able to withstand many hundreds of passages through tape-handling machines without deterioration in performance. Since the AMOS will be operating in less than ideal laboratory conditions and since it requires several weeks to write one reel of tape, there is much danger of the tape being contaminated with dust, and of being subjected to many changes in temperature. For these reasons it seemed wise to use the lowest density possible and thus be most immune to skew problems and bit-loss arising from these adverse conditions. Another advantage of the low density is that by immersing the tape in a liquid suspension of iron oxide powder, the actual transitions of magnetization on the tape can be made visible to the naked eye and in fact readable with low-power microscope. This facility has been of great help in detecting and correcting instrument malfunctions. Finally, magnetic tape recorders employ fewer electro-mechanical parts than do card or paper tape punches and should therefore prove the most reliable of the three recording media.

Measurement of D, H, and Z (X, Y, Z)

An electrical magnetometer of the fluxgate type is shown in Figure 2. The theory of operation of this type of magnetometer has been explained by Serson (1957), and Trigg *et al.* (1971). In the design used here, the method of

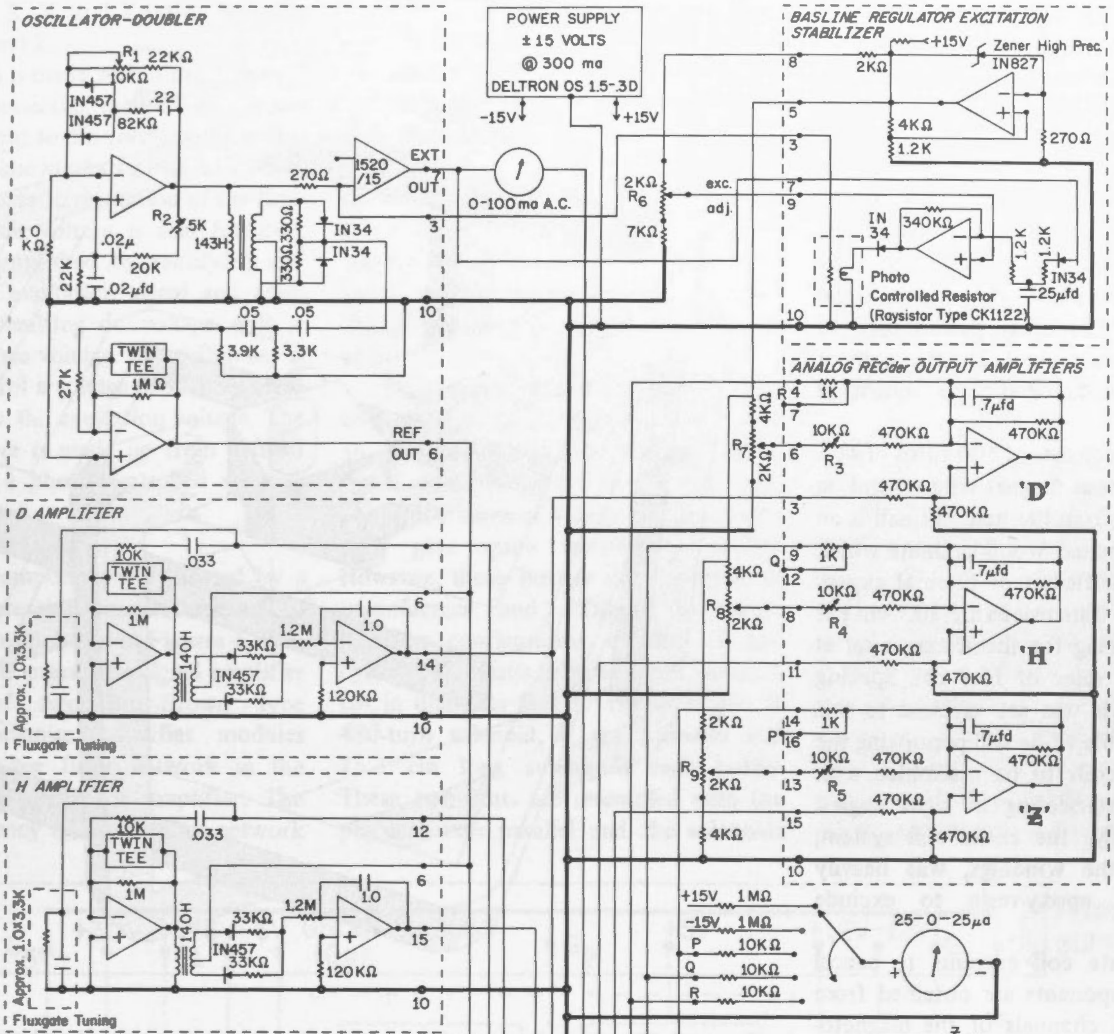


Figure 2. Circuit diagram of three-component fluxgate magnetometer as used in AMOS.

cancelling the various field components is unique in some respects. For maximum stability and accuracy it was decided that all three fluxgate detectors should operate in near-zero field, both axially and transversely. To achieve this, it was necessary to mount the detectors in the middle of a dual-axis, square Helmholtz coil system. One pair of coils is used to cancel the horizontal component of the earth's field, the other pair is used to cancel the Z component. The two pairs of coils are nested together as shown in Figure 3.

Each coil consists of 600 turns of #25 enamelled copper magnet wire wound on a form made from Permali. Permali is an epoxy-impregnated wood-laminate which has a low coefficient of thermal expansion. The coil dimensions are 30.5 cm per side. Coil-spacing for the Z axis is set at the optimum value of 16.8 cm. Spacing for the H axis was set as close to this value as possible while still permitting the two sets of coils to be assembled with their axes intersecting at right angles. After assembly, the entire coil system, particularly the windings, was heavily coated with epoxy-resin to exclude moisture.

Appropriate coil currents to cancel the field components are obtained from the H and Z channels of the magnetometer. The D fluxgate does not employ external coils for field cancellation since this field will always be quite small. Instead, the field-cancelling current is applied to the secondary winding of the fluxgate itself. Each of these three currents is passed through a precision resistor in order to generate a voltage which is proportional in magnitude and polarity to the value of the component being cancelled by that current. The resistors are of such values that the voltage-to-field factor for each component is exactly 10·0000 volts for 100,000 gammas of field.

These three analog voltages form the primary output of the fluxgate magnetometer. This output is used with a five-figure digital voltmeter (DVM) to produce a digital output for use with the magnetic tape recorder. The DVM is a Hewlett-Packard model 3460B to which a small modification has been added in order to provide external control of the front-panel display. This modification allows the display to be used as a temporary data storage for any one of the three channels being measured. Thus it is possible to "trap" any one measurement in the front-panel display for visual observation without affecting the normal operation of the AMOS. This combination of fluxgate, digital voltmeter, and tape recorder provides a geomagnetic recording system with a dynamic range of ±70,000 gammas in all components.

A secondary output is obtained from the fluxgate magnetometer by feeding each of the primary analog voltages into one input of a unity-gain differential amplifier. The other differential input is supplied with a stable but adjustable dc voltage. The output of the differential amplifier is again a voltage proportional in polarity and magnitude to the field component but with a baseline subtracted from it. This output is used with a strip-chart recorder.

It should be noted that the output of the D channel is in units of magnetic field along the axis of the D fluxgate, the orientation of which is fixed. Thus the D output is not the true D in the strictest sense. However, for most observatory locations the mean value of H is sufficiently large and the fluctuations of D sufficiently small that the difference between the D output and the true D is negligible. In locations where these conditions do not prevail, it is customary to orient the detector assembly in geographical coordinates and measure the

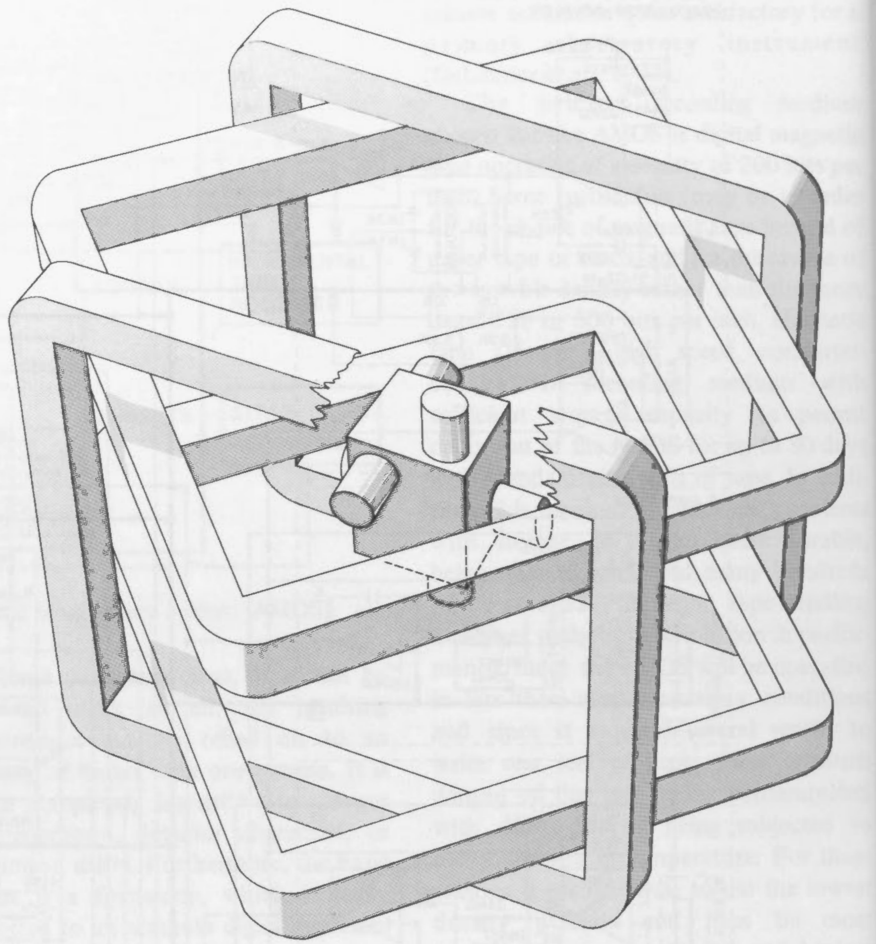


Figure 3. The three fluxgate detectors inside a two-axis square Helmholtz coil system.

components X, Y, and Z rather than the usual D, H, and Z.

Provision is made within the magnetometer for connecting each channel of the primary output to the voltmeter, and also for hourly time-marks on the secondary output. Automatic regulation of the flux-gate excitation voltage is also featured. This is accomplished by rectifying and filtering the excitation signal and comparing the resulting dc voltage with a stable reference voltage. The difference is used to control a voltage divider which in turn controls the excitation voltage. The voltage divider is made up from a fixed resistor and a photo-controlled resistor.

Measurement of F

The F component is measured by a proton precession magnetometer of simple design, as shown in Figures 4, 5, 6, 7, and 8. The precession signal amplifier consists of two Burr-Brown type 3001/13 low-noise amplifier modules with a twin-tee filter network in the feedback loop of each amplifier. The centre frequency of the twin-tee network is selected for the precession frequency corresponding to the mean value of F for the station in question. Additional tuning of the signal amplifier is provided by a capacitor across the amplifier input terminals, that is, by tuning the precession signal pick-up coil. This yields an overall Q of about 25, or a useful bandwidth corresponding to a field range of ±2,500 gammas. The tuning elements are easily changed to accommodate any mean value of F.

Two types of detecting head have been used. A toroidal plastic bottle with an outside diameter of 15 cm and an inside diameter of 4.5 cm wound with about 600 turns of #20 enamelled copper wire gave quite satisfactory results. However, these bottles are expensive to manufacture and difficult to repair. Another configuration consists of two cylindrical plastic bottles, each about 6 cm in diameter and 17 cm in length. A 480-turn solenoid, 6 cm diameter and 15.3 cm long surrounds each bottle. These two units are assembled with the physical axes parallel and the solenoids connected in series opposition. This configuration is much easier to manufacture and repair than the toroid type, and the performance is at least as good. A number of liquids have been used to fill the bottles. Among these are water, kerosene, JP-4 jet fuel, alcohol, and ethyl glycol. The most satisfactory fluid used thus far is an automotive windshield washer additive consisting mostly of methyl-hydrate. In situations where electrical noise has been a problem, it has been found very helpful to surround the detector assembly with a cubic shield about 600 mm per side, made from aluminum sheet about 1.6 mm thick.

Since the precession signal is of the order of 2,400 Hz for Canadian observatories, and persists for only 2-3 seconds after polarization, it is not possible to achieve the required accuracy of one part in 50,000 by direct counting of the precession signal. To achieve the desired accuracy, a phase-lock circuit is employed here (Serson, 1962). In this circuit, a voltage-controlled oscillator is electronically adjusted to a frequency which is

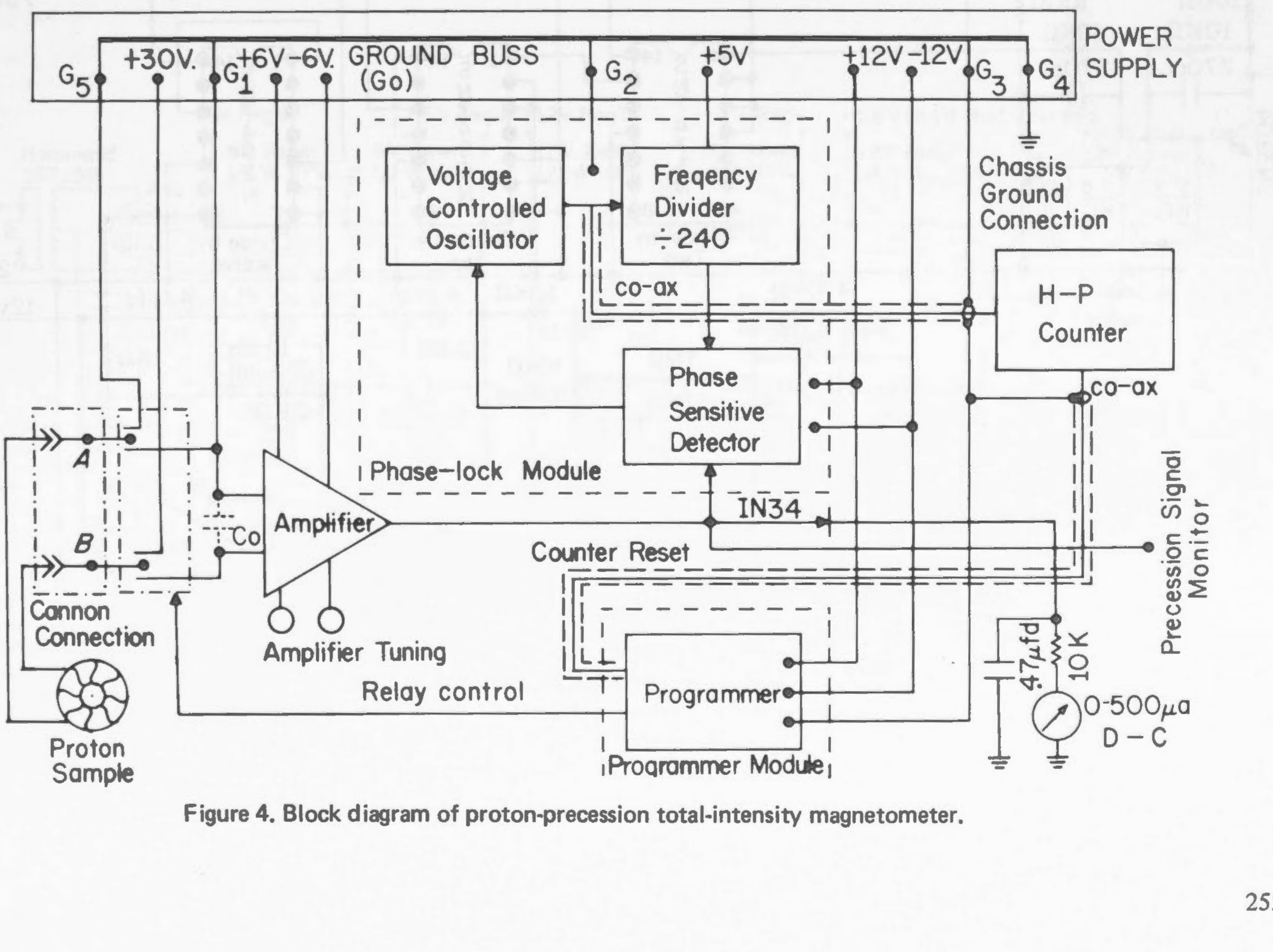


Figure 4. Block diagram of proton-precession total-intensity magnetometer.

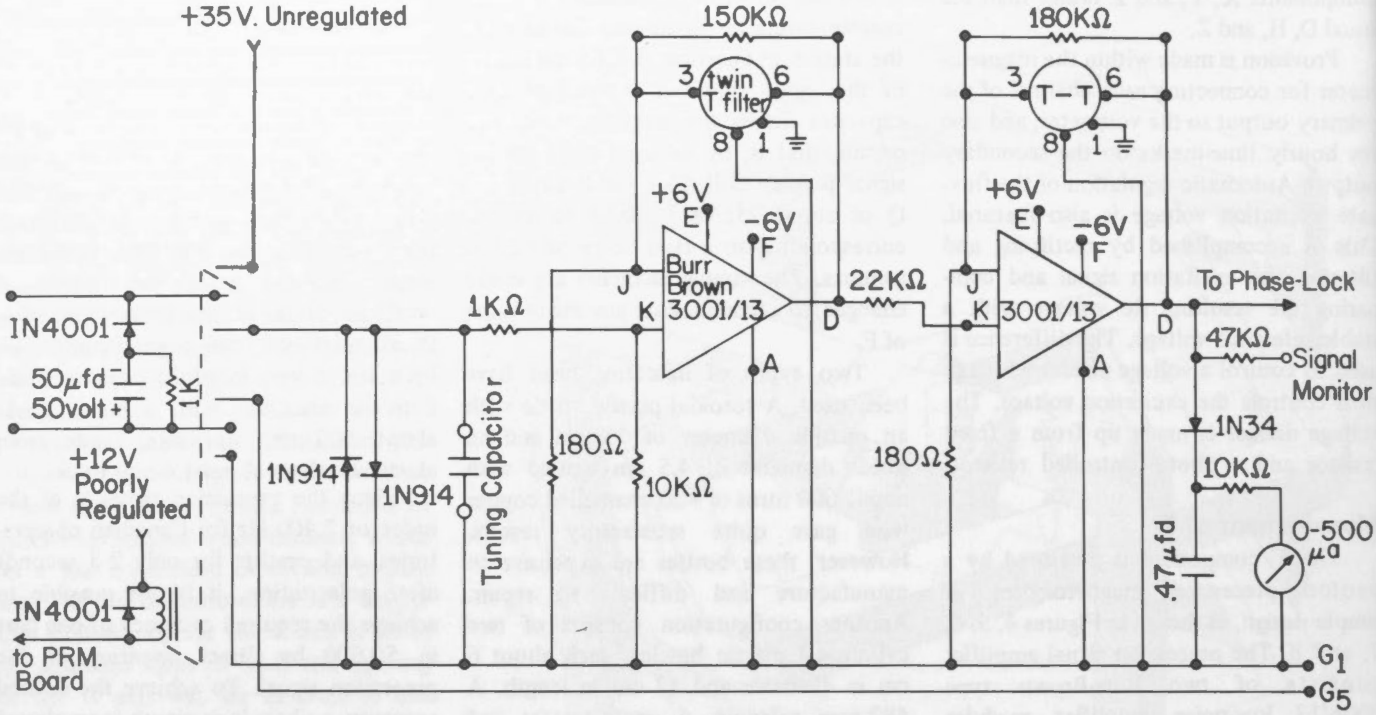


Figure 5. Polarizing circuit and signal amplifier for proton-precession magnetometer.

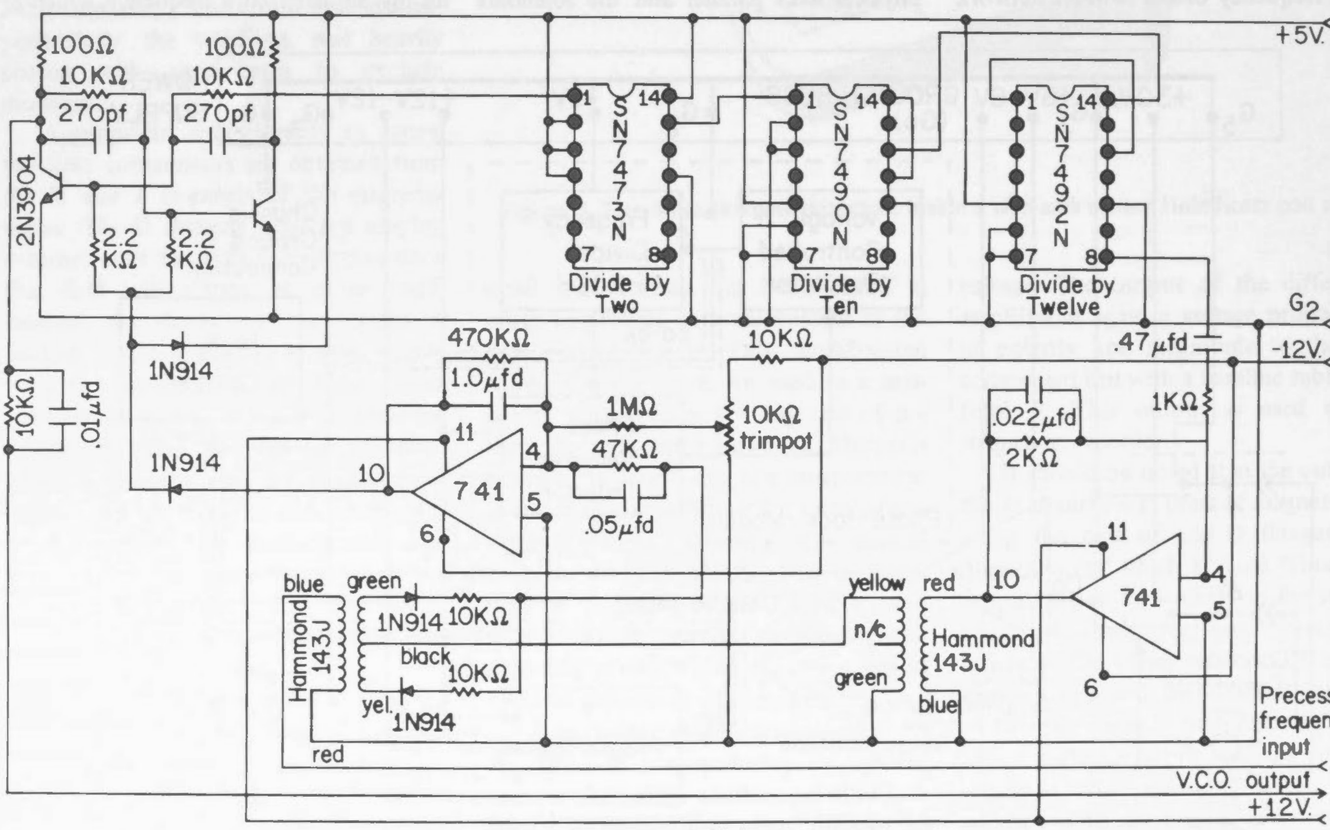


Figure 6. Frequency-multiplying circuit for proton-precession magnetometer.

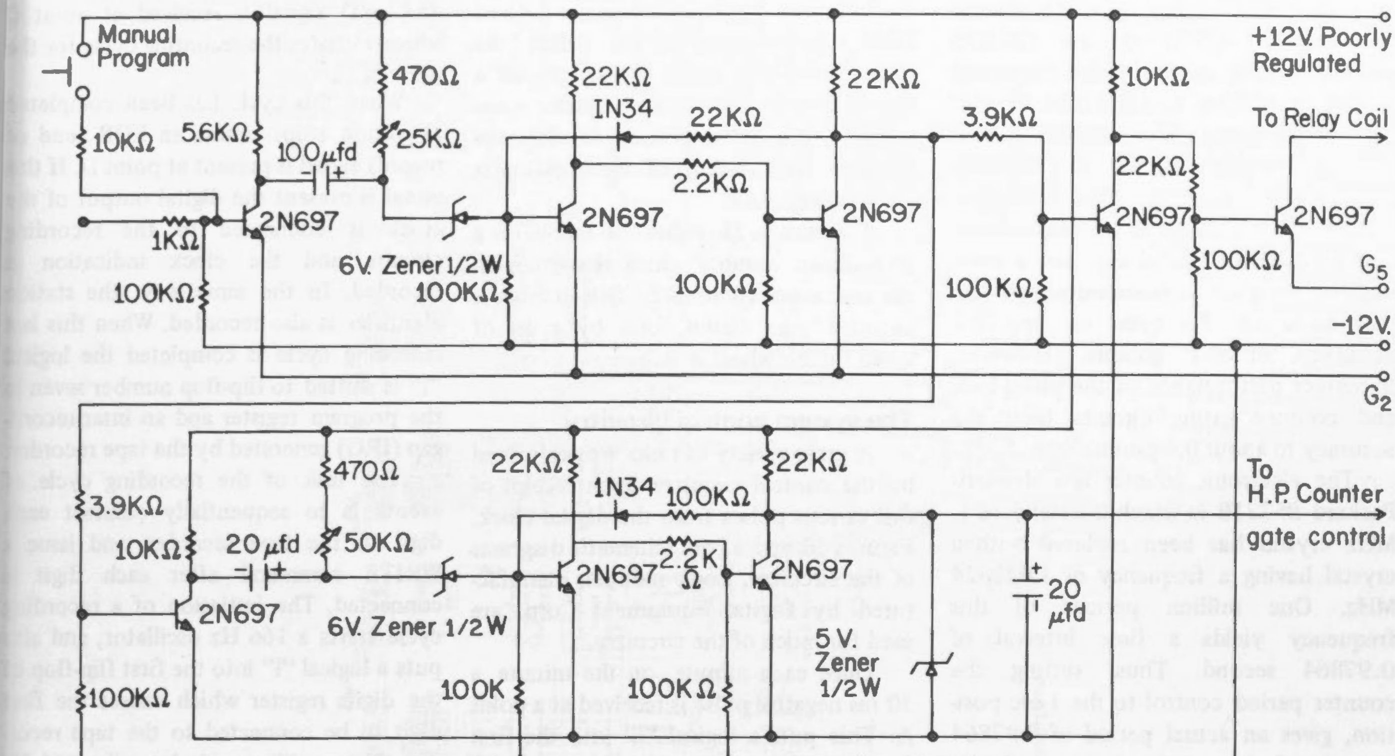


Figure 7. Programming circuit for proton-precession magnetometer.

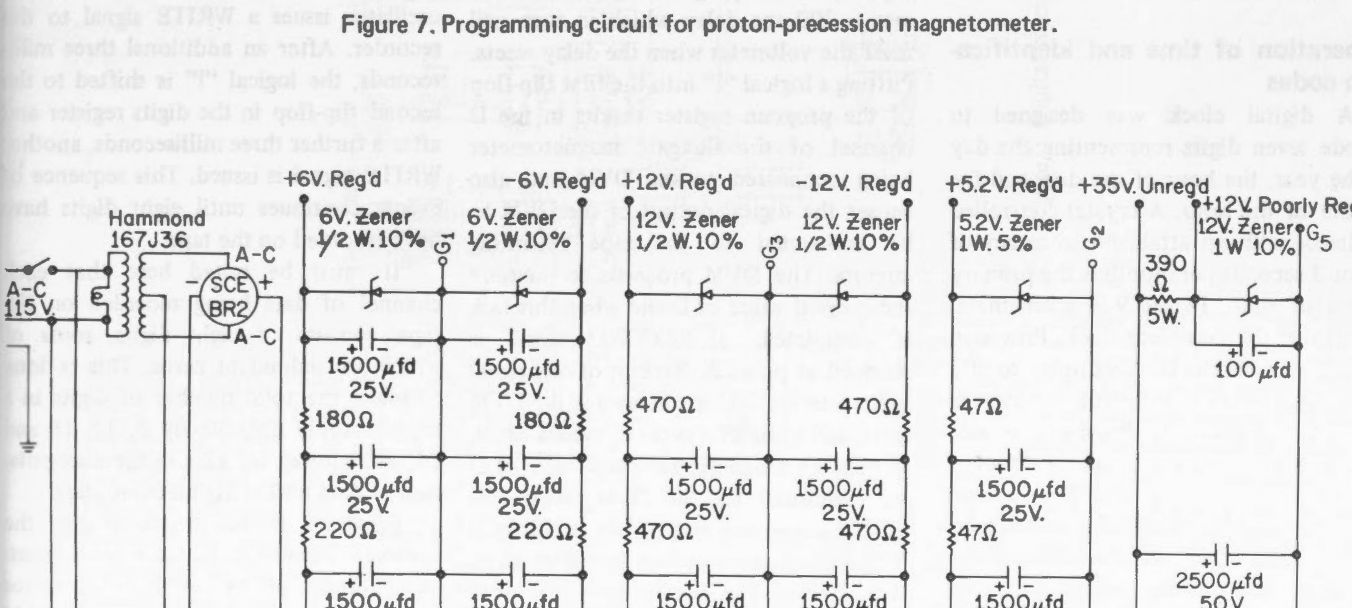


Figure 8. Power supply for proton-precession magnetometer.

exactly 240 times the precession frequency. Now since the precession frequency is 4257.6 Hz for 100,000 gammas of field, the multiplied frequency is 240 x 4257.6 = 1,021,824 Hz for 100,000 gammas. This frequency will yield 1,000,000 cycles in 0.97864 second. By counting this multiplied frequency for a period of 0.97864 second with a six-figure digital counter, a readout is obtained corresponding to the magnitude of F, with an apparent accuracy of 0.1 gamma. However, imperfect performance of the phase-lock and counter gating circuits limit the accuracy to about 0.4 gamma.

The electronic counter is a Hewlett-Packard #5221B in which the standard 1. MHz crystal has been replaced with a crystal having a frequency of 1.021824 MHz. One million periods of this frequency yields a time interval of 0.97864 second. Thus, setting the counter period control to the 1-sec position, gives an actual period of 0.97864 second with the non-standard crystal.

Generation of time and identification codes

A digital clock was designed to encode seven digits representing the day of the year, the hour of the day, and the minute of the hour. A crystal controlled oscillator with an attainable accuracy of about 3 seconds per month is the primary source of time. Figure 9 is a schematic diagram of the complete clock. Provision is made to reset the DAYS display to 001 after day number 365, 366 or 999 as selected by a switch. Provision is also made for operating the clock from a 12-volt automotive battery. When power fails, the clock automatically switches to the battery, and then automatically recharges the battery when power is restored. Battery operation will not light the NIXIE display tubes, but the remainder of the clock will function normally. This feature is useful in the AMOS in that should the power fail, the clock will continue until power is restored. Thus all recorded data will be properly timed.

Numerous control pulses of various durations and polarities are also produced by the digital clock for use in the AMOS control circuitry. These pulses are derived from negative-going signals within the clock. One such signal is used to set a flip-flop. A second signal, occurring some suitable time later, is used to reset the flip-flop. The output of the flip-flop is the required pulse.

The station identification number is a seven-figure number which is written on the tape every 10 minutes. This number is encoded into digital form by a set of seven thumb-wheel switches.

The system control circuitry

A great variety of tasks are performed by the control circuitry upon receipt of the various pulses from the digital clock. Figures 10 and 11 are schematic diagrams of the circuitry. Logic modules manufactured by Digital Equipment Corp. are used for much of the circuitry.

Once each minute, on the minute, a 50 ms negative pulse is received at a point A. This puts a logical "1" into the first flip-flop of the program register and also sets a 200 ms delay which in turn will reset the voltmeter when the delay resets. Putting a logical "1" into the first flip-flop of the program register results in the D channel of the fluxgate magnetometer being connected to the DVM and also causes the digital output of the DVM to be connected to the tape recording circuits. The DVM proceeds to measure the current value of D and when this task is completed, a RECORD signal is received at point B. Receipt of this signal again sets the 200 ms delay for the DVM reset, and initiates a cycle of events which records on magnetic tape the value of D just measured by the DVM. When the recording cycle is completed, the logical "1" in the program register is shifted to its second flip-flop. The current value of H and then of Z is measured and recorded in similar fashion as was the D value.

Following the completion of the Z recording cycle, the logical "1" is shifted to the fourth flip-flop in the program register. This connects the digital output of the proton precession magnetometer (PPM) to the recording circuits and commands the PPM to make a measurement of F. This takes 4-6 seconds. When the measurement is completed a RECORD signal is received at point C which initiates the recording cycle for the value of F.

When this cycle has been completed all action stops unless an EOR (end of record) signal is present at point D. If this signal is present the digital output of the clock is connected to the recording circuits and the clock indication is recorded. In the same way, the station identifier is also recorded. When this last recording cycle is completed the logical "1" is shifted to flip-flop number seven in the program register and an inter-record gap (IRG) generated by the tape recorder.

The task of the recording cycle of events is to sequentially connect each digit to the tape recorder, and issue a WRITE command after each digit is connected. The initiation of a recording cycle starts a 166 Hz oscillator, and also puts a logical "1" into the first flip-flop of the digits register which causes the first digit to be connected to the tape recorder. Three milliseconds later the 166 Hz oscillator issues a WRITE signal to the recorder. After an additional three milliseconds, the logical "1" is shifted to the second flip-flop in the digits register and after a further three milliseconds, another WRITE signal is issued. This sequence of events continues until eight digits have been recorded on the tape.

It must be noted here that each channel of data being recorded on the tape consists of eight digits, some of which are redundant zeros. This is done to make the total number of digits in a record evenly divisible by 8, 12, 16 and 24, as required for ease in the manipulation of data within digital computers.

Provision is also made within the control circuitry to control the front-panel display of the DVM. This involves clamping to ground the NEON TRANSFER signal within the DVM and releasing it only during the time the channel to be displayed is being measured.

Magnetic tape recorder

Two models of recorder have been used with the AMOS; the Precision Instrument #PI1177 and the Digidata #142OH. These machines record on 7

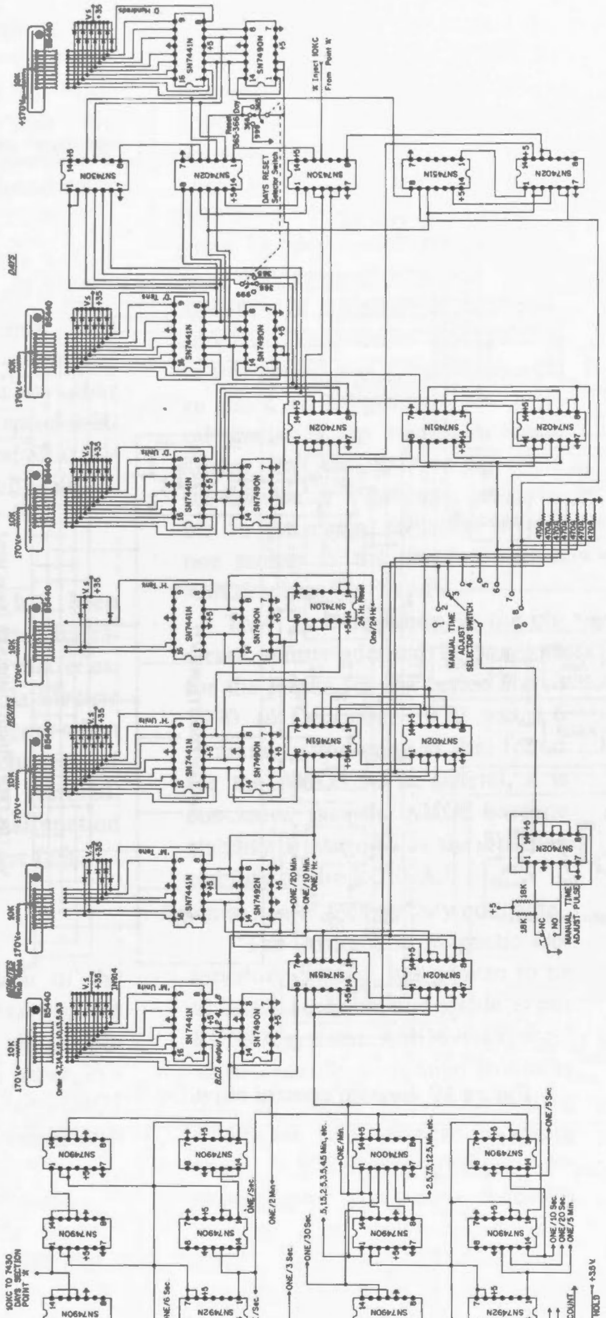


Figure 9. Digital clock and timer.

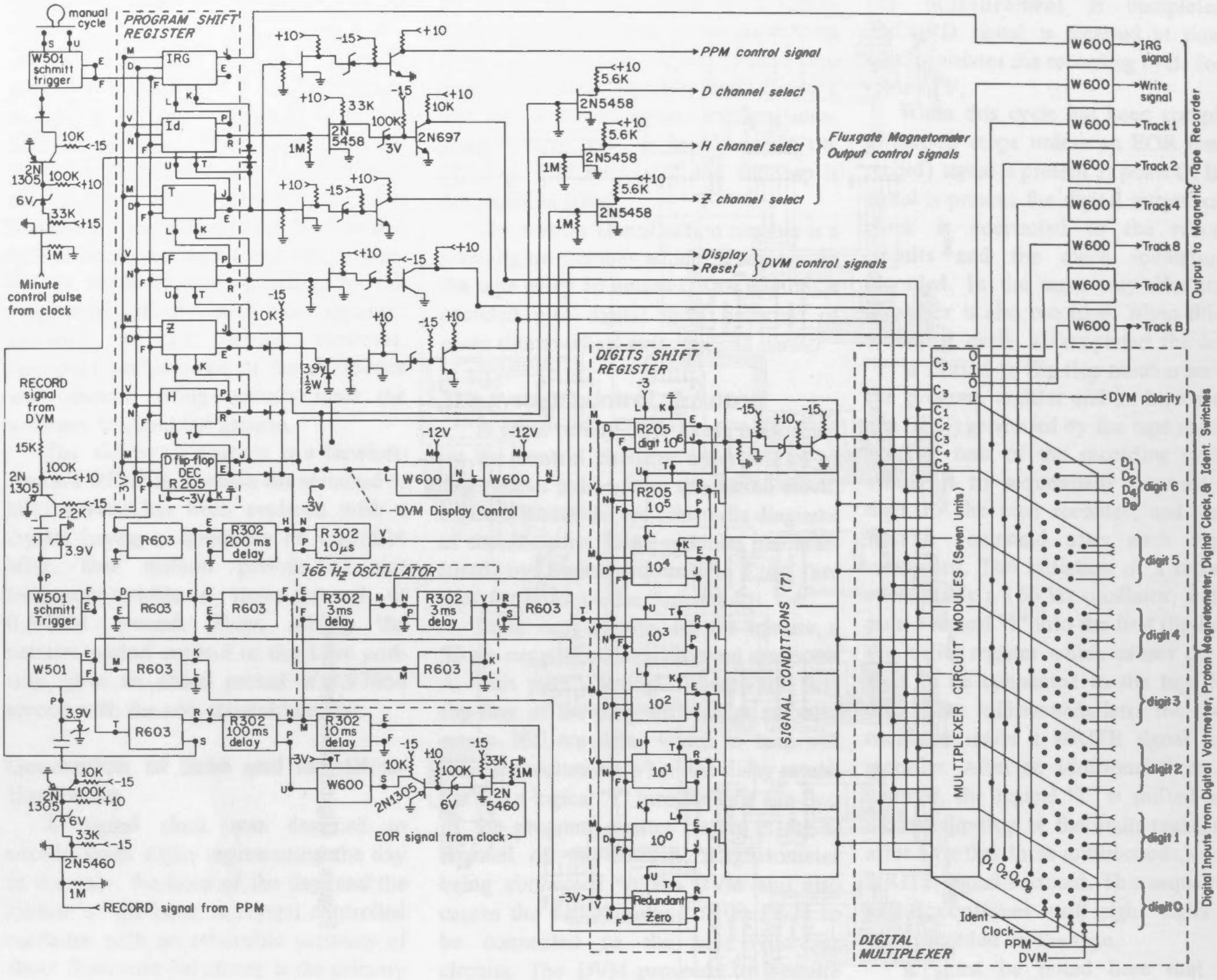
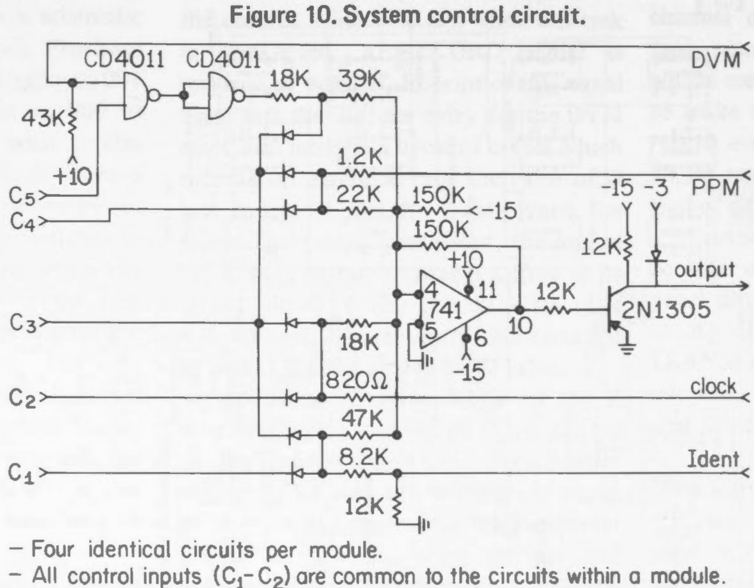


Figure 10. System control circuit.



- Four identical circuits per module.
- All control inputs (C_1–C_2) are common to the circuits within a module.
- All diodes are IN914.

Figure 11. Control circuit detail.

tracks at 200 bits per inch. Tape motion is incremental. Formatting of the inter-record gap, the file mark, and the load-point gap, is performed within the recorder. Both horizontal and vertical parity indications are automatically generated.

Strip-chart recorder

The strip-chart recorder now used with the AMOS is the Texas instrument Servo-Riter II. However, almost any other recorder could be used. Chart speed is 20 mm per hour and sensitivity on all channels is usually 1,000 gammas full scale.

Stand-by power supply

One AMOS installation has been equipped with a dc-to-ac inverter operating on large automotive-type batteries. This unit, manufactured by Sola Electric Co., features automatic switch-over when power fails and automatic recharging of the batteries when power is restored. Switch-over is so fast that no malfunction of the AMOS occurs when power fails.

Performance

A very extensive evaluation of the AMOS performance has been carried out by J.M. DeLaurier *et al.*, all of the Geomagnetic Division. In their paper, in a section entitled *Comparison of AMOS data with Absolute Field Measurements* they write,

> "AMOS data at all stations are regularly compared with the absolute field measurements by plotting the AMOS D baseline and the corrections required to reduce AMOS H (X, Y), Z values to the field measured at the absolute piers.
>
> For example, a careful comparison has been made between the corrected AMOS D, H, Z values and the absolute field observations at St. John's observatory for the 12-month period March 1970 to February 1971. For H and Z the differences between the absolute observations and the corresponding AMOS values were plotted, and the straight line segments were fitted to the points. In the interval from March to December 1970, for 84 absolute (QHM) observations, the correction necessary to reduce the AMOS H to the absolute pier, as given by the best straight line fit, was 3.3 gammas with an r.m.s. deviation of 1.6 gammas. The mean adopted correction to the AMOS Z in this period was 5.1 gammas with an r.m.s. of 1.6 gammas. The typical scatter in any month in determining the AMOS D baseline was 0.6 minute or 3 gammas, comparable to the r.m.s. deviation in any one month in the absolute minus AMOS values for H and Z.
>
> The r.m.s. deviation in the observed minus adopted H baselines for the Ruska for the period March 1970 to December 1970 was 1.6 gammas, or the same as that found for the AMOS H. In general, it is concluded that the AMOS baseline stability is as good as the baseline stability of the RUSKA."

Again in a later section they conclude,

> "The Automatic Magnetic Observatory System has proven to be at least as reliable and stable as our RUSKA systems. AMOS has recorded successfully such large storms as that of August 4-5, 1972, during which the field changed by more than 1,800γ/min whereas our photographic equipment failed to monitor such a disturbance. The direct recording of one-minute values on digital tape is an improvement over the manual scaling or digitizing of photographic traces."

Since late 1969, the Geomagnetic Division has built and installed a total of eight AMOS. Two more installations are planned for 1973. The most persistent sources of malfunction have been the digital voltmeters and the magnetic tape recorders. Usually the malfunction is traceable to the electro-mechanical items such as cooling fans, microswitches, reel motors, and relays.

The voltmeters must be calibrated on a regular basis, nominally every six months.

Miscellaneous information

The power consumption of the system is nominally 500 watts. During the time that the proton magnetometer is polarizing, an additional 100 watts is required. Overall weight is just under 200 kgm. Excluding the fluxgate detector assembly and proton sample, the dimensions of the system are about 140 cm high, 55 cm wide, and 55 cm deep.

Acknowledgments

It is a pleasure to thank Dr. P.H. Serson and E.I. Loomer of the Geomagnetic Division for their interest and encouragement during the development of the AMOS. They have also made numerous suggestions for improvement of this paper.

The author is much indebted to J.M. DeLaurier, E.I. Loomer, G. Jansen van Beek, and A. Nandi, also of the Geomagnetic Division, for permission to quote extensively from their paper on the evaluation of the AMOS.

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a theoretical evaluation of design ground seismic motions for pipelines in the yukon territory and mackenzie valley

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Contents

a theoretical evaluation of design ground seismic motions for pipelines in the yukon territory and mackenzie valley

H. S. HASEGAWA

Abstract. A proposed Mackenzie Valley pipeline route is partitioned into three seismic zones that are related to the calculated acceleration contours for a 100-year-return period of Stevens and Milne. A set of design ground seismic motion parameters is calculated for each zone. The magnitude of these ground motion parameters should be thought of as sustained vibrations that are representative of the seismic activity to be expected on firm ground for the specified return period. Isolated extreme peaks could be a factor of four or even five times greater.

For the section of the proposed corridor where the acceleration contours reach their largest value (west of Fort McPherson in the Richardson Mountains) a set of design ground seismic motion is as follows: 0.25g, 30 cm/sec (12 inches/sec) and 30 cm (12 inches) for ground acceleration, velocity and displacement respectively. For an adjacent region where acceleration contours reach an intermediate level, the corresponding ground motion parameters are 0.11g, 13 cm/sec (5 inches/sec) and 13 cm (5 inches). For the remainder of the proposed corridor where the acceleration contours reach their smallest levels (most of the proposed corridor lies in this region) ground motion parameters are 0.09g, 10 cm/sec (4 inches/sec) and 5 cm (2 inches). Estimated maximum strains are of the order of 10^{-6} for the permanent offset and 10^{-5} to 10^{-4} for transient or dynamic strain. For imperfect coupling between ground and pipeline the corresponding strains induced in the pipeline structure will be proportionately less, depending on the degree of coupling between ground and structure.

Résumé. Le tracé proposé du pipeline dans la vallée du Mackenzie est divisé en trois zones séismiques, reliées aux courbes d'accélération calculées pour une période de retour de 100 ans de Stevens et Milne. Un ensemble de paramètres de séismicité est calculé pour chaque zone. L'ampleur de ces paramètres doit être conçue sous forme de vibrations soutenues, représentatives de l'activité séismique à prévoir sur un terrain solide pour la période spécifiée de retour. Les points isolés extrêmes pourraient constituer un facteur de magnitude quatre ou même de grandeur cinq.

Quant à la section du corridor proposé où les courbes d'accélération atteignent leur plus forte intensité (à l'ouest de Fort McPherson dans les monts Richardson), la séismicité du tracé projeté se présente ainsi: 0.25 v, 30 cm/sec (12 pouces/sec) et 30 cm (12 pouces) pour l'accélération tellurique, la vitesse et le déplacement, respectivement. Dans une région adjacente, où les courbes d'accélération atteignent une intensité moyenne, les paramètres de mouvements telluriques correspondants sont 0.11 v, 13 cm/sec (5 pouces/sec) et 13 cm (5 pouces). Pour le reste du corridor proposé, où les courbes d'accélération atteignent leur intensité minimale (la majorité du corridor proposé s'étend dans cette région), les paramètres de mouvements telluriques sont 0.09 v, 10 cm/sec (4 pouces/sec) et 5 cm (2 pouces). Les tensions mécaniques maximales sont de l'ordre de 10^{-6} pour la compensation permanente et de 10^{-5} à 10^{-4} pour la tension passagère ou dynamique. Dans un contact imparfait entre le sol et le pipeline, les tensions transmises dans la structure du pipeline seront proportionnellement moindres, suivant le degré de contact entre le sol et la structure.

Introduction

Variability in seismic risk in the Yukon and adjacent areas of the Northwest Territories is illustrated in a recent report by Stevens and Milne (1973). Utilizing available seismic information on earthquakes (1899-1970) that have either originated in this region or have originated elsewhere but have generated intensities in this region high enough to have been felt, these authors have constructed two different types of maps depicting seismic risk in this region. It is the information presented in those maps based on a statistical approach to seismic zoning (see Milne and Davenport, 1969) that will be used in the present report.

Figures 1 and 2 show the proposed pipeline routes that are being considered north of 60° latitude together with available information on the seismicity (1899-1970) of this region superimposed upon a physiographic (Douglas, 1970) and a tectonic (Douglas, 1970) map respectively. Figure 3 illustrates an evaluation of the seismic risk in the region of interest in the form of acceleration contours for a 100-year-return period (from Stevens and Milne, 1973). From a glance at Figures 1, 2 and 3, it can be seen that the region of maximum seismic risk in the proposed pipeline route through the Yukon Territory and along the Mackenzie River lies in the sector that traverses the Richardson Mountains. In this region the proposed route intersects a seismically active zone in which the pipeline and associated structures could be subjected to strong seismic vibrations.

This report is concerned primarily with a determination of ground motion parameters that are indicative of the level of seismic activity expected in the proposed pipeline corridor over an appropriate time interval, namely a return period of 100 years. This set of strong ground motion parameters—acceleration, velocity and displacement—are designated as the "design earthquake" ground motion parameters. These values can be used by the design engineer as input into soil and structural design so as to enable the pipeline and associated structures to successfully resist the strong seismic vibrations expected from the "design earthquake".

Favourable conditions for estimating the degree of seismic activity obtain when both the earthquake history and the tectonics of a seismically active region are known in detail (e.g. some areas of California adjacent to San Andreas fault). From this information seismologists can evaluate ground motion parameters for an appropriate design earthquake. This information is useful to the design engineer

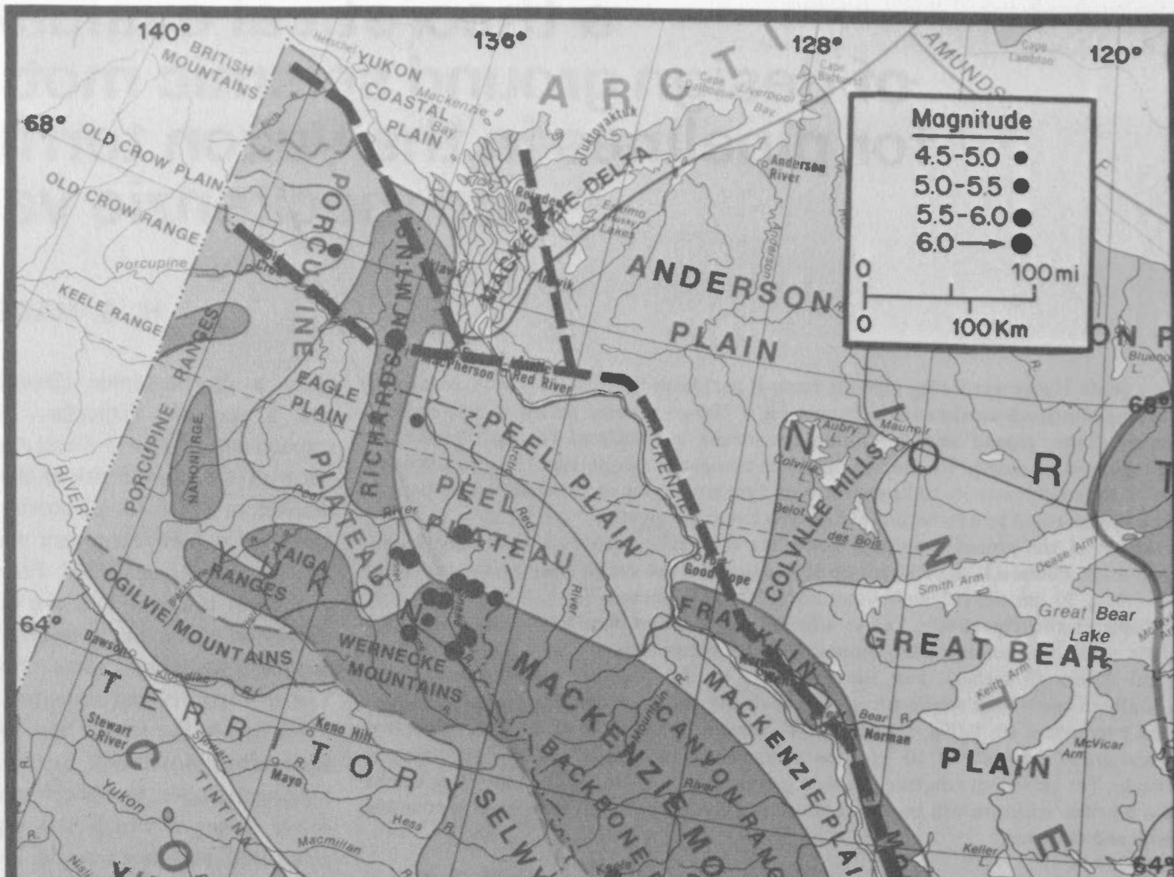

Figure 1. Seismicity (1899-1970) and proposed pipeline route (thick dashed line) superimposed upon physiographic map of Yukon and bordering portion of Northwest Territories (physiographic map from Douglas).

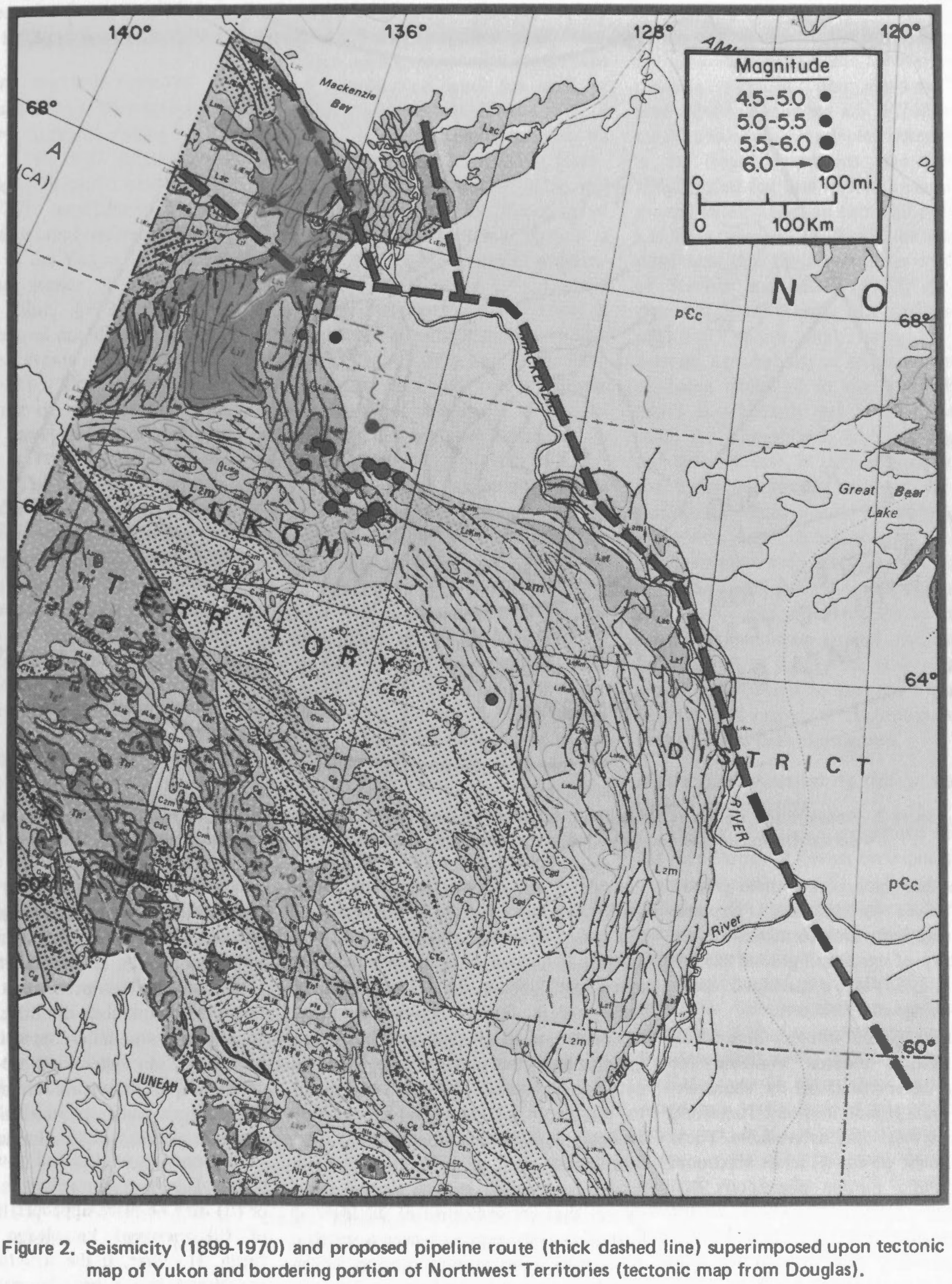

Figure 2. Seismicity (1899-1970) and proposed pipeline route (thick dashed line) superimposed upon tectonic map of Yukon and bordering portion of Northwest Territories (tectonic map from Douglas).

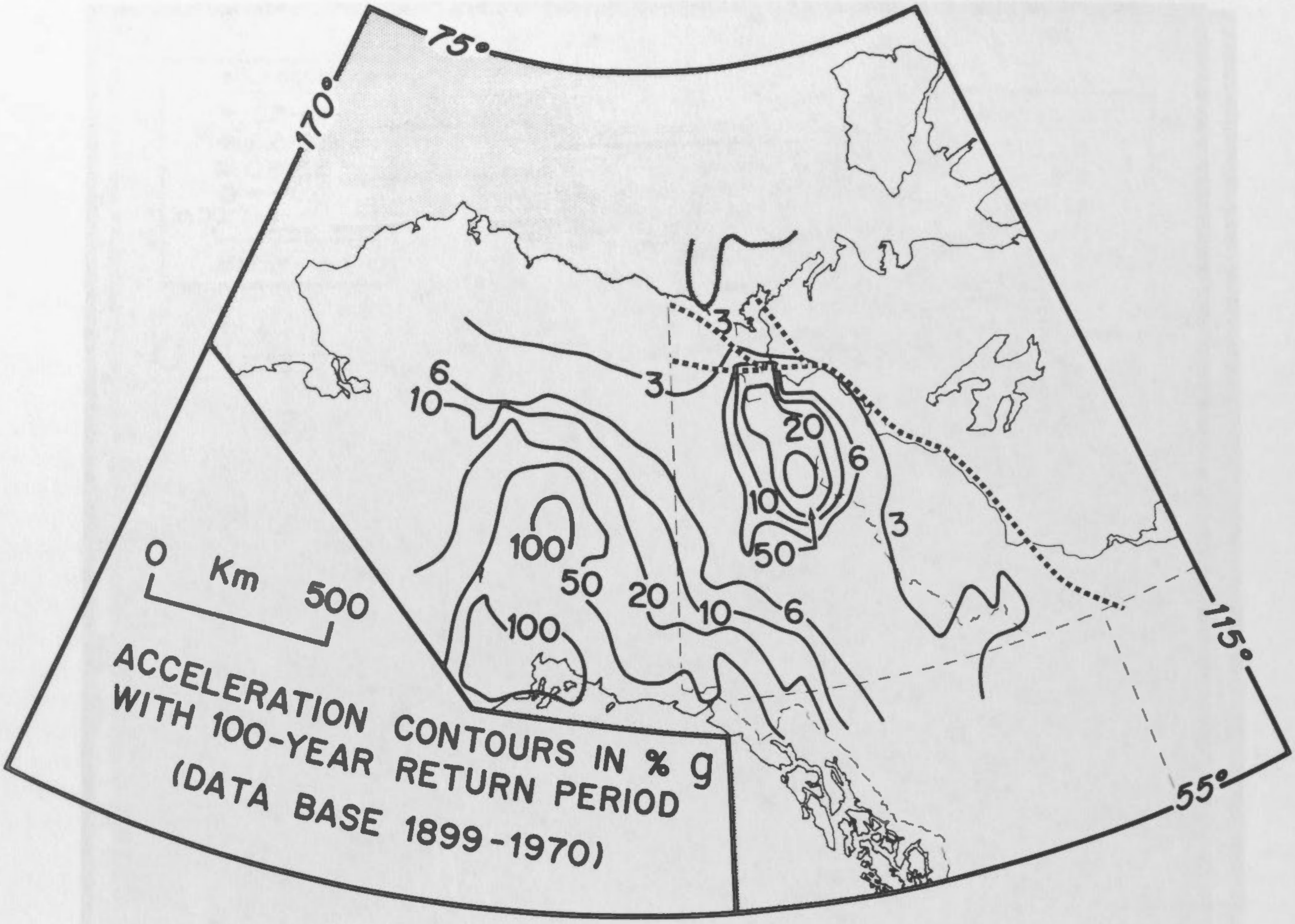

Figure 3. Acceleration contours for Yukon, bordering Northwest Territories and Alaska for a 100-year-return period (from Stevens and Milne). Proposed pipeline route represented by thick dashed line.

who can then incorporate these ground motion values (or associated response spectra) together with information on the time history of significant ground motion (see Perez, 1973) into a combined static-dynamic design of a structure.

For the region of interest there are no strong motion records available for obtaining observations on the characteristics of local ground motions. Therefore, there are several options available. These are as follows: we can (i) select maximum strong ground motion parameters that have been recorded anywhere in the world for any earthquake equivalent, or slightly greater, in magnitude to the largest magnitude earthquake that has occurred within or close to the region of interest (ii) estimate a physically plausible minimum focal depth that can be expected for the largest magnitude earthquake that has occurred in the region of interest; next assume that the structure of interest is located on the earth's surface immediately above the focus, that is at the epicentre; finally carry out the same procedure as in (i) but subject to the hypocentral (from earthquake focus to detector on surface) distance being equal to the depth of focus (iii) incorporate available information on seismicity and seismic risk with an appropriate seismic model to generate ground motion parameters that are indicative of the level of seismic activity expected over a suitable time span. The ground motion values calculated by this method are average amplitudes with a reasonable duration rather than extreme isolated peak values. These peaks, which have been noticed on some recent accelerograms, can be caused by unusual soil interaction, by focusing of seismic waves and other circumstances and consequently, are unpredictable.

Ground motion parameters evaluated by the three methods outlined above can be expected to differ appreciably. The selection of an appropriate set of values depends upon the anticipated response of the structure under consideration. If the structure under consideration is expected to respond to an isolated peak ground acceleration, then the values shown in (i) or (ii) may be more appropriate. The use of (ii) presumes knowledge of focal depth. However, if the structures under consideration can be adequately represented by single-degree-of-freedom oscillators with damping of about 5 per cent critical, then the values representative of

(iii) are more appropriate (see, for example, Perex, 1973).

Seismicity and tectonic features

Figures 1 and 2 show the seismicity in the Central and Northern Yukon for the time interval 1899-1970 superimposed upon a physiographic and a tectonic map (Douglas, 1970) respectively of this region. (For a detailed reference list on the seismicity of the Yukon and adjacent territories, the reader is referred to Stevens and Milne, 1973.) Since the published epicentral coordinates of many of the historical events could, in general, be in error by ±1°, we cannot associate with any degree of firmness the larger events in the past with local tectonic features such as faults observed at the earth's surface. The correlation of earthquake distribution with surface faulting has not yet been well established in this region, although recent field studies of smaller earthquakes with a temporary network of seismic stations are making some progress in this direction in the Wernecke Mountain and Richardson Mountains regions farther south (Leblanc, private communication, 1973).

Outline of computational procedure

The proposed pipeline corridor will be partitioned into three seismic zones. With reference to Figure 3 (from Stevens and Milne, 1973) these zones are as follows: the region in which the acceleration contours for a 100-year-return period lie between 0.06g and approximately 0.10g will be referred to as the zone of maximum seismic ground motion; the adjacent region in which the acceleration contours (for the same return period) lie between 0.03g and 0.06g will be referred to as the zone of intermediate seismic ground motion; the remainder of the proposed corridor for which the acceleration contours are of the order of 0.03g will be referred to as the zone of minimum seismic ground motion.

Because it is of paramount importance to safeguard the pipeline and associated facilities against failure and because of an uncertainty factor of about two in the acceleration contours, a safety factor of 2.5 will be applied when determining an appropriate design earthquake ground acceleration level for each of these three zones. Thus, for the zone of maximum seismic ground motion an acceleration level of 2.5 x 0.10g (maximum acceleration contour) = 0.25g will be ascribed. Similarly for the zone of intermediate seismic ground motion a value of 2.5 x 0.045g (mean of acceleration contour in this region) = 0.11g will be ascribed. Finally, for the zone of minimum seismic ground motion, a level of 2.5 x 0.03g = 0.075g may be ascribed. However, in view of recent seismic activity south of this zone (to be described later) this tentative value may be increased to 0.09g.

Since the above acceleration values are related to ground motion, they are appropriate as input parameters for the design of soil structures and completely buried structures (e.g. a buried pipeline). However, for structures that either rest on the ground surface or extend above the surface, a comparatively lower level of ground motion can be used for design purposes. This is due to the energy absorbed (dissipated) while in the inelastic (ductile) region, thereby reducing the elastic response of the structure by a factor equal to the ductility factor.

Ground motion parameters calculated in this report are based on a 100-year-return period. The use of equation (2), p. 5 of Stevens and Milne (1973) enables one to calculate the ratio of accelerations for any two return periods of interest. Consequently, acceleration levels for a desired return period can be evaluated using equation (2) in conjunction with an acceleration calculated for a particular return period.

The "safety margin" that a design engineer incorporates into a pipeline system will depend upon, among other factors, return period, percentage of critical damping and ductility factor. In structural terms, these are related to strength, stiffness and elasto-plastic behaviour, respectively.

Data input to a theoretical design earthquake

Input parameters to a theoretical design earthquake for the region of maximum seismic risk, i.e. the section of the pipeline corridor that traverses the Richardson Mountains are as follows: a magnitude of $6^1/_2$ is selected because this is the largest magnitude (see Meidler, 1962) listed for this region; a maximum ground acceleration on firm soil of 0.25g has been selected. It should be emphasized here that the acceleration contours of Stevens and Milne (1973) do not represent deterministic peak values but statistical values that have, on the average, a probability of one-in-a-hundred of being exceeded in one year. Focal depth is arbitrarily set to a minimum value for a magnitude $6^1/_2$ earthquake and this estimate, in turn, depends upon the linear dimensions assumed for the earthquake fault plane; epicentral distance is no longer an independent variable but has a value such that, for a magnitude $6^1/_2$ earthquake the theoretically generated earthquake accelerogram spectrum predicts a maximum ground acceleration on firm soil of 0.25g; the fault plane is arbitrarily oriented so that the radiation pattern will have a maximum value (unity) in the desired direction.

Method of calculating design earthquake parameters

Having selected a magnitude ($6^1/_2$) for this particular design earthquake and a ground acceleration (0.25g), we wish to calculate the remaining parameters of interest, namely ground velocity and ground displacement.

This is carried out in an indirect way and is as follows: first an appropriate multiplier is used to evaluate an acceleration level that a 0%ζ (critically damped) oscillator would experience when subjected to a predetermined ground acceleration (e.g. 0.25g in present case). Then from a suite of appropriate theoretical response curves that are a function of magnitude ($6^1/_2$ in the present case) and hypocentral distance (which is to be determined), the particular curve that has the predetermined acceleration response level is selected. A hypocentral distance that is associated with the selected curve gives us the important "distance" parameter insofar as body waves from a design earthquake are concerned. For surface waves, however, the important "distance" parameters are focal depth and epicentral distance. The theoretical response curves that we are referring to are the unnormalized Fourier amplitude spectrum (FS) curves of ground acceleration and are related to velocity response spectrum (SV) by (Trifunac, 1972)

$$|FS|_{max} \leq SV_{0\%\zeta}$$

where ζ represents critical damping of a single-degree-of-freedom oscillator.

Design engineers find it convenient to work with velocity response (SV) curves or the approximate pseudo-velocity response (PSV) curves. Although there is no obvious technique to generate theoretically either of these response curves, it is possible, however, to generate theoretically Fourier amplitude spectrum (FS) curves that are reasonably close facsimiles to velocity response ($SV_{0\%\zeta}$) curves (see, for example, Hasegawa, 1974).

For structural design purposes, it is convenient (and generally sufficiently accurate) to partition FS curves (see, for example, Figure 4) into three frequency (or period) bands. In each of these ranges the tangential line segments shown are used to evaluate the appropriate response parameters for a $0\%\zeta$ single-degree-of-freedom oscillator. Velocity response ($SV_{0\%\zeta}$) is read directly from the figure, acceleration response ($SA_{0\%\zeta}$) by multiplying by an appropriate angular frequency in the frequency range of interest and displacement response ($SD_{0\%\zeta}$), by dividing by an appropriate angular fre- quency in the selected frequency range.

From the three response value namely $SA_{0\%\zeta}$, $SV_{0\%\zeta}$ and $SD_{0\%\zeta}$, we can evaluate the desired ground motio parameters by dividing by appropriat damping scale factors (see, for exampl Newmark and Hall, 1969; Hasegaw 1974). The resulting ground acceleratio value should, of course, equal the pre- selected value. Ground motion parameters (acceleration, velocity and displacement) thus evaluated should be thought of as being representative not of an isolated large amplitude peak but of smaller amplitudes of longer duratio The reason for this qualifying statemen is that the selected FS curve (see Figur

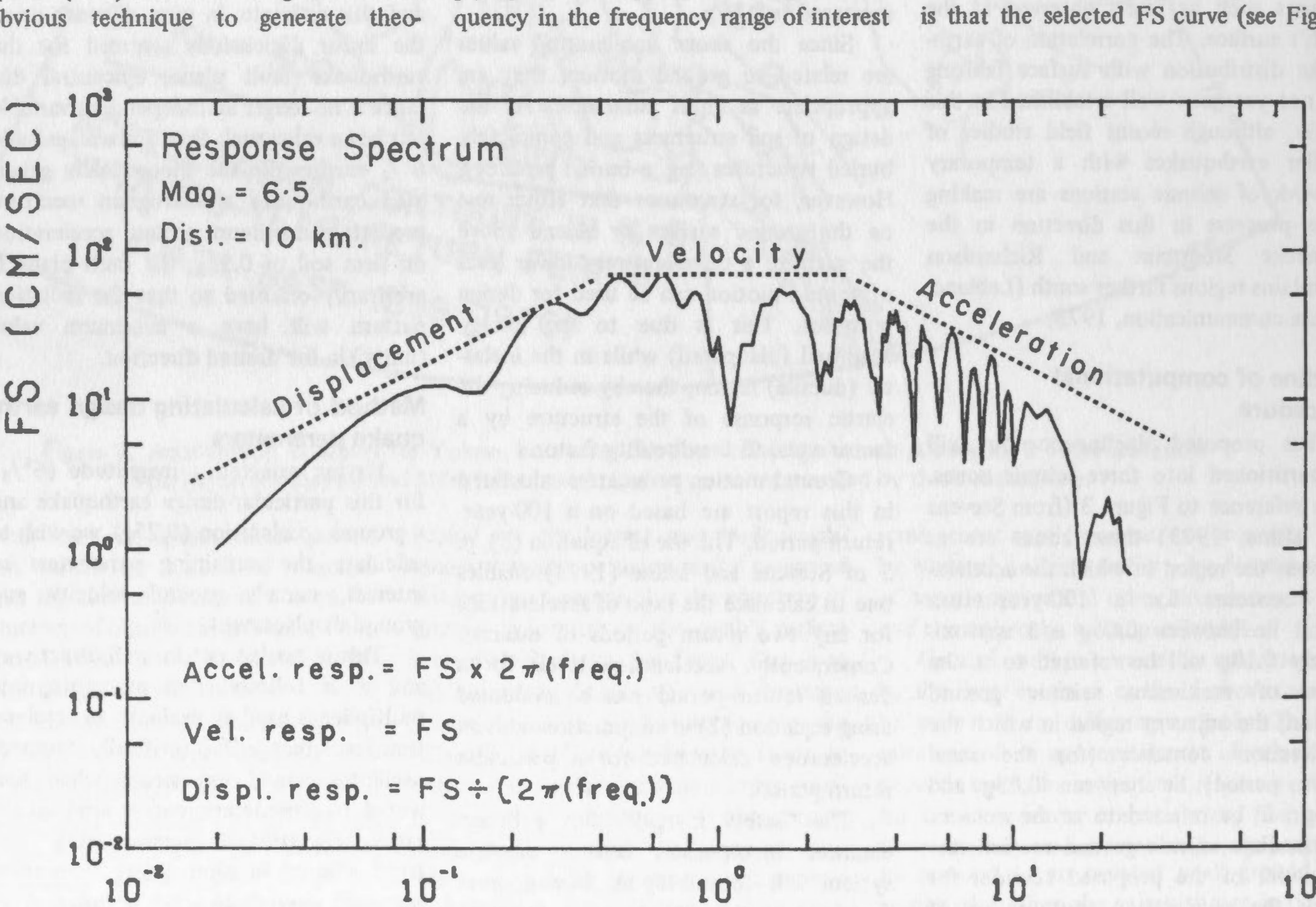

Figure 4. Acceleration, velocity and displacement response values for a $0\%\zeta$ oscillator are represented approximately by the straight line segments tangent to the Fourier amplitude spectrum (FS) curves of ground acceleration (due to the direct shear wave). The above FS curve is representative of the zone of maximum seismic risk in the proposed pipeline corridor.

4) does not contain isolated large amplitude peaks but a number of smaller amplitude peaks. In subsequent evaluations of response spectra for appropriate damping factors, one must work from the ground motion parameters and not from the prototype FS curve, nor more explicitly from the simulated response values for a 0%ζ single-degree-of-freedom oscillator.

A theoretical design earthquake spectrum

Table I lists the parameters selected for a theoretical design earthquake for the zone of maximum seismic risk. The data base used to generate the design earthquake spectra that are used in this report are the Fourier amplitude spectrum (the FS curves) of California earthquake accelerograms (from Hudson, 1972). This choice is necessitated because of an insufficient number of western Canada accelerograms.

The response spectrum parameters associated with the direct shear waves radiated from this design earthquake are readily evaluated from Figure 4 by the method outlined previously and are shown in Table II. The amplification factor/term includes crustal wave attenuation, crustal reverberations and surface (Love) wave contributions. Attenuation is significant in the high-frequency end of the spectrum, that is the acceleration flat portion (see Figure 4). Crustal reverberations are generally manifest in the central frequency band; that is in the velocity flat portion. Surface waves often predominate in the low-frequency portion, especially for shallow focus events (assumed 7 km focal depth). In order to avoid underestimating ground motion parameters for the selected design earthquake, we have selected minimum allowable values for the divisor that converts a Fourier amplitude spectrum, or its equivalent, which is the simulated velocity response spectrum (0%ζ), to ground motion; by "minimum allowable", we are referring to mean values reduced by one standard deviation.

Ground motion values shown in Table II are only appropriate over the respective frequency ranges shown in Figure 4. Although an acceleration value of 0.25g is, strictly speaking, only appropriate for frequencies greater than, say, several cps, it is, nevertheless, standard practice for design engineers to utilize this high-frequency acceleration level to evaluate, by means of a suitable multiplier or seismic coefficient, an approximate acceleration level appropriate for the natural period of vibration (T) of a structure. This extrapolated value is then used as input to the calculation of base shear. This acceleration value of 0.25g should be taken into consideration in the dynamic design of any soil or buried pipeline structure for which the natural resonant frequency is greater than several cps. Also this velocity of 30 cm/sec (12 inches/sec), which is appropriate for soils or buried structures for which the natural resonant frequency is close to 1 cps, is an important input into the dynamic design of these components. Finally this displacement of 30 cm (12 inches) may be required to calculate the dynamic response of buried structures with a natural period of the order of several seconds; a resonance phenomenon could develop, resulting in very large deformations.

For comparison purposes, Table III lists the ground motion parameters associated with a magnitude $6^1/_2$ earthquake that are obtained by other authors utilizing either experimental data or an empirical formula. Values for ground acceleration, velocity and displacement that are estimated in this report for magnitude $6^1/_2$ earthquake lie in between those of Newmark and Hall (1973) for magnitudes $6^1/_2$ and 7. Moreover, ground motion values evaluated in this report are (as anticipated) smaller (see Table III) than maximum experimentally observed isolated peak values.

The selection of an appropriate set of ground motion parameters depends upon the anticipated structural response. If a structure can be represented adequately by a single-degree-of-freedom oscillator with damping of 2–7%ζ, then the response spectrum (Velocity Response Envelope Spectrum) graphs of Perez (1973) indicate that velocity response is greater for smaller levels of ground acceleration of many cycles than for an isolated extreme peak in acceleration. Since

Table I. Theoretical Design Earthquake Parameters

Magnitude	Fault length (km)	Fault width (km)	Dislocation (cm)	Focal depth (km)	Epicentral distance (km)	Hypocentral distance (km)
6.5	18	11	75	7	7	10

Table II. Design Earthquake Spectrum Parameters

	Acceleration (gravities)	Velocity (cm/sec)	Displacement (cm)
FS* (direct shear wave)	1.15	70	25
Amplification factor/term	x 1	x 1.5 (crustal reverberation) contribution	† (200 per cent) (surface wave) contribution
FS (total shear plus surface wave)	1.15	105	75
Divisor † (to obtain ground motion)	4.6	3.5	2.5
Ground motion parameters	0.25	30	30

*FS = Fourier amplitude spectrum (from Figure 4) simulates a velocity response (SV) curve with 0%ζ (critical damping).

†Minimum value assumed for scalar divisor: these values were obtained from the average values and standard deviations in Hasegawa, 1974.

ground motion parameters evaluated in this report and by Newmark and Hall (1973) are representative of smaller average amplitude levels of ground vibration of many cycles and not for an isolated peak, then for pipelines and appurtenant structures that satisfy the criteria stated in the previous statement, the response graphs of Perez would indicate the appropriateness of utilizing, not isolated peak values, but the comparatively smaller values listed in Table III.

Uncertainties in estimates of design earthquake ground motion values utilizing the method outlined above are difficult to assess for several reasons: the mechanism by which the high-frequency (acceleration flat) components is generated is not fully understood; both the centre frequency (velocity flat) components and the low-frequency (displacement flat) components depend strongly on the linear dimensions of the fault, which for a specified magnitude can vary considerably. However, the tendency throughout theoretical calculations was to select values that tended not to underestimate ground motion, but which stayed within specified error limits. Schnabel and Seed (1973) have determined empirically the margin of scatter in maximum acceleration measurements in rock; specifically at 10 km from a magnitude $6^1/_2$ earthquake their range is about 0.24g. If we assume that this experimentally determined range of uncertainty is applicable to the ground acceleration value of 0.25g shown in Table III (and this would appear to be a reasonable assumption) then the uncertainty in ground motion acceleration would be ±50 per cent. Uncertainties in estimates of ground velocity are about ±30 per cent (see, for example, Page *et al.*, 1972). Uncertainties in ground displacement depend, in a large part, upon the amount of surface wave generated as compared with long-period body (shear) waves. In the present case we have assumed at long periods (> 2 seconds) that the contribution from surface waves is twice that from body waves; an uncertainty factor of ±30 per cent is assigned.

Utilizing a method of calculating design earthquake ground motion parameters described previously and the uncertainty factors discussed above, we have evaluated the following ground motion parameters for each of the three seismic zones of the proposed pipeline corridor. For the section of the proposed corridor where the acceleration contours for a 100-year-return period are largest, a set of seismic ground motion parameters is as follows: acceleration 0.25g ±0.12g; velocity 30 cm/sec ±10 cm/sec; displacement 30 cm ±9 cm. For the zone in which the acceleration contours reach an intermediate level, a set of ground motion values is based on the selection of a ground acceleration value that is 2.5 times an average (of 0.045g) for this region: acceleration 0.11g ±0.05g; velocity 13 cm/sec ±4 cm/sec; displacement 13 cm ±4 cm. For the remainder of the proposed corridor a ground acceleration value that is 2.5 times a representative value of 0.03g would be 0.075g. However, in recent years several seismic events have occurred south of this region and if we take these events into consideration in evaluating a set of ground motion values for this region we get the following: acceleration 0.09 ±0.05g; velocity 10 cm/sec ±3 cm/sec; displacement 5 cm ±2 cm.

The earthquakes mentioned in the previous paragraph are the Snipe Lake, Alberta, earthquake of March 8, 1970 and the Bengough, Saskatchewan earthquake of July 26, 1972. The U.S. Coast and Geodetic Survey PDE cards list the Snipe Lake event as having a magnitude

Table III. Ground Motion Parameters for a Magnitude $6^1/_2$ Earthquake

Reference	Hypothetical focal depth (km)	Assumed epicentral distance (km)	Hypocentral distance (km)	Acceleration (gravities)	Velocity (cm/sec)	Displacement (cm)	Comments
Page *et al.* (1972)			few (3-5)	0.90	100	40	Maximum horizontal acceleration—single components; see Page *et al.* † for qualifying remarks.
Schnabel and Seed (1972)	30 20 10	0 0 0	30 20 10	0.17 ±0.08 0.26 ±0.10 0.42 ±0.12			Average values of maximum acceleration in rock. Hypothetical focal depths are those of present author and not Schnabel and Seed*.
Newmark and Hall (1973)				0.22	28	22	"Effective" and not maximum spike values of design seismic motion. (See Newmark and Hall** for more details.)
Hasegawa (this report)	7	7	10	0.25 ±0.12	30 ±10	30 ±9	Not extreme peak values but those representative of level of seismic activity expected in region under study.

†Page *et al.* (1972) list, in the same table peak accelerations and velocities that are exceeded up to 10 times. That is, they tabulate a "time history" of strong ground motion.
*Schnabel and Seed (1973) display lower and upper bounds expected for average values of maximum acceleration in rock.
**Newmark and Hall (1973) tabulate two sets of values, depending on intensity of earthquake; above values are for more extreme conditions.

(m_b) of 5.1, a focal depth of 9 km and an epicentre of 55.0°N and 116.6°W. The U.S. National Earthquake Information Center PDE cards list the Bengough event as having a 4.3 m_b, a normal focal depth and an epicentre of 49.5°N and 104.8°W. (For further information regarding the Snipe Lake event the reader is referred to Milne (1970) and for the Bengough event, to Horner *et al.* (1973).) A design earthquake of magnitude $5^1/_2$ and a focal depth of 10 km is assumed for the zone of minimum risk. In order to determine whether surface waves at a distance of approximately 100 km from a magnitude $6^1/_2$ earthquake are of the order of 5 ±2 cm, we have examined a number of strong motion records found in Hudson and Brady (1971): surface wave amplitudes are of the order of 3 to 5 cm, in agreement with our results.

Table IV summarizes design earthquake ground motion levels associated with each of the three seismic zones. These values are appropriate as input into the design of soils and buried structures. For structures that extend above the ground surface, a suitable divisor (ductility factor) should be applied to the values shown in Table IV and the desired response spectrum can be calculated by selecting an appropriate damping factor and applying its related multipliers (see Newmark and Hall, 1973).

Another important factor that should be taken into consideration in the design of the pipeline is the anticipated maximum strain in the pipeline itself. According to Newmark (Alyeska Appendix A-3, 1051) dynamic strains of the order of 6×10^{-4} can cause longitudinal stresses of about 18,000 p.s.i., which according to this author is considered to be high, i.e. capable of damage; consequently if this level of stress is anticipated, then this should be taken into account in the design of the pipeline. Table V shows that strain steps of the order of 2×10^{-6} can be expected at a hypocentral distance of 10 km from a magnitude $6^1/_2$ earthquake (Wideman and Major, 1967). If we assume that the pipeline, being very flexible, can withstand strains of up to 4×10^{-3} ("operating deformation limit" of Newmark), then it would appear that the estimated strain step is not significant. However, the two estimates (one for constant velocity frequency range and the other, for constant displacement) of peak transient or dynamic strain shown in Table V are not insignificant if we take Newmark's criterion regarding the stress/strain level that a pipeline can safely withstand. The above example presumes perfect coupling between pipeline and firm ground; since strain is not continuous between two elastic bodies in welded contact (stress and displacement are) and since there is likely to be imperfect coupling between firm ground and the pipeline, an accurate estimate of strain induced in the pipeline is a difficult task.

The next step, which is the specification of peak response spectrum parameters appropriate for pipelines and associated structures, is the responsibility of the design engineer. If, in the opinion of the design engineer, the structure under consideration can be represented adequately by a single-degree-of-freedom oscillator, with a low damping factor (ζ) then the solution becomes tractable. For this approximate representation of a structure, design engineers can readily calculate a response spectrum envelope from ground motion parameters such as those shown in Table IV by taking into consideration an appropriate reduction (ductility) factor and empirically determined amplification (damping) factors; several examples are presented by Newmark and Hall (1973). The above method, although expedient does not take into account explicitly, but only implicitly, the duration of strong ground vibrations.

Duration of strong ground motion

The method utilized in this report to

Table IV. Design Earthquake and Design Ground Seismic Motions*

Seismic zone	Design earthquake mag.	Distance (hypocentral) km	Acceleration (gravities) ground motion	Velocity (cm/sec) ground motion	Displacement (cm) ground motion
Maximum	$6^1/_2$	10	0.25	30	30
Intermediate	$6^1/_2$	20	0.11	13	13
Minimum	$5^1/_2$	10	0.09	10	5

*For firm ground and for a 100-year-return period.

Table V. Maximum Predicted Strain in Corridor*

	Modulus	Peak strain	Comments
Permanent offset (dislocation at source)	75 cm	2×10^{-6}**	from Figure 6 of Wideman and Major (1967).
Maximum ground displacement (D_m) 10 km from earthquake focus	20 cm	$\simeq 10^{-4}$**	from $\frac{1}{2} \frac{2\pi D_m}{T \cdot \beta}$ (eq. 27 of Major *et al.*, 1964)
Maximum ground velocity (V_m) 10 km from earthquake focus	30 cm/sec	$\simeq 10^{-5}$**	from $\frac{1}{2} \frac{V_m}{\beta}$ (eq. 27 of Major *et al.*, 1964)

Legend:
T = Predominant period in ground motion.
β = Shear wave velocity.
*10 km hypocentral distance from magnitude $6^1/_2$ earthquake.
**Assuming (i) Perfect coupling between ground and pipeline.
(ii) Elastic moduli of pipeline similar to that of ground.

generate strong ground motion parameters is quasi-static in that it does not provide explicit information on the duration of strong ground vibration. Page *et al.* (1972) show that the duration of strong ground motion increases with increasing magnitude; the 0.05g level duration at 10 km from a magnitude $6^1/_2$ earthquake is listed as being 17 sec. This time interval is related to the rupture process and to the volume of the fault region; in some regions crustal reverberations could be a contributing factor.

For sites where there is an appreciable amount of very low-velocity unconsolidated surficial sediments, Trifunac (1971) has shown that a significant part of strong earthquake ground motion can consist of surface waves. The importance of the duration of an approximately sinusoidal wave-train on the response spectrum of a single-degree-of-freedom oscillator with 2–5%ζ is illustrated clearly by Perez (1973). When the natural period of vibration of a structure coincides with the dominant period in a dispersed surface wave train then the response of a structure can be appreciable. This situation could conceivably happen for a structural system in a region where the low-velocity surficial sediments are such that a shallow earthquake could generate a significant amount of short period (0.5 sec–2 sec) surface waves of appreciable amplitude and duration. Then provided the natural period of vibration of the system lies in this period range, a resonance phenomenon could develop, resulting in large-amplitude forced oscillations. However, both conditions are necessary for a resonance phenomenon to exist: dispersed short-period surface waves and a natural period of vibration that coincides with the dominant period in the surface wave train.

Local conditions

Seismically induced ground disturbances such as slope failure, seismic liquefaction (see Lachenbruch, 1970) and the scattering of seismic waves by pronounced topographic relief (see Davis and West, 1973; Viecelli, 1973) are beyond the scope of this report.

A very brief qualitative description will be given of some important effects of seismic waves reacting with local surface and near-surface crustal conditions.

(1) Surficial sediments: Unconsolidated surficial sediments tend in general to (i) diminish ground acceleration amplitude at high frequencies because of attenuation, (ii) enhance ground velocity amplitude in the intermediate frequency range (near 1 cps) due in part to constructive interference, (iii) enhance ground displacement amplitude at low frequencies. When a resonance phenomenon exists, then (ii) and/or (iii) can be appreciable. The amplitude of short-period surface waves is enhanced by surficial sediments.

(2) Permanent fault offset: Calculated dislocations, such as that shown in Table I, can be quite different from fault offsets measured at the surface for very shallow focus events for which the rupture propagates to the surface (see Haskell, 1969). A decoupling of a thin surface layer near the surface is given by Aki (1968) as a possible explanation of this observed difference (smaller relative offset at surface). However, large amplifications (greater relative offset at surface) are also conceivable (Boore *et al.*, 1971). Newmark describes methods of decoupling pipeline from support (ground/pier) so as to overcome this problem.

(3) Permafrost: The mean annual ground temperature for the northern Yukon lies between −10°C and 0°C; theoretical estimates of permafrost thickness range as high as 1,000 metres but in most locations it is doubtful if the thickness exceeds 500 metres (Judge, 1973). For example, (i) measured permafrost thickness in the Eagle Plains at 66°11′N, 138°42′W is 88 m. (ii) in the vicinity of Fort McPherson the thickness ranges from 90–150 m. (iii) along the Arctic coast permafrost thickness increases and the ice content is greater (Judge, personal communication).

If the ice content in the permafrost is appreciable, then the velocity and elastic properties of the permafrost should approach that of ice: e.g. velocity of compressional wave 3.5 km/sec, velocity of shear wave 1.6–2.0 km/sec (Press, 1966); shear modulus 0.033 mb and Poisson's ratio 0.36 (Birch, 1966). Theoretical calculations on the effect on seismic amplitudes of superposing a 400-metre-thick layer of permafrost with the seismic velocities quoted above over a granitic crust indicate an enhancement in both surface and body wave displacement amplitudes. For example, Love (surface) wave displacement amplitudes of periods of the order of several seconds are enhanced by 25 per cent; the displacement amplitudes of SH (body) waves of shorter periods impinging from below at shallow angles upon the permafrost layer, are enhanced by 150 per cent. However, the transmission characteristics of permafrost with respect to ground acceleration for frequencies greater than, say 3 cps, is not known. We fully realize that the above example is an extreme case even for the section of the pipeline corridor near the coastline. It is simply used to give an indication of the response of body and surface waves to a permafrost layer at the surface.

Summary

(1) A set of ground motion parameters has been evaluated for each of three seismic zones in the proposed pipeline corridor. These values should be thought of as being maximum sustained levels that are representative of the seismic activity to be expected on firm ground for a 100-year-return period. The following are ground motion parameters that are input into the design of soils and completely buried structures: for the zone in the proposed corridor where the acceleration contours for a 100-year-return period reach a maximum, acceleration is 0.25g, velocity is 30 cm/sec and displacement is 30 cm; for the zone of intermediate ground acceleration levels, corresponding values are 0.11g, 13 cm/sec and 13 cm; for the zone of minimum ground acceleration levels, values are 0.09g, 10 cm/sec and 5 cm respectively. For above-ground structures that can be represented by a single-degree-of-freedom oscillator with low critical damping factor, the above values should be divided by the ductility factor of the structure. This reduced set of "ground motion parameters" are appropriate for structures that can dis-

ipate some of the input energy while in the inelastic (ductile) region, thereby reducing the elastic vibration levels.

(2) Isolated peak values can be much larger and could well lie outside the estimated margin of error (see Table III). Uncertainties in experimental peak ground motion parameters are assumed to be applicable to these design earthquake ground motion parameters and are based on graphs from Schnabel and Seed (1973) and experimental plots of Page *et al.* (1972); these uncertainty values are ±50 per cent for acceleration, ±30 per cent for velocity and ±30 per cent for displacement, respectively.

(3) Estimates of maximum strains expected in the pipeline corridor are of the order of 10^{-6} for the permanent offset and 10^{-5}–10^{-4} for transient or dynamic strain. If we compare these values with the safety criteria of Newmark, then it would appear that the estimated strain step is not likely to generate a damaging stress in the pipeline, but that the transient (dynamic) strain may be capable of generating dangerous stress levels.

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record of observations at victoria magnetic observatory 1972

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DEPARTMENT OF ENERGY, MINES AND RESOURCES

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Geographic Coordinates: 48° 31′; 123° 25′
Geomagnetic Coordinates: 54.3°; 292.7°*
Officer-in-Charge: L.K. Law
Assistant: D.R. Auld

Introduction

The Victoria Magnetic Observatory was established in 1957, on the grounds of the Dominion Astrophysical Observatory on Little Saanich Mountain, about 16 km north of Victoria, British Columbia. The magnetic observatory is pleasantly situated, some 185 m above mean sea level, in a wooded area about 120 m northeast of the Dominion Astrophysical Observatory office building. The site was chosen in 1956 for convenience to facilities and power, while maintaining adequate separation from buildings and pipelines.

The Victoria Magnetic Observatory is controlled by the Division of Geomagnetism of the Earth Physics Branch, Ottawa, Canada.

Site

The area is underlain by acid intrusive rocks of Mesozoic age. A sur[illegible] was made in 1956 [illegible]m grid separation [illegible]tions, to determine the vertical magnetic field intensity gradients. This revealed an average station difference, independent of sign, of 25 gammas† ±20 gammas standard deviation in any one difference. No large anomalies exceeding 25 gammas were found within 30 m of the building site and the distribution of small anomalies was apparently random.

Magnetic equipment

A) Buildings

Pre-fabricated hut. The first and only building erected when the observatory was established was an insulated aluminum pre-fabricated hut. It is located 30 m east of the access road to the Astrophysical Observatory. The building was constructed in 1956 and during 1957-1958 all the magnetic equipment was housed in it.

Variometer building. Prior to the end of the Geophysical Year, the decision was made to establish Victoria as a continuing magnetic observatory, and in 1959 a permanent variometer building was constructed. It is located about 30 m to the east of the original building; it is an insulated 5.5 m × 5.5 m cement block structure, containing two 3 m × 4.5 m rooms and a 1.2 m × 5.5 m light-trap entrance. The floor is a single concrete slab resting on bedrock, providing flexibility in location of instruments as well as an effective heat-sink. Both rooms are electrically heated, and have sensitive thermostat controls. Non-magnetic construction materials were used throughout.

Absolute building. A permanent building for the absolute instruments was completed in 1961, located about 30 m north of the variometer building. An extension was added in 1967. The building consists of a single room, 3 m × 9 m and construction is completely non-magnetic. The entire building rests on a solid concrete slab floor.

B) Magnetic recording systems

Ruska variometer. A set of Ruska photographic variometers records the horizontal intensity H, the declination D, and the vertical intensity Z of the geomagnetic field. The time scale of the Ruska variometer is 20 mm/hr. In 1971 the mechanical clock drive was replaced by a synchronous motor. Timing is supplied by a Sprengnether type TS-100 crystal-controlled chronometer with periodic comparison against WWV time signals. Timing accuracy of the magnetogram hour marks is maintained to ±5 seconds. The time used throughout is Universal Time—UT. A floating battery supply prevents loss of trace due to power failures.

Fluxgate magnetometer. A three-component transistorized magnetometer (Trigg *et al.*, 1971) records H, D, Z on a strip-chart recorder. Chart speed is 20 mm/hr. The recorder sensitivity is normally 1,000 gammas full scale with automatic halving of the sensitivity during times of large disturbances.

Digitally recording magnetometer system. As of Jan. 1, 1971 an automatic magnetic observatory system (AMOS) (Andersen, 1973) was in operation at the observatory. It records values of D, H, Z and F once per minute, on digital magnetic tape, together with the date, time, and station identification, and in a format which can be read directly by a computer.

The elements D, H, Z are derived from a fluxgate magnetometer. A proton precession magnetometer, with its sensor 8 m from the fluxgate magnetometer, measures F.

C) Absolute instruments

The absolute instruments used for the determination of baselines consisted of a

*Assuming the position of the geomagnetic pole is 78.3° N, 69.0° W (Finch and Leaton, 1957).

† 1γ = 1 nanotesla.

GSI precise (first order) magnetometer, following the rotating coil design of Dr. I. Tsubokawa, and manufactured by Sokkisha Limited, Japan. This instrument was used for the determination of declination and inclination. A proton precession magnetometer manufactured by Presentey Engineering Products (model PPM-1) was used for measurement of the total force.

D) 1972 Ruska scale values

D:	Jan. 1	to	Dec. 31,	0.94 min/mm or 5.15 ±0.03 γ/mm
				(γ/mm)
H:	Jan. 1	to	May 11,	2.33 ± 0.02
	May 11	to	Oct. 12,	2.25 ± 0.02
	Oct. 12	to	Nov. 11,	2.36 ± 0.02
	Nov. 11	to	Dec. 31,	2.28 ± 0.02
Z:	Jan. 1	to	May 11,	4.12 ± 0.03
	May 11	to	Oct. 12,	3.95 ± 0.03
	Oct. 12	to	Dec. 31,	4.18 ± 0.03

Absolute observations and baseline values

Absolute observations were generally made four times a month. Simultaneous marks were placed on the Ruska record and the baseline values determined from measurements of the ordinates at these points.

The declination, inclination and total force were measured using the absolute instruments described above. The horizontal and vertical components are then computed from these measured values.

Baseline drift in all three components was negligible. The rms value of the observed minus adopted baselines is ±0.4 minute for declination, ±2 gammas for the horizontal component, and ±2 gammas for the vertical component.

Magnetic reductions

The data was processed on the semiautomatic magnetogram reader (Caner and Whitham, 1970) with output directly on computer cards. The system 370/model 145 computer at the University of Victoria was then used to a) cross-check the computed sum of the hourly mean values against the daily mean value (these are derived from independent channels in the magnetogram reader); b) print out the hourly mean value tables; c) compute and print out the summary mean tables. Direct photo-offset reproduction of the computer output sheets was used for the publication. The data are available on tab cards, and duplicate decks can be supplied to interested agencies.

1972 Ruska Baseline Values

Declination D	Jan. 1 (0000) – Jan. 15 (2400)	22° 9.0′	East
	Jan. 16 (0000) – Jan. 31 (2400)	22° 9.2′	
	Feb. 1 (0000) – Oct. 1 (2400)	22° 9.4′	
	Oct. 2 (0000) – Nov. 16 (2400)	22° 9.8′	
	Nov. 17 (0000) – Dec. 31 (2400)	22° 10.3′	
			(γ)
Horizontal intensity H	Jan. 1 (0000) – May 11 (1628)	18916	
	May 11 (1628) – Oct. 12 (1607)	18982	
	Oct. 12 (1607) – Nov. 11 (0010)	18901	
	Nov. 11 (0010) – Dec. 31 (2400)	18963	
Temperature correction (γ/mm T)	+9 when temperature is greater than reference level		
	−7 when temperature is less than reference level		
			(γ)
Vertical intensity Z	Jan. 1 (0000) – May 11 (1628)	53052	
	May 11 (1628) – Oct. 12 (1607)	53035	
	Oct. 12 (1607) – Dec. 31 (2400)	53049	
Temperature correction	−2 γ/mm T		
			(mm)
Temperature reference levels	Jan. 1 (0000) – May 11 (1628)	5.0	
	May 11 (1628) – Oct. 12 (1607)	13.3	
	Oct. 12 (1607) – Dec. 31 (2400)	4.4	

The seasons as listed in the summary mean tables are defined as follows: Winter – January, February, November, and December; Equinox – March, April, September, and October; Summer – May, June, July, and August.

Microfilm copies of the standard-run photographic magnetograms with provisional baseline and scale values were supplied to the World Data Center A, Washington, on a monthly basis.

Magnetic activity and disturbance indices

The magnetograms were inspected each month for occurrences of magnetic phenomena and these results reported to the I.A.G.A.

Tables 46–51 show the three-hour range indices for each element separately, together with the adopted maximum or K-value. The lower limit adopted for K = 9 was 500 gammas.

As of May 1, 1964, the vertical component range indices were no longer used for the derivation of the K-indices although they are still being scaled and listed. In practice this change in procedure did not introduce any significant discontinuity in local K-indices, since at Victoria the Z-component range is usually well below the range of the horizontal components.

The three-hour range indices and the K-indices were punched on computer cards and the corresponding tables were set up and printed by computer means. Direct photo-offset reproduction of the computer output sheets was used for publication.

Summary of annual mean values

The mean values listed have been corrected to the new (post-1961) location and absolute standards.

For the period 1971.5–1972.5, the decrease in declination was 2.8 minutes (the mean rate of decrease over the whole

Summary of Annual Mean Values

Year	D East	H	Z	X	Y	I	F
	° ′	γ	γ	γ	γ	° ′	γ
1956.6	23 00.2	18689	53427	17203	7303	70 43.2	56601
1957.75	22 57.1	19705	53408	17224	7294	70 41.9	56589
1958.5	22 55.2	18713	53396	17236	7288	70 41.2	56580
1959.5	22 52.8	18736	53377	17262	7284	70 39.5	56570
1960.5	22 50.3	18748	53362	17278	7277	70 38.5	56560
1961.5	22 47.8	18787	53322	17319	7279	70 35.5	56535
1962.5	22 44.4	18804	53288	17342	7268	70 33.8	56508
1963.5	22 41.4	18814	53264	17358	7257	70 32.7	56489
1964.5	22 38.6	18837	53239	17385	7252	70 30.9	56473
1965.5	22 36.0	18860	53205	17412	7248	70 28.9	56449
1966.5	22 34.2	18873	53179	17428	7244	70 27.6	56429
1967.5	22 31.7	18888	53157	17447	7237	70 26.3	56413
1968.5	22 29.4	18902	53138	17464	7230	70 25.1	56400
1969.5	22 27.4	18923	53127	17488	7228	70 23.7	56396
1970.5	22 24.8	18946	53117	17515	7224	70 22.2	56395
1971.5	22 21.8	18971	53099	17544	7218	70 20.4	56386
1972.5	22 19.0	18986	53085	17564	7209	70 19.2	56378

17-year period being 2.6 minutes per year); the increase in horizontal intensity was 15 gammas (the mean rate of increase over the 17-year period being 19 gammas per year); the decrease in the vertical component was 14 gammas (the mean rate of decrease over the 17-year period being 21 gammas per year).

Acknowledgments

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HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 1 VICTORIA — H = 18.500 GAMMA + — JANUARY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	485	490	487	485	483	481	480	479	481	483	483	485	486	487	487	488	485	486	476	454	451	459	462	477	479
2	486	487	485	484	483	484	480	479	479	486	484	486	486	487	492	491	487	487	461	449	464	471	482	491	481
3	492	494	491	491	489	480	477	463	469	475	474	478	480	484	482	481	477	469	458	457	464	474	482	486	478
4	486	480	466	467	481	476	467	474	478	480	483	483	483	486	485	485	485	476	464	458	460	470	477	483	476
5	495	492	488	487	489	487	485	483	485	490	487	486	491	493	487	490	486	474	459	454	457	469	484	489	483
6 Q	495	496	493	492	487	490	486	485	486	487	485	489	489	491	489	488	485	478	468	463	463	468	477	488	484
7 Q	495	497	494	493	492	490	488	488	487	489	488	488	488	493	492	497	495	487	474	459	462	473	483	495	487
8 Q	495	495	495	494	492	490	488	488	488	488	490	491	492	493	495	495	493	488	471	474	469	474	481	488	488
9	487	483	486	490	486	482	483	481	484	488	488	488	487	492	492	496	495	494	478	471	466	471	478	488	485
10	489	483	480	482	484	487	488	489	486	487	487	491	492	493	494	496	492	472	460	457	455	463	468	467	481
11	461	467	456	465	475	474	475	465	460	461	465	473	482	481	483	478	486	480	471	463	462	466	466	463	470
12	473	477	478	476	476	474	476	478	477	475	473	478	480	479	479	485	487	488	480	476	467	464	465	480	477
13 Q	484	484	483	484	483	484	483	483	483	485	485	487	486	486	487	489	488	486	479	471	466	470	483	491	483
14 Q	495	494	488	487	489	489	488	488	486	487	485	487	487	489	485	485	487	481	472	467	467	473	484	490	485
15	497	497	493	490	488	482	481	487	483	486	490	494	484	486	501	487	458	454	457	456	456	453	459	469	479
16 D	479	476	477	478	476	467	455	468	475	464	471	467	468	474	483	406	498	487	469	451	450	455	461	467	468
17	467	451	452	451	470	474	469	472	470	471	471	474	472	475	477	472	457	468	442	448	456	466	474	476	466
18	479	473	471	471	458	489	473	461	473	474	483	470	454	470	472	476	463	466	467	512	462	470	476	469	472
19	478	472	474	476	473	478	481	474	483	477	479	474	473	482	485	475	486	493	485	473	470	472	473	472	477
20	485	487	483	473	478	473	471	483	479	471	473	466	477	485	488	487	490	487	474	469	464	467	470	478	477
21	484	484	488	486	485	481	482	474	463	464	458	478	473	471	435	439	436	444	448	446	448	456	468	475	465
22 D	476	479	474	468	459	464	490	459	459	461	448	464	467	473	471	463	447	431	461	461	457	452	454	433	461
23 D	426	435	426	446	446	460	465	459	451	439	469	457	463	467	468	469	470	464	453	440	428	434	444	463	452
24	470	470	471	476	476	471	468	470	475	476	475	471	478	478	477	478	475	470	448	426	436	448	460	472	467
25	474	476	477	471	456	455	443	458	465	468	466	468	479	480	479	482	480	468	469	462	459	454	466	459	467
26 D	468	484	482	479	476	494	481	480	485	477	471	480	489	485	483	481	472	477	469	454	452	464	474	476	476
27	476	482	476	480	485	481	472	478	488	476	475	470	483	488	482	489	485	468	457	455	465	463	476	483	476
28 D	483	484	486	479	477	475	468	479	470	470	485	468	477	476	473	476	458	460	430	418	408	446	455	463	465
29	471	470	471	468	463	484	475	476	476	475	478	479	483	482	462	469	482	469	451	438	448	454	456	453	468
30	468	471	467	482	484	478	477	477	479	481	480	483	483	486	484	482	475	473	475	471	464	456	464	472	476
31	481	486	486	485	479	485	485	485	485	484	486	487	490	486	488	492	479	484	474	460	459	461	470	476	481
MEAN	480	481	478	479	478	479	477	476	477	477	478	479	481	483	482	480	479	474	465	458	457	462	470	475	475

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 2 VICTORIA D = 22 DEG 00.0 MIN EAST + JANUARY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	17.7	19.5	19.9	21.0	21.1	20.8	20.4	20.1	20.0	20.3	19.8	20.8	20.7	20.2	20.2	21.9	22.6	23.4	23.1	21.0	17.8	16.4	17.2	19.0	20.2
2	18.4	19.4	19.8	20.4	20.7	20.8	20.5	20.7	20.7	18.7	20.3	20.5	20.3	19.9	20.5	21.2	20.3	23.4	22.1	19.2	19.6	17.7	17.0	18.1	20.0
3	18.8	19.8	20.2	20.5	20.5	20.9	22.2	20.7	19.0	19.0	19.2	20.1	19.7	20.1	20.7	21.9	22.7	23.9	22.5	21.8	19.0	18.1	18.2	17.9	20.3
4	19.4	20.2	21.2	21.6	22.4	21.8	24.6	22.8	19.8	19.1	19.8	20.9	19.8	20.2	20.3	21.3	23.3	25.2	24.9	23.5	20.2	17.7	18.0	18.8	21.1
5	19.1	19.6	20.6	21.6	21.5	21.2	20.8	21.1	20.0	19.2	20.5	19.8	19.0	20.3	20.2	21.9	24.8	25.1	24.7	22.6	19.4	17.5	17.3	18.3	20.7
6 Q	18.8	19.5	20.1	20.4	22.0	20.9	20.9	20.7	20.2	20.1	19.8	20.1	19.9	20.5	21.7	22.2	23.7	25.0	24.7	22.4	20.0	18.2	17.3	17.3	20.7
7 Q	17.3	19.2	19.7	20.5	20.9	20.9	20.6	20.2	20.2	19.8	19.7	19.9	19.9	19.6	20.2	21.0	22.6	24.2	25.5	24.2	20.7	18.2	17.0	17.3	20.4
8 Q	18.1	19.3	19.6	20.6	20.3	20.5	20.6	20.8	20.9	20.4	20.0	20.1	19.9	19.8	20.1	20.4	21.9	24.7	24.4	22.4	20.9	18.9	17.9	17.7	20.4
9	17.7	18.3	18.5	20.3	20.5	20.4	20.9	21.1	20.8	21.6	21.1	20.6	20.2	18.7	19.8	20.3	21.3	24.9	24.7	22.2	20.4	17.7	16.4	16.9	20.2
10	17.7	17.8	17.5	19.8	20.4	20.5	20.5	20.4	20.0	19.8	19.8	19.7	19.6	19.4	19.5	19.9	22.4	22.9	22.3	19.9	17.3	14.2	13.5	15.1	19.2
11	16.5	14.9	17.5	19.5	20.0	21.6	21.6	22.3	23.2	25.1	25.1	23.8	21.4	19.1	21.0	21.2	22.7	23.5	22.2	21.5	20.0	18.3	17.1	17.4	20.7
12	17.4	17.8	19.7	20.3	20.5	20.1	20.1	20.5	21.2	21.0	20.7	21.1	20.6	20.3	18.8	20.4	22.4	22.3	21.7	20.9	19.6	18.3	17.3	17.2	20.0
13 Q	18.2	18.9	19.8	19.8	20.1	20.3	20.6	20.1	19.8	19.3	20.0	20.4	20.2	20.0	20.7	21.5	22.7	22.8	22.8	21.7	20.0	18.3	17.6	18.3	20.2
14 Q	18.8	19.2	19.8	20.2	19.5	20.1	19.9	20.1	19.9	19.9	19.9	20.3	20.4	20.8	20.7	21.3	22.1	22.7	22.1	20.9	19.4	17.8	17.5	17.9	20.0
15	18.2	18.6	19.0	19.6	19.6	19.5	19.3	20.0	20.6	22.2	21.6	20.7	23.7	11.0	22.2	22.9	17.8	14.2	16.3	16.9	20.3	21.0	20.5	19.5	19.4
16 D	19.6	19.1	20.2	20.2	20.8	21.4	21.8	21.8	21.4	20.7	19.4	23.2	18.6	17.2	17.5	4.1	7.5	21.0	23.3	19.4	19.6	17.9	18.6	19.0	18.9
17	20.1	22.1	22.5	20.7	26.9	24.1	21.4	21.0	19.7	19.9	20.2	20.4	17.8	19.6	22.1	21.1	20.5	21.5	19.8	20.2	18.7	17.3	18.3	19.4	20.6
18	19.4	20.8	28.0	23.7	23.2	27.2	22.4	22.5	17.9	17.9	19.4	23.0	13.5	17.2	21.8	22.9	22.3	17.5	21.1	19.7	19.0	18.0	18.3	19.9	20.7
19	19.5	20.6	21.7	21.4	22.1	22.3	20.9	20.7	19.5	19.7	20.0	21.7	20.5	18.0	20.6	18.6	19.6	18.9	19.8	18.2	18.2	18.0	18.0	19.4	19.9
20	18.6	20.7	20.8	21.3	23.0	21.6	21.3	21.4	20.6	20.5	20.1	21.0	22.7	23.5	21.1	21.4	20.0	21.9	21.1	21.0	19.7	18.4	18.0	18.9	20.8
21	19.7	20.0	20.4	20.7	20.8	21.4	23.0	21.6	20.6	18.9	18.4	17.1	19.2	17.3	13.5	22.9	25.4	26.5	25.3	22.4	21.0	18.9	18.1	18.5	20.5
22 D	19.1	20.0	19.9	21.0	22.7	20.1	22.5	19.7	23.3	19.2	21.5	24.8	23.2	21.9	22.9	16.6	11.8	12.2	13.9	21.1	20.3	19.3	18.0	18.1	19.7
23 D	18.6	22.2	20.8	21.7	22.3	21.6	21.7	31.4	28.1	24.7	25.5	22.4	21.2	21.6	16.5	21.3	24.7	25.9	25.5	23.0	21.9	19.0	16.1	16.4	22.3
24	17.1	18.0	19.9	20.7	20.3	20.5	20.2	20.0	20.5	20.5	21.8	21.0	19.0	20.2	20.4	22.0	22.7	24.4	24.3	21.3	16.8	17.2	17.3	17.5	20.1
25	18.5	19.7	19.6	19.2	21.2	24.5	26.4	22.8	21.4	20.5	21.4	20.6	20.4	20.7	21.6	22.7	24.4	24.3	24.4	21.9	20.8	19.5	18.6	17.4	21.4
26 D	18.4	19.3	19.9	20.5	21.6	20.7	21.5	22.5	20.4	21.4	16.9	21.3	25.3	23.6	24.3	21.9	23.0	24.8	23.7	21.4	20.2	18.7	18.1	19.0	21.2
27	20.2	19.7	19.8	20.0	21.2	19.6	21.0	21.7	20.8	20.6	20.2	17.1	19.0	18.9	14.1	19.1	22.3	23.4	21.1	20.2	18.8	18.6	18.1	18.5	19.7
28 D	19.5	20.3	19.9	19.5	20.4	20.6	21.4	20.8	22.7	17.5	24.6	23.5	24.1	24.9	22.2	22.2	18.5	15.2	19.9	20.2	19.7	18.9	18.9	19.5	20.6
29	19.8	20.0	20.4	20.1	20.4	25.3	19.9	20.2	20.5	19.9	19.7	20.1	20.2	19.2	16.9	13.5	22.3	23.2	21.6	18.8	18.9	17.5	16.8	17.2	19.7
30	16.8	18.3	20.6	19.7	21.1	21.2	20.8	20.4	20.0	20.7	20.6	20.6	20.5	20.6	21.1	22.0	23.4	22.9	21.3	20.5	19.7	18.6	17.8	17.2	20.3
31	18.0	19.2	19.5	19.9	21.0	19.4	20.3	19.9	20.2	19.7	19.6	20.4	19.7	18.6	20.1	20.9	21.7	21.5	22.3	21.0	19.7	18.5	18.1	16.6	19.8
MEAN	18.5	19.4	20.2	20.5	21.3	21.3	21.3	21.3	20.8	20.3	20.5	20.9	20.3	19.8	20.1	20.4	21.4	22.4	22.3	21.0	19.6	18.1	17.6	18.0	20.3

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 3 VICTORIA | Z = 53,000 GAMMA + | JANUARY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	98	98	100	100	100	100	99	101	99	99	98	98	97	94	95	97	98	99	97	94	94	98	97	99	98
2	102	98	99	99	99	99	99	98	99	94	93	96	96	94	94	94	94	96	94	95	94	93	92	93	96
3	97	95	93	95	95	97	98	99	108	107	103	101	99	100	99	99	101	100	100	103	103	104	102	100	100
4	101	98	100	108	108	103	105	107	108	104	102	100	99	98	98	99	101	102	98	97	98	97	97	98	101
5	101	99	97	98	97	97	96	97	95	89	93	93	92	93	92	94	97	98	95	97	97	96	99	96	96
6 Q	98	99	97	96	95	96	94	96	95	96	95	96	94	94	93	95	98	97	92	92	93	93	96	96	95
7 Q	100	99	97	96	96	95	93	93	94	94	94	95	93	94	94	94	98	96	96	94	93	93	93	97	95
8 Q	96	96	98	96	96	95	93	94	94	96	94	94	95	95	95	95	98	99	96	96	93	94	93	96	95
9	98	98	99	101	100	99	99	98	97	96	96	96	95	95	93	96	98	100	96	93	88	88	89	92	96
10	97	98	100	102	101	100	98	96	95	94	94	94	94	95	94	95	98	96	91	89	88	89	90	95	95
11	100	109	120	125	116	110	105	103	100	102	101	97	85	86	91	100	102	100	94	94	94	96	98	98	101
12	102	105	106	108	107	106	105	104	101	101	98	98	98	97	97	99	102	99	93	91	89	90	93	99	100
13 Q	102	100	101	101	101	101	101	100	99	98	96	96	94	95	94	97	101	99	100	99	96	94	95	95	98
14 Q	95	96	95	98	97	97	97	96	95	95	94	94	93	93	93	97	98	98	99	99	94	95	97	96	96
15	97	96	97	98	99	103	104	102	101	101	100	98	90	56	61	80	82	76	80	93	98	103	107	107	93
16 D	105	102	101	101	101	102	108	107	102	95	27	56	66	76	82	42	48	64	78	89	95	95	96	101	85
17	102	105	113	118	123	110	108	107	106	102	100	97	95	88	96	96	93	99	95	101	98	95	97	99	102
18	100	99	105	105	104	105	90	93	91	88	76	62	44	52	66	75	78	85	90	95	94	94	97	96	87
19	97	97	98	99	98	101	97	99	90	91	93	91	91	87	91	87	87	84	87	90	95	94	92	92	93
20	95	96	96	96	97	96	97	96	84	86	88	85	84	86	86	89	92	90	94	94	94	91	94	97	92
21	99	100	98	95	96	96	97	97	98	95	86	72	6	-58	-78	-32	20	74	87	92	94	99	103	101	68
22 D	103	100	100	105	110	112	113	99	111	108	93	99	102	105	101	68	58	61	72	84	89	94	100	101	95
23 D	114	130	132	135	125	124	116	104	89	88	97	98	99	97	79	85	98	96	97	95	96	105	106	109	105
24	110	109	109	111	109	107	106	108	105	93	97	98	101	100	102	104	106	105	99	98	99	98	102	104	103
25	105	106	106	108	113	113	115	111	115	112	110	105	100	102	104	107	108	105	100	96	96	95	100	99	105
26 D	105	106	105	106	109	108	97	104	103	98	76	30	64	70	78	91	99	103	99	96	95	98	102	101	93
27	104	103	104	106	109	106	108	103	90	88	96	95	98	96	86	88	101	97	99	95	98	97	101	102	99
28 D	102	101	102	103	104	107	111	111	106	95	83	84	94	92	87	81	77	67	77	88	101	112	100	102	95
29	106	105	104	107	110	115	109	105	103	101	100	100	99	94	84	72	81	86	89	95	101	99	97	98	98
30	103	106	109	109	108	105	105	106	104	102	102	100	100	98	98	99	102	100	100	100	99	95	97	97	102
31	100	101	103	101	103	104	104	101	100	99	97	97	96	91	94	95	99	102	98	93	96	99	97	97	99
MEAN	101	102	103	104	104	104	102	101	99	97	93	91	89	86	85	86	91	93	93	94	95	96	97	98	96

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 4 VICTORIA H = 18,500 GAMMA + FEBRUARY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	481	485	486	485	485	484	479	480	479	481	486	487	493	503	491	488	487	488	482	473	470	470	472	473	483
2	478	487	488	478	476	473	461	454	468	468	471	478	477	492	494	497	489	483	474	466	458	460	466	471	475
3	480	485	483	485	484	482	483	483	481	485	473	478	482	488	489	484	477	482	485	471	459	456	466	481	479
4	488	488	477	467	478	479	474	479	475	477	482	474	479	480	482	487	489	481	474	465	462	462	472	483	477
5	488	488	488	487	487	487	486	485	487	485	482	485	489	488	492	491	491	480	476	472	470	461	465	477	483
6	486	489	494	482	488	488	486	483	487	487	485	488	491	492	494	495	495	490	478	458	456	461	464	474	483
7	479	477	480	482	481	480	477	485	481	485	485	485	487	485	488	484	488	482	476	469	460	457	469	463	479
8	484	486	481	476	478	485	485	484	484	486	483	489	489	488	487	492	491	486	479	471	468	465	473	482	482
9 Q	484	489	489	489	490	482	487	487	485	482	487	485	487	489	489	492	492	484	476	467	466	471	479	493	484
10	502	493	485	496	492	488	485	485	488	487	489	490	495	498	498	501	501	498	490	482	481	472	476	489	490
11	494	496	497	493	493	489	483	486	488	482	491	486	487	493	494	495	494	484	478	472	470	471	483	488	487
12 Q	490	489	482	483	488	486	485	485	492	487	489	491	493	493	493	489	485	474	468	461	460	463	475	488	483
13 D	494	495	496	495	492	493	495	497	492	495	499	499	492	487	492	494	487	468	459	456	459	465	463	434	483
14 D	459	472	477	469	475	477	475	480	474	480	482	487	489	490	492	486	491	483	471	457	456	463	470	470	476
15	481	480	486	484	485	488	475	471	484	481	484	484	488	484	491	489	486	481	474	472	468	466	472	472	480
16	480	482	479	483	483	483	488	483	484	486	487	488	493	490	495	488	482	474	464	459	459	464	466	471	480
17 D	471	483	487	482	484	487	488	488	484	501	487	483	487	491	484	510	475	438	417	446	443	440	439	446	473
18	465	469	475	471	479	473	464	469	474	474	475	479	478	479	479	476	474	469	458	456	460	453	461	478	470
19	458	458	463	472	475	475	476	478	480	482	484	484	483	479	480	481	483	476	476	469	465	458	461	469	474
20	477	471	466	466	469	464	465	471	478	478	478	482	482	486	485	484	486	484	481	472	468	463	460	457	474
21	468	478	484	490	479	475	473	477	478	481	483	484	490	488	490	492	483	473	476	470	460	460	467	474	478
22 Q	480	485	489	490	487	489	491	486	486	484	485	488	492	496	496	493	488	478	471	464	455	448	451	470	481
23	484	490	491	486	489	492	491	490	491	493	494	496	498	498	493	496	498	492	475	463	455	453	458	466	485
24 D	473	479	478	480	485	482	483	479	466	455	418	435	467	470	427	441	466	454	440	443	429	431	436	452	457
25 D	459	452	437	448	466	466	468	460	468	476	474	474	472	472	463	474	477	465	460	449	438	441	453	462	461
26	465	469	477	479	477	478	489	479	482	480	481	481	483	482	478	478	477	473	459	444	446	448	452	463	472
27 Q	473	481	484	484	484	484	481	482	480	482	481	485	488	485	486	483	477	464	448	453	458	464	463	471	476
28	476	476	481	486	485	475	473	477	468	484	483	481	482	483	481	479	477	466	455	448	452	458	467	475	474
29 Q	485	490	493	493	494	494	496	494	494	493	496	495	497	498	497	494	481	465	455	450	454	462	470	483	484
MEAN	479	481	482	481	483	482	481	481	481	483	482	483	487	488	486	487	485	476	468	462	459	459	464	472	478

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 5 VICTORIA D = 22 DEG 00.0 MIN EAST + FEBRUARY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	19.0	19.8	20.4	20.6	20.6	20.5	20.3	20.7	20.4	19.7	20.3	21.5	19.4	24.3	23.7	23.7	24.2	23.6	22.7	21.5	20.7	19.2	17.5	17.1	20.9
2	17.5	19.1	19.3	19.1	19.1	19.3	22.8	22.1	22.3	18.3	23.2	21.2	17.4	20.0	19.9	21.9	23.0	23.2	23.4	21.5	20.5	19.3	17.6	17.9	20.4
3	17.8	19.2	20.2	21.2	20.4	20.6	20.4	20.4	20.9	22.4	22.8	21.3	22.1	21.7	24.5	25.2	24.0	22.3	23.2	22.8	20.8	19.2	18.4	17.4	21.2
4	18.0	19.1	19.8	19.9	20.4	21.6	22.0	25.5	21.7	19.6	21.2	23.0	21.0	22.3	18.5	20.9	22.3	23.6	23.0	22.3	21.2	19.3	17.9	17.4	20.9
5	23.9	19.9	19.8	20.1	21.2	20.5	20.5	20.6	22.6	20.7	21.7	21.2	22.7	21.6	20.8	22.2	24.9	25.0	21.9	20.3	20.5	18.8	17.3	17.6	21.1
6	17.8	19.1	19.4	19.7	20.3	20.1	21.0	20.5	20.8	20.9	21.1	20.1	20.2	20.3	20.5	21.0	22.5	24.9	24.8	21.9	18.4	16.7	15.5	15.7	20.1
7	16.1	17.9	19.4	20.4	21.1	20.9	22.6	20.5	20.6	20.1	20.7	20.5	20.5	20.9	21.2	21.4	24.1	25.7	23.8	20.8	19.8	17.4	14.4	14.9	20.2
8	16.8	17.4	17.4	16.9	20.3	20.8	20.9	20.8	20.4	20.6	21.0	21.0	20.8	20.7	20.5	21.1	22.3	23.2	23.8	22.6	21.6	19.3	17.7	16.9	20.2
9 Q	18.2	19.6	19.8	20.0	20.1	20.4	20.0	19.6	20.3	20.2	19.3	19.9	20.5	20.9	20.5	21.4	23.5	24.1	24.3	22.8	19.8	18.1	17.0	16.2	20.3
10	16.7	16.5	18.0	19.7	20.3	20.5	21.0	20.7	20.1	20.9	20.1	20.2	20.5	20.1	20.2	21.0	22.7	24.4	22.1	22.6	19.5	17.7	16.8	17.2	20.0
11	18.0	18.0	19.5	19.9	19.6	19.7	20.3	19.9	19.5	20.7	21.0	21.8	19.4	18.6	20.7	21.8	22.6	22.3	22.1	21.2	19.5	18.7	17.5	17.8	20.0
12 Q	18.8	19.0	19.9	20.2	19.9	19.8	20.1	19.8	20.6	20.1	20.1	19.9	20.4	20.2	21.1	21.9	23.8	25.2	25.0	23.7	21.0	19.0	18.0	17.5	20.6
13 D	17.8	19.0	19.7	20.0	20.1	19.6	19.4	19.1	19.3	19.7	19.8	16.6	24.0	23.0	23.7	23.4	22.2	18.5	18.2	17.0	18.0	16.9	16.8	16.0	19.5
14 D	17.8	20.3	21.1	22.0	24.6	21.9	24.3	23.2	18.8	18.4	17.3	19.4	21.2	21.2	21.0	21.0	21.7	21.9	21.9	21.1	20.0	18.8	18.2	17.5	20.6
15	19.6	19.7	19.7	20.4	21.4	31.7	22.9	19.1	19.0	19.6	19.8	21.9	22.4	19.9	20.3	21.6	23.0	23.6	22.1	20.9	19.9	18.9	17.4	17.4	20.9
16	18.6	19.5	20.7	22.0	20.8	20.6	18.3	19.7	18.8	19.2	19.5	19.1	18.1	18.6	20.7	21.3	22.5	24.2	22.9	20.5	19.7	18.1	17.4	16.9	19.9
17 D	17.7	18.3	19.6	20.8	21.3	19.8	20.0	19.6	19.8	18.3	21.1	22.7	19.8	16.5	11.4	11.5	19.3	21.0	15.8	11.8	15.0	17.2	16.4	16.6	18.0
18	17.5	17.6	16.6	19.3	19.1	19.4	23.2	20.5	19.2	19.7	20.4	20.4	20.9	21.1	21.4	22.9	24.2	24.9	23.6	20.5	18.6	16.4	14.8	11.7	19.7
19	12.3	16.2	19.9	21.0	20.2	20.3	20.7	20.7	20.2	20.6	20.7	20.7	21.4	21.5	19.6	23.3	24.4	25.9	19.5	19.2	18.4	18.0	17.8	18.0	20.0
20	18.5	19.6	22.5	19.4	20.4	21.4	21.2	20.6	20.3	19.5	21.4	20.4	18.2	20.3	21.2	22.9	22.9	24.6	25.2	23.7	22.2	20.9	20.1	18.2	21.1
21	18.8	17.7	18.5	19.0	20.5	22.3	20.8	20.3	20.1	19.8	20.1	19.5	20.2	21.6	21.2	22.0	23.6	22.5	22.8	22.6	20.4	19.0	18.1	17.4	20.4
22 Q	17.6	18.1	18.9	19.1	19.2	19.7	20.6	19.2	20.1	20.1	20.8	21.1	21.6	21.7	21.4	22.5	23.3	24.3	24.6	23.8	22.2	19.5	18.1	17.3	20.6
23	17.5	17.8	18.5	19.1	19.8	19.8	19.7	19.9	20.1	19.7	20.2	18.9	20.3	20.9	20.2	21.0	25.4	26.6	24.9	25.0	22.8	20.8	18.8	17.2	20.6
24 D	16.6	16.6	18.0	18.3	19.4	21.1	24.5	23.0	27.2	29.8	36.2	41.5	30.1	22.5	18.4	13.2	24.2	26.6	25.6	21.9	20.4	18.7	18.5	16.3	22.9
25 D	17.4	16.3	20.2	19.5	20.2	20.8	21.2	24.4	21.6	20.2	20.5	21.5	17.2	21.0	16.9	18.9	24.7	24.4	24.1	21.7	19.9	17.7	17.0	16.9	20.2
26	18.1	19.0	19.6	19.5	20.1	21.1	20.3	19.5	20.0	19.7	19.9	20.6	20.8	21.0	21.7	22.4	24.1	24.3	24.8	22.8	21.1	20.0	18.7	18.0	20.7
27 Q	18.0	17.9	18.3	19.2	19.5	19.2	19.7	19.5	19.9	19.8	19.1	20.9	20.5	21.4	22.2	23.0	23.6	24.3	21.9	17.8	16.3	15.5	14.8	14.2	19.4
28	14.6	16.1	17.6	19.1	21.7	19.0	20.1	21.6	20.8	20.9	20.0	20.5	20.7	21.1	21.9	23.2	24.6	25.3	23.8	21.1	19.2	18.1	18.1	17.8	20.3
29 Q	18.5	18.3	18.7	19.2	19.4	19.1	19.2	19.5	19.1	19.3	19.6	19.8	19.8	20.5	21.1	22.9	24.9	25.3	23.3	19.4	17.5	16.9	16.8	17.4	19.8
MEAN	17.8	18.4	19.3	19.8	20.4	20.7	21.0	20.7	20.5	20.3	21.0	21.3	20.8	20.9	20.6	21.4	23.4	24.0	22.9	21.2	19.8	18.4	17.4	16.8	20.4

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 6 VICTORIA Z = 53.000 GAMMA + FEBRUARY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	100	100	100	99	99	100	100	103	102	101	102	98	85	73	83	91	98	99	99	96	98	97	97	98	97
2	100	100	101	102	106	111	116	114	107	97	101	104	98	95	97	99	98	99	98	98	98	95	95	95	101
3	98	102	101	101	100	101	100	100	100	98	95	98	93	83	88	91	92	95	92	94	93	94	99	100	96
4	101	99	99	103	106	104	102	98	99	97	84	81	88	94	94	97	99	97	97	96	96	95	97	97	97
5	100	100	99	99	98	97	98	98	98	98	98	97	94	94	97	97	97	94	92	90	93	89	89	94	96
6	100	101	101	98	101	99	100	100	102	101	100	99	98	97	96	98	99	96	95	90	91	91	92	94	97
7	98	101	101	100	100	99	100	99	97	98	98	96	96	96	95	96	96	93	87	86	86	84	86	90	95
8	99	102	103	105	106	105	100	99	98	97	95	93	91	94	94	97	97	95	93	90	91	90	91	93	97
9 Q	97	98	98	98	97	97	98	96	95	95	94	95	96	95	96	98	101	98	95	90	89	87	91	94	95
10	96	95	97	97	98	95	96	97	93	95	96	97	97	96	94	97	98	97	91	85	83	77	83	90	93
11	93	95	93	94	93	92	94	96	94	88	86	87	92	91	95	96	97	95	94	90	87	88	90	93	92
12 Q	94	95	95	96	97	96	96	96	94	93	93	93	94	93	94	97	101	101	100	94	91	86	90	91	95
13 D	92	91	91	91	91	91	92	91	90	91	91	68	40	60	80	90	91	89	94	96	99	99	96	99	88
14 D	108	108	107	106	109	104	103	101	94	90	87	89	92	93	94	94	96	93	92	91	91	90	90	90	96
15	96	98	97	97	99	97	95	95	86	85	85	86	90	89	92	94	97	94	90	89	91	89	87	88	92
16	91	95	95	97	97	96	93	93	93	93	92	91	87	85	87	89	93	89	82	81	84	86	88	90	90
17 D	92	94	96	95	96	96	95	94	93	87	74	82	84	72	44	31	41	50	50	63	76	85	94	103	79
18	108	109	108	111	112	112	119	113	108	105	101	101	98	97	96	96	95	89	80	81	84	86	93	98	100
19	107	119	114	107	104	102	102	102	103	101	101	99	97	95	88	89	91	87	80	79	84	88	93	99	97
20	101	100	104	105	106	104	107	107	104	99	97	97	92	92	95	95	98	97	92	87	84	85	89	90	97
21	98	101	101	100	100	102	102	99	98	99	99	97	90	90	95	96	96	93	89	87	87	91	95	96	96
22 Q	98	99	99	98	96	95	96	94	95	94	95	95	95	94	95	98	97	96	97	96	94	94	93	97	96
23	99	98	98	96	94	95	94	92	91	91	90	89	86	88	88	90	92	89	85	83	83	83	85	88	90
24 D	93	98	99	99	100	99	99	93	77	48	27	-20	-54	-10	-5	0	65	89	83	82	86	95	104	104	65
25 D	106	108	112	123	116	111	108	110	109	104	101	99	94	88	82	78	90	88	92	89	87	92	94	99	99
26	100	103	105	102	102	102	97	95	95	96	98	96	96	96	97	99	101	99	97	95	96	95	96	94	98
27 Q	97	98	99	99	99	99	97	98	97	97	95	92	91	89	94	98	95	92	84	84	85	86	87	89	93
28	92	98	101	104	106	107	110	108	105	106	101	97	96	95	95	100	101	99	94	89	89	89	91	91	99
29 Q	92	93	95	97	95	96	94	95	93	92	91	90	90	90	91	98	100	97	90	86	85	84	86	90	92
MEAN	98	100	100	101	101	100	100	99	97	94	92	89	86	86	87	89	94	93	90	88	89	89	92	94	94

HORIZCNTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 7 VICTORIA H = 18,500 GAMMA + MARCH 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	490	496	498	496	493	485	493	494	498	497	496	495	497	499	499	496	490	475	457	444	431	438	461	474	483
2	484	486	486	482	484	489	490	489	490	485	487	485	501	493	489	480	471	467	459	450	447	456	460	461	478
3	466	474	485	485	488	482	469	463	478	489	486	483	481	491	489	468	482	475	459	448	449	455	457	470	474
4	480	483	487	488	486	482	476	489	475	497	490	486	487	494	491	493	489	475	460	455	455	461	467	472	480
5	484	487	490	489	491	490	492	490	492	498	493	493	490	494	494	494	486	478	462	465	465	467	471	477	485
6	505	480	488	489	483	495	485	492	489	500	493	493	492	493	495	494	490	478	468	466	468	473	478	520	488
7 D	463	441	453	475	463	433	427	453	483	497	478	483	471	473	479	482	489	469	453	451	451	446	453	461	464
8	463	466	475	474	477	477	474	479	482	487	487	487	493	491	491	495	479	496	483	464	455	450	456	463	477
9	480	484	483	488	489	486	479	488	489	490	482	489	481	483	487	484	474	478	477	468	463	466	463	468	480
10 Q	474	480	484	488	488	488	487	490	489	490	486	487	488	491	493	492	486	476	467	463	460	463	461	469	481
11	480	487	479	483	479	479	477	476	480	482	486	484	486	487	489	490	486	481	464	456	462	461	464	471	478
12 Q	482	487	492	493	493	493	493	493	489	494	493	496	496	496	494	495	489	476	463	459	459	462	464	466	484
13	477	491	498	495	492	494	491	490	490	495	500	498	494	497	494	496	491	480	466	459	451	452	462	472	484
14 Q	479	489	493	496	493	494	489	488	495	499	495	498	496	500	499	496	487	480	473	472	472	479	487	494	489
15	498	502	499	497	496	498	498	501	497	499	502	504	502	504	499	495	489	480	469	465	471	482	490	496	493
16 D	487	463	460	447	446	459	473	470	469	469	482	491	480	483	475	464	462	460	458	455	463	465	479	483	468
17	476	471	482	483	471	476	484	486	488	488	480	488	486	483	476	476	478	482	467	450	434	432	447	467	473
18	470	468	475	481	481	477	494	473	480	483	487	487	492	493	492	483	471	467	461	459	462	465	463	475	477
19 Q	482	486	480	484	487	486	488	491	492	490	491	491	494	496	494	489	478	465	460	461	455	455	467	482	481
20	481	482	484	487	489	493	490	491	496	493	495	495	498	497	497	493	487	481	468	462	460	460	467	479	484
21 Q	487	489	493	491	493	490	491	497	496	497	498	496	498	496	495	494	490	485	481	481	481	484	487	494	491
22	540	487	487	483	485	491	489	490	492	497	502	503	505	503	498	496	488	483	470	462	460	464	466	475	488
23	481	490	491	495	498	498	501	504	503	498	496	490	490	495	497	494	493	488	476	460	444	446	464	473	486
24 D	474	482	475	458	448	454	472	473	474	475	486	489	489	494	488	483	465	473	461	457	457	470	469	477	473
25	475	484	491	489	489	487	481	474	475	487	486	489	488	488	486	480	475	471	464	464	468	465	468	476	479
26	479	483	487	485	482	487	487	490	489	483	487	498	494	495	494	488	485	489	473	468	463	463	458	458	482
27	463	480	477	472	467	478	486	487	490	497	502	504	507	507	509	504	497	487	470	458	456	461	472	459	483
28	463	461	459	459	462	474	478	482	490	495	501	504	503	505	505	504	500	492	479	466	461	474	483	492	483
29 D	493	500	504	504	505	503	494	494	497	497	497	478	488	492	489	478	463	477	470	448	427	449	450	466	482
30 D	479	468	467	465	453	443	449	437	458	484	481	484	494	484	474	472	482	471	458	438	448	459	469	479	467
31	482	482	481	483	479	478	496	489	487	491	496	498	499	500	499	487	470	461	442	445	461	467	453	475	479
MEAN	481	481	483	483	482	482	483	484	487	491	491	492	492	493	492	488	483	477	466	459	457	461	466	476	480

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 8 VICTORIA D = 22 DEG 00.0 MIN EAST + MARCH 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	17.6	18.0	18.9	19.1	19.2	19.4	19.7	19.4	19.3	20.3	21.4	20.8	21.2	19.6	22.0	25.4	28.5	27.4	26.2	22.9	20.2	15.7	15.2	16.4	20.6
2	16.8	17.5	17.7	17.8	18.4	20.0	19.9	19.6	19.5	21.1	21.5	20.0	19.4	22.6	23.4	25.7	25.2	25.6	22.3	19.8	17.2	15.8	13.6	12.1	19.7
3	11.8	14.0	16.8	18.9	19.9	20.0	23.6	24.1	19.7	21.5	19.7	20.5	18.2	20.4	21.9	16.6	25.7	28.1	25.8	21.9	20.1	17.7	17.4	16.1	20.0
4	16.7	17.2	19.0	19.6	19.8	20.2	21.1	22.1	22.3	23.3	21.3	20.8	20.5	21.5	22.4	24.3	26.3	26.5	25.5	22.4	19.8	17.7	16.3	16.3	21.0
5	16.9	17.5	18.0	18.8	19.7	20.4	20.3	20.2	20.3	21.2	20.8	20.5	20.5	20.7	22.3	23.6	25.3	26.9	25.0	21.6	19.2	17.1	15.8	14.5	20.3
6	14.8	15.2	16.5	18.6	20.1	23.4	20.1	20.9	20.4	17.7	21.7	21.1	20.9	20.8	20.7	22.4	23.7	24.1	22.3	20.2	17.7	19.3	14.5	9.2	19.4
7 D	8.2	15.3	18.8	19.5	18.3	24.2	24.1	23.0	24.0	20.8	20.2	21.1	21.6	19.0	20.4	21.7	23.0	24.4	23.5	21.7	19.7	18.2	16.9	17.1	20.2
8	17.9	18.9	19.5	19.8	20.1	20.5	20.3	20.3	19.8	20.2	20.4	19.9	19.6	19.1	18.8	17.1	11.8	21.2	24.1	24.1	21.7	19.8	18.4	17.0	19.6
9	16.8	18.9	18.6	19.5	19.7	20.6	21.0	20.3	20.5	21.6	23.2	24.3	23.2	16.1	19.3	22.0	20.3	20.4	22.2	20.8	19.7	19.3	18.6	18.8	20.2
10 Q	19.7	19.2	19.3	19.7	19.6	19.6	19.4	19.4	18.0	18.7	18.7	19.0	19.1	20.0	20.7	22.3	24.6	25.8	24.8	22.1	20.4	18.5	18.3	17.3	20.2
11	18.9	20.7	20.4	19.1	20.9	19.9	20.2	21.1	20.2	19.6	19.1	19.4	19.7	19.5	20.6	22.0	24.1	25.7	25.1	22.5	21.2	20.5	18.0	17.4	20.7
12 Q	17.8	18.3	18.4	19.3	19.4	19.7	19.8	19.7	19.5	19.6	19.7	19.6	19.7	19.4	20.6	22.6	25.4	26.6	25.9	24.0	21.9	20.1	18.5	17.3	20.5
13	17.2	17.6	17.8	18.9	19.1	19.5	20.0	20.0	19.6	19.7	20.0	19.6	21.5	20.7	20.6	23.5	25.2	26.6	25.5	23.6	21.4	18.7	16.3	15.7	20.3
14 Q	17.2	17.8	18.4	19.0	19.2	19.6	20.0	20.9	18.8	20.9	20.8	20.5	20.9	21.6	21.9	23.7	24.3	24.2	22.8	20.8	19.4	18.5	17.7	17.4	20.3
15	17.0	17.1	18.0	18.8	19.3	19.0	19.2	19.3	20.0	20.7	18.9	19.7	20.6	20.7	21.0	22.6	25.3	25.7	23.3	19.3	17.1	17.1	16.3	15.8	19.7
16 D	14.8	16.8	14.1	14.4	15.4	20.0	19.4	18.5	19.4	20.8	24.1	26.0	25.9	24.4	21.5	22.7	23.3	23.0	20.4	18.0	16.8	15.5	15.4	14.1	19.4
17	16.0	17.9	18.7	18.1	20.0	19.0	19.2	19.1	18.7	19.9	24.3	25.0	19.9	21.8	19.8	21.8	22.2	22.2	22.8	20.8	19.8	18.4	17.3	17.0	20.0
18	15.9	18.9	17.6	17.6	18.2	22.2	23.9	21.0	20.8	20.8	20.1	20.1	19.7	20.6	22.3	24.4	25.9	24.7	22.0	19.5	17.9	16.7	16.5	16.0	20.1
19 Q	16.7	17.2	19.1	18.7	18.9	19.2	19.1	19.2	19.1	19.9	21.2	20.6	18.7	20.3	21.7	23.3	25.0	25.5	22.9	19.7	18.1	16.2	15.4	14.7	19.6
20	15.4	16.3	17.3	18.6	19.2	19.7	19.7	20.4	20.8	20.6	20.5	20.6	20.4	19.4	19.8	22.0	24.0	24.3	24.5	23.0	20.5	18.6	17.4	16.8	20.0
21 Q	16.6	17.5	17.4	18.5	19.2	19.3	19.8	19.8	19.9	20.0	21.0	20.6	21.3	20.7	21.6	22.5	24.8	25.0	23.5	21.2	18.3	15.7	14.7	14.2	19.7
22	15.0	16.4	16.4	17.6	19.1	19.8	20.2	20.4	19.7	20.6	20.0	19.4	19.9	19.2	19.4	21.4	22.6	23.6	22.6	19.6	15.1	14.7	15.9	16.2	18.9
23	16.2	17.1	17.7	18.2	18.3	18.8	18.9	19.4	19.6	21.4	25.5	28.4	25.1	23.0	23.0	23.9	24.8	24.8	22.6	19.2	16.1	13.6	13.6	13.9	20.1
24 D	12.1	12.8	13.5	16.2	16.9	21.3	23.3	23.1	23.3	22.5	27.6	26.1	20.7	19.8	21.1	26.0	22.7	20.8	18.5	16.9	18.7	18.7	18.1	17.3	19.9
25	17.4	17.9	18.3	18.3	22.7	21.2	20.3	20.8	23.4	21.3	20.8	20.7	21.0	21.4	21.4	22.3	21.4	21.9	19.1	17.9	18.0	17.8	16.9	16.9	20.0
26	17.1	16.9	17.6	18.2	18.5	18.5	19.1	19.5	20.5	21.6	22.7	24.2	22.9	22.0	21.3	22.6	23.0	21.1	21.8	18.2	17.1	17.3	15.1	12.5	19.6
27	13.6	13.9	13.4	11.7	17.5	18.8	19.1	21.8	24.5	23.9	20.5	21.2	21.0	21.7	21.7	23.9	26.4	25.8	20.4	19.1	16.6	15.6	15.6	14.4	19.3
28	17.4	19.6	20.7	22.2	24.1	23.2	22.2	21.8	20.1	20.7	19.3	19.4	18.2	19.4	20.4	21.2	22.8	23.7	23.2	21.3	19.5	17.7	16.1	15.7	20.4
29 D	16.4	16.6	17.4	18.2	18.4	18.1	17.8	19.2	14.3	22.0	23.6	22.9	22.4	23.1	23.1	21.6	15.8	17.3	19.0	18.5	17.4	14.4	11.6	13.9	18.5
30 D	14.4	15.2	19.5	20.8	21.1	25.0	26.0	26.0	26.3	21.1	20.1	18.4	23.0	25.7	24.3	23.7	24.8	21.5	21.0	18.3	16.2	14.5	14.8	14.3	20.7
31	13.6	13.0	15.0	20.2	16.2	18.3	23.0	19.5	19.4	18.0	16.3	19.0	20.8	21.3	23.5	25.6	25.7	25.6	25.6	19.7	17.2	15.5	14.8	15.1	19.2
MEAN	15.9	17.0	17.7	18.5	19.2	20.3	20.6	20.6	20.4	20.7	21.1	21.3	20.9	20.8	21.4	22.7	23.7	24.2	23.0	20.6	18.7	17.3	16.2	15.5	19.9

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 9 VICTORIA Z = 53,000 GAMMA + MARCH 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	91	91	91	90	91	91	93	93	92	90	88	88	89	89	90	94	97	93	87	82	79	80	86	91	89
2	93	94	95	95	98	98	98	98	98	99	97	95	79	82	91	99	91	84	76	73	76	83	87	95	91
3	102	101	103	103	101	102	101	96	65	65	85	92	89	91	91	76	80	87	82	81	86	93	95	96	90
4	99	98	101	98	97	97	98	86	85	77	71	83	89	93	90	93	91	91	84	79	81	88	92	93	90
5	97	98	97	97	95	95	95	94	93	88	86	88	90	91	92	93	91	88	80	77	79	81	85	89	90
6	91	97	98	98	98	99	95	97	97	81	76	84	89	91	92	94	95	86	76	75	76	74	79	92	89
7 D	124	117	108	108	106	122	128	102	111	100	99	91	86	93	97	97	95	96	89	85	81	87	93	97	101
8	99	102	104	101	99	98	96	97	96	94	95	95	95	94	95	95	77	78	77	74	76	82	89	94	92
9	98	98	95	95	96	96	94	94	92	89	79	63	72	78	79	89	88	83	79	79	84	93	93	93	87
10 Q	94	94	96	96	96	93	92	93	90	91	91	92	92	93	95	98	100	99	95	91	89	89	90	96	94
11	101	105	102	104	105	103	101	102	101	99	97	97	98	97	100	101	101	101	93	87	89	89	90	91	98
12 Q	94	98	96	98	96	96	95	93	92	92	91	92	91	91	92	95	98	91	86	83	82	83	85	88	92
13	93	96	98	96	95	95	93	93	92	92	89	77	77	88	92	96	99	95	86	81	77	78	83	89	90
14 Q	90	94	96	95	93	94	94	94	91	83	87	87	88	89	90	92	90	87	80	77	75	77	79	81	88
15	86	88	89	90	90	91	92	91	90	89	89	82	81	83	87	90	93	87	80	79	79	78	79	80	86
16 D	84	95	115	136	159	150	133	120	115	110	104	74	59	60	77	91	93	92	88	86	89	90	96	101	101
17	103	106	107	103	109	109	107	106	105	87	76	83	84	91	86	86	82	82	80	87	92	98	98	102	95
18	105	110	107	1C7	107	107	106	95	102	99	97	95	92	93	95	93	93	86	83	84	87	86	86	89	96
19 Q	92	96	99	98	97	97	98	97	98	97	95	95	90	88	88	92	91	86	84	85	86	86	90	96	93
20	95	97	97	99	97	97	95	98	94	95	95	94	94	90	87	91	88	80	76	75	76	82	87	89	90
21 Q	93	94	98	98	96	96	97	97	95	96	92	89	87	87	87	88	86	79	74	73	75	77	79	79	88
22	87	89	96	96	97	96	95	92	93	92	92	92	90	91	89	94	92	87	76	73	78	85	90	91	90
23	92	96	94	93	91	90	90	91	89	88	77	64	73	83	90	93	91	79	72	70	69	77	87	89	85
24 D	91	102	111	128	151	148	138	121	111	101	88	86	79	79	86	88	82	80	82	85	86	92	90	91	100
25	93	98	100	101	100	97	99	100	95	98	95	93	92	93	91	89	90	88	82	86	91	94	94	96	94
26	95	94	98	97	99	100	98	99	95	96	96	91	87	88	90	90	90	87	79	85	89	89	92	95	92
27	106	113	116	123	128	122	117	111	104	101	100	99	96	96	95	97	96	89	86	87	94	98	104	102	103
28	113	118	117	116	112	106	102	99	91	89	90	89	91	89	90	95	96	97	95	95	97	94	89	88	98
29 D	87	92	90	92	91	92	93	98	89	76	81	51	59	82	87	85	68	68	73	74	76	92	93	113	83
30 D	117	127	133	129	129	136	121	86	95	106	99	87	68	78	85	88	87	84	82	79	82	90	97	101	99
31	105	104	105	112	111	115	108	97	99	97	83	82	88	91	90	89	89	85	84	89	89	89	90	98	95
MEAN	97	100	102	103	104	104	102	98	95	92	90	86	85	88	90	92	90	87	82	81	83	86	89	93	92

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 10 VICTORIA H = 18.500 GAMMA + APRIL 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	486	494	489	491	491	491	489	514	487	493	491	494	497	491	496	498	490	471	451	445	448	469	466	466	483
2	482	488	480	475	466	485	483	486	490	491	489	492	491	491	489	483	476	462	453	453	452	458	472	483	478
3 Q	487	489	492	493	493	492	493	494	497	496	497	501	499	500	502	502	497	487	478	480	481	476	484	491	492
4 D	504	516	513	493	495	499	505	500	505	499	498	504	504	506	501	505	505	486	478	480	482	489	492	492	498
5	487	491	485	488	488	487	479	490	494	500	499	496	488	491	499	494	486	477	474	471	470	473	481	484	486
6	490	489	493	495	494	496	497	497	503	502	497	499	498	496	488	497	487	472	464	464	465	472	482	488	489
7	494	494	494	498	489	492	491	494	503	492	488	490	492	492	491	495	486	478	470	469	465	471	464	474	486
8	487	497	497	499	495	495	498	500	503	502	501	501	504	505	506	499	489	460	461	470	476	477	481	492	491
9 Q	480	484	493	498	497	498	499	499	503	502	505	507	507	503	499	493	487	478	480	483	482	481	481	485	493
10	490	496	500	500	500	500	498	500	502	505	505	506	508	505	504	501	490	476	473	478	484	485	484	489	495
11	491	497	496	491	495	497	489	488	489	490	493	496	494	492	492	482	469	461	465	474	476	476	479	481	486
12	487	492	502	493	500	498	502	499	503	504	506	509	502	500	499	489	484	484	473	465	461	467	485	480	491
13	486	490	487	482	487	491	487	484	491	491	496	495	494	496	495	490	485	472	472	460	452	459	464	473	482
14	492	492	492	485	486	484	481	483	501	497	495	493	492	494	495	493	484	475	470	462	453	457	468	478	483
15	484	490	497	497	500	496	493	501	495	494	500	495	501	499	495	497	499	490	478	472	473	470	479	484	491
16	488	493	498	491	493	495	497	492	496	500	502	499	499	496	500	499	494	479	476	469	470	472	478	496	491
17	497	489	494	500	500	499	493	490	493	497	498	501	502	500	500	497	491	485	481	481	485	482	487	482	493
18 D	488	494	497	466	467	472	479	481	485	484	476	465	488	486	481	472	463	457	456	466	481	484	488	486	478
19	491	495	496	493	500	500	504	504	502	507	498	490	500	494	490	489	490	489	483	481	473	473	476	485	492
20	491	494	496	497	496	498	500	501	503	503	502	507	504	500	503	494	489	472	460	464	474	470	476	493	491
21 D	489	470	484	476	464	472	476	476	480	478	484	495	493	491	486	470	458	455	455	463	477	480	483	488	477
22	490	493	494	491	490	491	491	494	494	495	498	493	497	504	510	504	492	466	460	474	476	475	467	478	488
23	480	493	492	491	491	490	496	497	512	499	511	507	502	499	499	494	481	462	457	465	474	478	471	478	488
24 Q	487	488	492	491	492	490	494	495	502	505	505	510	512	509	509	492	478	469	475	486	495	499	494	490	494
25 Q	494	494	497	495	498	499	500	502	504	508	512	511	510	509	506	498	488	480	477	482	494	499	505	502	499
26 Q	500	503	505	506	507	507	507	511	515	514	514	517	516	512	509	498	486	475	476	481	492	504	508	508	503
27	510	512	509	509	510	512	512	515	513	515	516	518	517	527	523	500	463	459	473	478	480	483	497	505	502
28 D	503	475	488	486	481	488	498	485	473	468	466	479	487	489	467	455	434	462	471	456	468	481	492	496	477
29 D	498	509	500	497	480	465	473	450	446	456	453	463	447	479	492	472	486	470	445	430	435	443	462	468	467
30	491	471	478	472	479	477	485	486	492	500	486	490	486	485	475	483	482	476	470	458	459	467	469	480	479
MEAN	491	492	494	491	491	492	493	494	496	496	496	497	498	498	497	491	483	473	469	469	472	476	481	486	488

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 11 VICTORIA D = 22 DEG 00.0 MIN EAST + APRIL 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	16.4	17.7	18.1	18.0	18.9	19.1	20.1	26.6	23.6	23.4	21.9	21.1	22.0	20.3	22.7	25.9	26.2	25.9	23.1	17.3	15.3	12.5	11.3	13.5	20.0
2	16.0	16.4	16.7	19.7	25.4	24.5	19.2	19.9	18.9	18.7	20.3	19.9	20.4	20.9	22.0	23.1	24.8	24.4	22.2	20.1	18.3	16.5	15.1	15.1	19.9
3 Q	15.5	17.1	18.2	18.8	18.8	19.1	19.1	19.9	19.5	19.4	19.3	20.0	20.3	21.3	22.2	23.7	25.1	25.4	23.6	21.1	18.5	16.2	14.4	15.1	19.6
4 D	14.5	14.0	14.5	18.3	19.6	18.9	18.9	19.7	20.6	20.3	19.5	19.7	19.9	19.5	15.1	15.3	21.8	22.4	21.3	19.5	17.4	16.4	17.1	17.8	18.4
5	17.7	18.1	19.0	20.1	21.7	28.6	24.5	20.1	19.5	19.7	20.0	19.5	15.1	17.3	21.9	23.6	24.5	24.9	22.9	19.8	17.9	16.7	15.9	15.7	20.2
6	16.1	17.4	18.5	19.4	19.8	19.5	20.1	20.5	19.0	20.2	19.9	18.2	21.0	20.5	19.7	22.4	24.3	24.6	22.9	20.3	17.3	15.7	14.9	15.4	19.5
7	16.7	17.5	18.4	19.4	21.2	20.3	19.8	19.8	18.3	21.8	22.7	21.7	20.5	15.2	18.1	21.5	23.8	23.3	22.4	20.6	19.3	17.3	15.8	15.4	19.6
8	15.4	16.5	18.4	18.7	19.5	19.0	18.7	19.3	19.7	19.9	19.9	19.9	20.5	21.0	22.5	24.7	26.5	27.0	20.6	18.0	16.6	15.6	15.2	14.1	19.5
9 Q	16.5	17.4	18.2	18.5	18.7	18.8	19.2	19.1	19.5	19.5	19.3	19.1	19.1	20.6	22.1	22.7	23.4	23.3	21.9	19.7	18.6	18.2	17.3	16.4	19.5
10	16.2	16.4	17.7	18.3	18.5	19.2	19.2	17.9	20.5	19.6	19.8	20.3	20.8	21.5	22.7	23.7	26.1	26.4	23.2	17.8	15.3	16.1	16.3	15.7	19.5
11	17.0	16.7	17.5	19.6	17.8	17.2	17.8	19.6	20.4	20.7	20.9	20.8	21.6	22.4	24.3	25.4	25.3	24.5	21.4	18.8	17.9	16.9	15.5	15.2	19.8
12	15.9	16.0	16.5	17.9	18.4	17.7	18.7	18.8	19.4	20.0	20.7	21.1	22.2	22.9	23.8	25.0	23.7	23.3	23.3	21.1	17.8	14.6	12.8	12.5	19.3
13	13.5	17.4	16.7	17.7	18.9	19.3	21.6	20.9	19.5	18.5	18.1	19.6	19.6	20.7	23.9	24.6	25.8	25.0	23.4	21.0	16.8	13.9	13.2	13.1	19.3
14	13.2	13.9	15.9	17.1	17.8	18.2	18.2	19.5	19.3	20.9	19.2	20.0	21.2	23.3	24.1	24.3	24.3	23.8	23.1	20.2	17.1	14.3	12.3	12.3	18.9
15	14.0	15.9	17.5	17.9	17.9	18.1	17.5	19.8	18.7	18.9	18.5	18.6	19.5	20.9	22.7	22.8	22.1	21.9	21.4	18.1	16.0	14.7	14.0	13.4	18.4
16	13.8	14.5	16.7	18.0	17.7	18.2	18.7	18.4	18.7	18.4	19.0	19.0	19.6	20.2	21.8	22.3	23.8	24.2	23.4	20.6	17.2	15.2	13.8	12.1	18.6
17	12.4	13.5	16.3	17.7	18.0	17.6	17.7	20.3	20.7	20.3	19.9	21.2	22.8	23.0	23.8	25.4	25.7	25.6	24.4	21.5	20.2	17.3	14.6	13.8	19.7
18 D	14.0	15.0	15.5	17.9	17.8	18.9	19.3	18.4	21.7	25.3	29.1	28.6	24.6	25.6	26.6	28.0	24.3	22.8	18.3	15.9	14.6	13.1	12.5	14.1	20.1
19	15.4	16.8	17.7	18.8	19.1	19.5	19.0	19.1	18.8	22.8	19.6	19.5	20.4	25.1	25.2	25.6	25.6	25.0	23.7	21.1	19.8	18.2	17.0	16.3	20.4
20	16.3	16.8	18.0	18.3	18.4	18.4	18.5	18.3	19.0	19.3	19.7	20.3	21.4	20.8	23.6	25.6	26.0	26.0	22.4	17.5	16.0	14.1	11.6	8.6	19.0
21 D	7.0	13.4	14.9	15.4	17.0	20.4	17.2	22.9	21.6	23.6	19.4	24.0	23.5	26.9	25.3	27.0	23.3	20.2	16.3	12.2	13.6	14.0	14.7	15.4	18.7
22	17.1	17.4	18.4	18.7	18.6	18.9	19.2	19.1	19.2	19.5	20.3	20.0	20.5	20.7	21.4	23.5	26.0	26.2	19.8	15.9	15.7	14.1	14.4	14.8	19.1
23	16.6	17.8	18.2	18.1	18.6	18.4	18.5	18.5	19.2	20.1	20.9	21.0	23.5	22.4	21.4	23.2	24.4	22.8	19.1	16.2	15.4	15.0	16.4	17.3	19.3
24 Q	17.9	17.9	18.3	18.7	18.8	18.5	18.7	18.5	19.6	19.8	19.8	20.7	22.4	23.1	24.6	26.4	26.3	24.7	19.9	17.0	16.4	16.2	16.6	16.8	19.9
25 Q	17.0	16.7	17.3	17.6	18.1	17.8	18.1	18.7	19.2	19.5	20.0	20.7	21.6	22.9	24.3	25.5	25.5	24.0	21.3	18.3	16.9	16.3	16.1	16.2	19.6
26 Q	16.6	16.7	17.1	17.4	17.5	18.2	18.6	18.5	19.0	19.4	20.0	20.7	22.0	22.8	24.0	25.1	25.2	23.5	19.7	15.5	14.4	13.6	13.6	14.3	18.9
27	15.4	16.2	17.8	17.7	18.0	17.5	18.0	18.0	18.8	18.9	19.7	19.9	21.1	22.4	25.3	27.0	29.0	23.6	19.0	16.4	14.7	13.1	12.4	13.2	18.9
28 D	13.5	13.7	15.9	17.0	17.2	17.9	17.5	16.7	23.5	26.5	29.3	29.7	26.0	24.0	25.0	23.5	21.6	14.3	16.3	15.2	14.2	14.7	15.6	16.0	19.4
29 D	16.8	17.3	16.7	15.9	15.8	24.2	40.7	30.6	38.1	36.0	32.7	24.9	22.1	22.3	27.9	24.9	22.1	21.0	20.5	19.1	15.8	14.5	14.1	13.2	22.8
30	12.0	15.3	22.3	16.6	17.5	17.7	17.7	18.0	18.9	19.5	19.9	22.3	22.4	26.6	25.0	22.2	21.6	21.0	19.6	17.4	16.3	15.4	14.8	15.3	19.0
MEAN	15.2	16.2	17.4	18.1	18.7	19.3	19.7	19.8	20.4	21.0	21.0	21.1	21.3	21.9	23.1	24.1	24.6	23.7	21.3	18.4	16.7	15.3	14.6	14.6	19.5

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 12 VICTORIA Z = 53.000 GAMMA + APRIL 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	101	99	97	97	97	98	101	85	71	77	82	88	90	86	84	91	92	87	82	79	83	91	95	109	90
2	106	106	107	112	100	100	100	100	100	98	96	91	90	94	94	94	91	84	86	86	88	91	95	97	96
3 Q	98	97	97	96	95	95	95	96	96	95	96	95	92	94	93	95	92	88	83	81	77	73	78	82	91
4 D	89	91	93	89	93	94	93	94	89	91	91	90	90	90	84	73	74	77	80	81	84	87	86	90	87
5	96	98	98	97	97	96	90	94	92	91	83	77	68	69	82	86	87	86	87	85	83	85	89	88	88
6	91	92	95	95	94	92	92	91	89	81	88	77	81	87	85	87	88	84	80	78	79	81	85	87	87
7	89	92	94	94	92	92	94	93	87	71	70	79	83	76	68	72	77	74	67	61	65	69	73	83	80
8	88	92	95	94	92	92	92	90	88	88	89	89	89	90	93	90	87	78	77	74	73	72	76	85	86
9 Q	90	96	95	93	91	89	88	88	87	88	87	87	87	85	87	88	85	80	77	75	73	76	78	76	85
10	80	86	89	89	88	88	89	87	86	87	87	87	87	88	88	86	82	74	72	71	73	78	81	82	84
11	87	89	91	92	92	90	95	96	96	94	92	90	90	88	88	87	85	78	75	75	74	74	79	81	87
12	85	88	92	91	93	90	91	90	89	86	86	83	77	79	80	82	81	80	77	73	74	77	81	84	84
13	96	106	103	103	101	97	93	92	92	88	86	87	84	82	81	79	78	75	75	70	73	77	81	89	87
14	97	99	99	101	100	100	104	101	97	86	89	86	83	85	83	85	86	83	82	77	74	77	82	84	89
15	90	93	96	92	93	93	94	89	88	90	90	86	83	80	82	81	80	77	72	73	78	81	87	90	86
16	94	97	98	97	98	97	97	96	94	93	88	86	87	86	84	88	86	82	77	75	76	76	76	85	88
17	92	93	94	93	91	92	94	97	99	95	92	90	82	84	85	83	79	73	68	69	71	68	69	70	84
18 D	79	95	119	145	134	130	121	123	116	105	83	83	89	80	90	88	89	84	83	81	86	90	96	98	99
19	99	99	95	90	92	90	89	89	88	78	84	82	56	60	79	87	90	87	82	79	77	80	83	85	84
20	89	89	91	89	88	87	87	86	87	86	88	87	86	79	72	72	71	65	61	61	65	69	74	86	80
21 D	99	112	112	116	124	121	75	90	87	81	82	61	58	65	77	79	80	76	73	77	81	85	86	89	87
22	95	98	98	94	91	90	90	89	89	90	91	90	91	93	92	90	88	80	77	84	82	90	98	102	91
23	107	100	96	96	95	93	93	93	93	92	83	59	67	74	80	84	83	76	75	80	86	91	90	92	87
24 Q	96	95	96	94	94	93	92	92	92	91	90	90	91	90	91	88	85	79	68	71	78	79	83	83	88
25 Q	85	85	87	89	89	89	90	89	90	88	87	87	87	88	89	86	84	83	77	75	76	77	78	76	85
26 Q	76	79	83	83	85	85	86	85	85	85	84	84	83	84	84	86	81	71	62	62	67	73	74	74	79
27	77	83	87	86	85	84	84	83	83	83	83	82	81	85	81	74	69	69	67	67	67	65	69	77	78
28 D	87	88	98	104	105	104	100	96	83	61	39	52	61	46	31	30	45	51	62	73	90	95	96	97	75
29 D	98	103	106	104	125	142	90	61	17	30	26	17	-18	1	39	57	65	71	76	85	93	100	129	127	73
30	128	135	147	123	119	113	107	100	100	87	54	58	71	69	71	69	69	70	69	75	84	90	99	97	92
MEAN	93	96	98	98	98	97	94	92	88	85	82	80	78	79	81	81	81	77	75	75	78	81	85	88	86

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 13 VICTORIA H = 18,500 GAMMA + MAY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	490	491	475	479	493	480	481	493	493	488	490	492	491	487	500	490	474	471	472	465	456	468	482	483	483
2 D	495	485	486	479	492	486	490	496	501	484	490	495	501	501	499	497	486	476	473	474	484	484	490	503	489
3	501	498	494	489	488	492	495	499	503	502	505	502	505	507	500	499	493	487	485	488	493	491	491	487	496
4	494	495	492	492	496	496	499	497	501	505	503	503	504	504	502	508	499	493	484	484	485	486	487	494	496
5	565	503	497	497	489	494	494	498	500	505	504	503	505	504	500	502	499	494	493	494	492	491	485	496	500
6	504	503	504	505	504	501	505	504	502	504	500	499	500	510	507	501	495	489	490	491	497	505	502	491	501
7 Q	486	487	495	499	496	497	499	501	502	502	501	503	501	505	507	505	496	487	486	488	497	497	496	491	497
8 Q	492	494	495	497	499	504	503	508	507	507	508	510	512	517	510	486	481	482	489	500	508	512	510	504	501
9	500	503	503	498	501	509	509	507	498	484	491	495	498	499	500	491	485	463	450	454	454	460	473	485	488
10	495	496	488	493	499	494	497	494	504	499	499	495	497	493	483	477	478	476	468	468	479	482	481	486	488
11	549	555	555	557	556	564	555	560	566	562	565	565	562	559	563	553	548	546	548	557	558	557	552	552	557
12	485	500	493	497	479	482	485	484	487	486	492	503	492	480	486	477	470	464	461	461	465	470	474	474	481
13	493	484	470	480	486	487	493	493	492	496	499	499	501	506	503	493	477	464	474	481	479	472	472	483	487
14	491	486	486	484	485	488	493	492	491	488	486	493	492	493	492	483	480	468	455	460	463	465	470	475	482
15 D	490	496	492	490	492	493	495	498	502	501	495	496	500	502	501	492	482	475	469	393	427	446	499	480	484
16 D	493	421	440	458	459	462	467	475	485	483	490	478	486	492	495	496	491	484	470	460	453	454	465	477	472
17	484	481	487	477	474	477	469	475	475	478	481	480	479	481	481	482	483	475	462	453	446	446	455	468	473
18	475	496	497	496	480	472	485	494	497	500	500	495	495	497	500	502	490	476	465	465	467	469	468	481	486
19 Q	487	495	494	493	488	490	494	497	495	496	496	498	502	504	504	498	484	470	467	468	472	477	481	491	489
20 Q	496	499	494	487	481	482	488	490	493	495	493	492	492	500	500	487	475	468	472	483	491	488	495	498	489
21 Q	505	497	497	495	500	498	502	504	506	505	505	508	506	506	501	492	486	484	491	496	496	493	488	497	498
22	499	497	493	494	494	496	492	498	501	501	502	503	505	507	509	509	506	500	499	496	493	496	500	508	500
23	505	497	491	491	494	497	499	502	504	506	503	505	507	511	505	490	473	466	480	485	485	485	484	481	494
24	491	489	499	485	475	480	478	484	486	491	489	493	495	497	500	498	490	483	473	468	470	477	487	496	486
25	500	501	498	497	498	502	504	502	497	503	506	503	507	512	512	507	504	501	493	494	494	492	499	501	501
26	501	499	493	495	496	485	490	493	495	496	498	493	494	487	480	476	484	488	490	487	491	491	501	492	491
27	497	483	486	483	485	488	491	495	496	497	499	498	500	497	490	486	487	488	476	465	469	470	491	490	488
28 D	495	498	490	499	506	510	518	513	522	522	525	504	513	518	511	482	475	496	499	492	495	496	491	488	502
29	489	493	495	484	494	494	496	498	505	506	504	496	493	489	495	491	491	482	476	466	469	481	485	498	490
30	496	501	497	495	495	499	497	501	503	505	509	502	508	510	523	531	523	526	517	508	518	504	499	501	507
31	505	491	489	498	496	506	505	483	491	490	498	501	502	512	516	507	498	488	486	488	487	484	489	475	495
MEAN	498	494	492	492	493	494	496	498	500	500	501	500	501	503	502	496	490	484	481	478	482	484	488	491	493

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 14 VICTORIA — D = 22 DEG 00.0 MIN EAST + — MAY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	15.4	16.4	21.5	16.5	18.1	21.4	20.1	20.6	23.5	21.6	21.1	21.2	19.6	20.8	24.7	26.3	25.4	23.6	21.7	20.5	18.4	15.0	13.8	14.3	20.1
2 D	14.5	16.4	17.7	21.2	24.1	18.7	18.7	18.6	25.0	22.4	21.2	20.4	21.0	23.3	25.4	28.1	27.3	26.1	21.8	17.3	15.4	14.9	14.6	14.8	20.4
3	16.0	17.2	19.3	19.3	19.9	19.0	19.0	19.2	19.6	18.3	19.7	19.3	20.3	22.8	24.1	24.8	24.2	23.3	21.7	18.7	16.2	15.6	15.4	15.9	19.5
4	16.6	17.2	18.2	20.7	20.9	18.6	18.7	18.8	19.6	19.9	20.2	20.4	20.3	20.2	20.6	22.1	22.9	23.3	22.8	20.3	19.4	18.2	17.2	16.0	19.7
5	15.7	16.1	17.9	19.8	18.3	18.5	18.6	18.8	19.1	19.1	19.7	19.8	20.2	21.3	22.4	23.3	24.1	23.4	22.1	19.9	18.6	17.5	15.8	15.4	19.4
6	14.4	14.5	15.3	17.0	17.9	18.2	19.4	20.1	17.6	22.3	20.8	21.0	21.7	24.8	24.2	23.3	22.7	20.0	20.3	19.0	17.1	17.2	16.0	16.2	19.2
7 Q	16.2	17.0	17.8	19.0	19.6	19.6	19.7	19.5	19.4	19.2	19.6	19.5	19.6	20.7	22.4	23.1	23.7	23.1	21.8	19.6	17.6	16.2	15.2	15.4	19.4
8 Q	16.4	16.9	17.8	18.1	18.1	18.8	18.8	19.1	19.2	18.6	19.0	19.4	20.1	21.3	23.0	24.2	24.8	23.4	19.2	14.1	12.9	13.6	15.2	16.5	18.7
9	17.7	17.9	18.5	18.4	18.7	18.5	18.3	20.1	28.3	25.9	20.8	20.4	20.7	20.1	23.9	25.5	26.4	25.5	24.5	19.2	14.8	13.2	12.7	13.2	20.1
10	13.7	15.4	17.8	18.3	17.9	18.6	18.3	18.5	19.4	19.4	19.9	20.3	21.2	23.2	24.0	25.8	25.3	24.5	22.0	17.7	14.6	13.6	14.0	14.3	19.1
11	16.3	17.7	18.1	18.7	17.9	17.7	19.4	18.4	17.6	19.0	18.9	19.6	22.9	24.3	25.2	23.1	23.6	23.2	20.8	16.6	14.9	14.2	14.4	13.5	19.0
12	15.7	15.5	16.5	16.6	21.2	18.5	19.6	19.7	21.2	20.8	19.6	19.1	20.5	17.0	19.9	22.3	23.6	25.2	22.1	16.6	11.7	8.9	7.7	7.6	17.8
13	13.1	14.3	17.4	17.9	17.7	17.6	17.3	18.1	18.4	18.0	18.2	18.4	20.0	21.4	23.2	23.4	24.0	21.4	17.6	16.1	14.7	13.2	12.4	12.5	17.8
14	12.9	15.1	17.2	17.3	16.5	16.9	16.9	16.5	17.6	19.0	18.0	19.7	19.7	22.2	23.1	24.4	24.1	23.4	20.4	15.4	12.0	10.1	10.0	9.9	17.4
15 D	12.4	16.1	18.5	19.5	19.2	18.5	18.3	17.7	17.4	18.7	18.5	19.0	20.3	21.8	24.3	26.8	28.0	25.0	22.9	31.2	11.0	2.8	2.3	0.6	17.9
16 D	0.7	9.3	13.1	16.0	17.1	18.5	19.4	19.4	17.8	18.0	18.0	14.8	18.4	20.9	23.2	25.3	25.3	24.3	22.2	19.7	17.4	15.4	14.6	15.0	17.7
17	16.7	18.7	19.8	19.3	19.3	20.0	19.5	18.6	18.8	18.2	18.4	17.8	17.9	21.4	25.0	28.6	29.5	28.4	26.0	21.8	18.5	15.7	13.8	13.3	20.2
18	15.0	14.9	18.0	19.6	20.6	24.7	22.6	18.4	17.1	15.5	14.5	18.3	20.9	23.7	26.2	27.7	27.8	25.3	22.8	18.7	16.7	15.5	15.0	14.5	19.7
19 Q	14.8	16.5	19.1	20.1	20.0	19.2	18.5	18.3	18.1	18.2	18.6	18.3	19.0	20.9	23.3	24.4	24.5	23.4	21.5	18.1	15.2	14.0	13.2	12.9	18.8
20 Q	14.1	15.9	17.0	18.5	17.7	17.7	18.0	18.0	18.0	18.3	18.1	18.8	21.8	23.6	25.5	26.6	26.3	24.1	20.8	18.2	17.2	16.7	15.9	15.5	19.3
21 Q	15.4	16.1	16.3	16.9	17.4	17.2	18.0	18.5	18.6	18.8	19.4	19.6	20.7	23.0	24.1	24.8	25.9	24.3	19.6	17.3	16.2	17.1	16.3	15.0	19.0
22	15.2	16.0	18.3	18.6	19.1	18.7	19.1	18.1	19.1	19.6	19.7	19.9	21.2	22.8	24.6	25.8	24.8	23.5	21.7	19.5	17.0	15.9	15.1	13.8	19.5
23	14.1	14.9	17.0	17.4	17.7	18.0	18.0	18.7	18.5	19.1	19.3	19.6	20.3	21.6	23.0	26.3	28.0	22.4	18.3	14.0	13.0	12.1	9.8	10.2	18.0
24	11.9	16.6	18.7	17.9	17.1	17.9	18.0	17.6	18.0	18.3	18.8	19.2	19.8	21.7	23.7	25.6	27.0	25.9	23.4	20.1	19.2	17.9	15.3	14.4	19.3
25	15.3	16.7	18.1	18.1	18.1	18.0	18.1	17.9	18.1	18.5	19.3	20.4	21.0	21.5	23.0	24.1	24.6	24.6	23.2	20.5	18.1	15.3	13.4	13.2	19.1
26	15.2	16.2	17.4	17.7	17.2	17.0	17.3	17.7	18.0	17.8	16.9	18.7	19.9	20.5	22.7	23.3	20.9	19.2	14.1	11.8	8.2	8.1	9.3	11.7	16.5
27	13.9	17.1	18.2	17.9	17.5	17.8	17.9	18.1	18.3	18.2	18.4	18.7	19.6	21.1	22.2	23.5	22.4	21.7	20.2	14.5	10.1	7.3	5.5	6.9	17.0
28 D	10.0	12.8	15.7	16.9	15.5	15.5	15.4	17.4	18.1	18.0	21.0	21.4	20.9	23.5	22.8	26.4	25.3	21.3	21.0	15.2	12.6	14.4	15.6	16.3	18.0
29	17.4	18.4	20.0	21.8	19.5	18.2	18.4	20.3	16.9	17.8	18.5	18.3	22.2	22.6	24.0	25.9	28.5	27.8	24.4	19.3	15.1	12.7	11.6	12.9	19.7
30	15.7	18.2	22.0	22.5	19.0	19.9	17.9	17.7	17.7	17.3	18.4	17.4	19.6	21.4	22.7	26.2	29.4	26.8	22.8	20.2	15.6	13.8	12.8	11.8	19.4
31	13.3	16.3	17.1	17.7	23.2	29.1	26.1	20.9	18.6	19.8	18.2	18.0	20.6	22.9	25.0	26.1	24.6	24.5	22.7	19.3	16.5	14.7	13.7	13.8	20.1
MEAN	14.4	16.1	17.9	18.6	18.8	18.9	18.8	18.7	19.1	19.1	19.1	19.2	20.4	21.9	23.6	25.1	25.3	23.9	21.5	18.4	15.4	13.9	13.1	13.1	18.9

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 15 VICTORIA Z = 53,000 GAMMA + MAY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	96	104	111	105	103	118	119	107	66	79	91	92	91	81	84	87	85	84	86	86	84	86	88	94	93
2 D	103	106	112	113	112	102	101	98	88	50	82	90	94	95	96	96	92	84	80	81	89	95	96	98	94
3	99	98	97	92	93	93	93	94	94	91	87	87	91	95	92	85	82	78	78	78	82	85	84	83	89
4	86	93	95	96	94	92	90	92	92	89	91	93	92	86	77	73	71	73	74	74	78	80	80	86	85
5	88	91	94	95	91	90	89	90	91	90	87	88	90	91	89	88	85	80	71	67	70	72	75	78	85
6	87	87	90	88	87	86	89	89	68	81	86	87	82	80	82	83	84	82	81	83	81	80	81	83	84
7 Q	86	90	94	94	91	89	90	88	88	87	88	88	89	90	89	84	81	74	67	59	61	65	74	76	83
8 Q	81	88	90	89	89	88	88	86	86	86	87	87	90	89	90	86	84	75	64	67	67	75	81	85	83
9	90	92	91	89	87	88	87	88	79	65	82	87	91	84	82	80	78	71	60	62	69	77	94	97	82
10	101	102	103	100	96	96	96	94	84	65	73	72	78	78	81	79	79	75	66	66	72	77	83	88	84
11	71	77	75	75	74	72	74	73	71	68	68	62	65	64	65	64	43	46	59	42	51	56	58	67	64
12	85	96	95	101	101	101	103	87	85	85	86	88	84	74	70	72	73	75	68	67	70	72	79	90	84
13	99	106	97	95	90	88	90	89	88	88	86	85	87	87	86	83	78	71	67	70	69	68	76	91	85
14	102	103	104	101	98	97	95	93	90	89	87	85	81	80	78	72	70	64	57	53	49	55	68	78	81
15 D	89	95	96	92	88	87	86	87	86	81	82	83	86	84	77	72	68	60	51	25	43	62	80	95	77
16 D	145	159	137	120	105	99	95	95	94	94	96	89	99	104	103	99	95	88	82	80	84	92	97	103	102
17	105	103	101	92	90	93	92	94	93	94	95	94	88	81	80	84	80	77	69	70	74	78	80	89	87
18	93	106	113	110	106	104	101	102	97	94	79	80	90	95	97	98	93	82	73	70	72	73	77	86	91
19 Q	89	91	93	91	88	87	87	86	85	85	87	86	89	89	84	82	80	78	74	69	74	80	85	98	85
20 Q	103	108	108	104	95	93	90	89	88	88	88	81	88	90	90	88	83	77	73	72	74	76	81	81	88
21 Q	88	88	88	83	83	81	83	83	81	83	83	84	86	85	83	76	72	67	63	66	72	74	74	77	79
22	83	88	89	87	87	89	88	88	86	83	84	86	87	87	85	80	77	71	60	59	62	64	66	72	80
23	77	82	82	81	81	80	81	80	80	80	79	81	80	84	82	75	70	58	57	57	61	71	79	90	76
24	107	111	113	108	107	104	99	95	92	89	88	89	92	92	96	95	90	82	78	81	78	82	87	91	94
25	96	96	93	88	86	84	83	84	83	85	84	82	83	85	84	82	76	70	64	62	60	65	73	79	80
26	89	95	94	90	91	90	88	85	84	82	79	76	81	80	80	73	65	64	64	68	74	80	85	91	81
27	100	99	96	88	85	85	86	85	85	82	84	81	79	74	66	61	53	50	45	45	57	68	76	90	76
28 D	94	98	94	91	85	85	84	85	81	78	71	68	81	86	85	85	80	72	68	65	72	70	75	82	81
29	89	92	94	93	93	90	88	83	73	70	78	75	75	78	83	82	78	74	65	63	71	80	85	92	81
30	95	93	100	98	90	87	86	85	86	85	84	80	82	85	86	86	78	69	60	62	72	70	72	75	82
31	85	87	91	94	98	95	77	79	83	83	81	80	79	82	83	83	80	72	65	60	62	66	75	85	80
MEAN	94	93	98	95	92	91	90	89	85	82	84	83	85	85	84	82	78	72	67	65	69	74	79	86	84

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 16 VICTORIA H = 18,500 GAMMA + JUNE 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	483	493	496	494	495	493	495	496	499	495	494	496	502	510	514	508	496	482	470	481	484	490	490	494	494
2	496	495	496	494	500	502	503	503	506	505	502	499	502	506	520	520	514	513	508	501	492	491	492	499	502
3	489	507	505	492	486	491	490	491	499	489	493	496	505	508	513	513	502	482	479	477	484	485	483	481	493
4 D	494	505	507	498	499	506	504	517	505	507	510	510	501	504	512	497	503	502	499	505	495	483	478	481	501
5	495	494	487	493	490	502	506	492	498	505	498	496	495	492	487	479	469	471	480	486	495	496	501	498	492
6	502	497	495	497	500	495	499	504	504	504	504	505	507	508	510	505	505	508	498	498	508	513	500	495	503
7	492	502	499	488	485	493	501	504	498	495	490	494	488	495	492	478	471	467	467	476	486	495	507	501	490
8	500	505	497	495	501	496	500	499	501	498	495	493	493	488	491	489	475	474	492	491	486	484	487	488	492
9 Q	492	483	479	488	496	496	494	497	498	501	502	495	495	494	491	478	466	459	457	463	476	484	496	502	487
10 Q	500	501	497	503	503	506	503	502	503	504	506	507	508	512	509	496	485	476	472	471	476	484	494	502	497
11 Q	512	503	504	506	506	505	502	510	509	508	509	507	512	514	510	499	481	467	475	488	488	489	492	498	500
12 Q	497	503	509	508	506	504	504	506	510	512	514	513	514	520	520	514	503	489	485	486	491	497	508	514	505
13	523	517	506	505	507	508	508	509	514	517	518	517	521	521	518	510	500	497	490	477	492	500	498	490	507
14	498	503	506	508	509	517	508	511	504	510	512	515	523	525	528	529	515	508	481	486	471	481	480	496	505
15	516	498	512	494	497	489	491	488	497	502	500	512	517	519	524	513	516	512	499	486	477	481	483	486	500
16	497	501	501	501	499	493	494	499	503	496	493	502	510	498	493	494	498	498	494	487	473	470	479	481	494
17 D	487	494	488	506	500	497	501	497	479	505	504	493	483	511	527	515	498	469	535	505	490	477	551	563	503
18 D	725	796	883	548	443	417	364	357	334	377	321	283	362	341	369	387	411	426	406	417	436	461	476	491	451
19 D	482	490	484	469	447	437	435	442	436	451	454	449	462	468	477	478	484	473	471	464	459	452	451	457	461
20	480	481	472	455	464	465	475	468	471	472	474	474	480	478	484	479	466	454	454	450	449	448	452	453	467
21	468	482	490	480	475	468	475	473	477	477	475	479	482	488	493	486	482	467	456	459	443	455	473	482	474
22	478	483	482	480	483	485	491	498	500	491	484	480	490	493	489	489	477	460	457	469	474	480	484	468	482
23	478	481	470	486	484	485	485	484	482	483	479	477	478	483	491	481	462	447	437	451	468	470	470	478	475
24	487	489	484	482	484	483	480	479	489	485	478	486	488	483	483	486	506	501	479	467	468	463	468	474	482
25	476	484	483	483	482	483	481	485	487	491	494	495	502	500	503	498	494	495	505	500	492	488	484	481	490
26	490	491	491	495	486	481	492	496	498	492	498	494	501	505	502	496	496	483	469	468	474	476	482	480	489
27 D	492	497	494	498	486	485	486	489	491	494	497	500	496	503	508	508	500	479	474	459	460	464	479	491	489
28	494	492	474	473	487	483	479	487	480	482	493	485	491	496	504	509	498	479	467	478	483	482	480	490	486
29	501	503	479	472	480	475	481	483	485	491	489	488	488	493	488	497	501	494	488	480	479	477	472	464	485
30 Q	480	478	486	490	493	492	486	485	485	483	487	486	491	497	500	500	496	488	483	478	477	478	478	481	487
MEAN	500	505	505	493	489	488	487	488	488	491	489	488	493	495	498	494	489	481	478	477	478	480	486	489	489

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 17 VICTORIA D = 22 DEG 00.0 MIN EAST + JUNE 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	14.5	16.7	19.8	18.7	18.7	18.3	18.0	17.7	19.0	19.0	18.0	18.5	20.0	21.6	22.9	25.7	27.0	25.5	20.9	15.3	12.3	11.5	11.8	11.8	18.4
2	12.6	15.1	17.2	18.8	18.6	17.3	17.6	17.7	18.1	16.8	17.9	18.5	19.1	20.4	21.8	23.1	23.6	23.9	21.7	18.6	17.1	15.4	13.6	12.7	18.2
3	15.0	18.9	21.0	19.5	21.4	20.1	18.5	18.5	18.4	18.1	17.0	15.0	18.2	21.4	24.8	26.5	28.3	24.2	23.4	19.8	16.8	15.9	14.3	13.9	19.5
4 D	13.5	14.8	16.9	17.5	19.6	17.7	17.3	18.9	19.1	18.4	18.4	19.4	21.8	23.4	25.0	27.5	23.5	24.9	21.9	20.4	17.9	15.6	14.3	14.0	19.2
5	12.7	14.8	18.6	20.2	20.5	20.4	25.1	20.9	18.8	18.0	17.9	20.3	20.5	21.3	23.2	25.2	24.6	21.9	18.5	14.4	13.3	12.1	11.7	12.9	18.7
6	14.8	15.7	17.3	18.2	18.9	19.2	18.6	19.0	18.7	18.1	18.6	19.1	19.5	20.7	23.3	25.5	26.4	24.2	20.1	16.3	14.4	14.0	13.9	14.5	18.7
7	16.0	17.1	19.1	20.3	19.5	18.2	19.8	19.0	17.5	16.8	17.8	18.8	22.2	23.2	25.1	26.5	24.4	20.0	16.7	13.1	12.2	12.5	12.6	13.5	18.4
8	15.0	15.7	17.5	17.7	18.5	18.0	16.9	16.6	16.8	16.9	17.8	20.1	20.6	21.9	21.2	24.4	24.4	22.2	17.6	16.5	14.9	13.2	12.5	12.9	17.9
9 Q	13.7	13.5	15.9	16.7	17.5	16.9	16.9	17.2	17.7	17.5	17.6	18.0	19.1	20.6	21.9	22.8	24.1	23.2	20.4	17.2	15.0	13.4	12.7	13.1	17.6
10 Q	15.5	16.8	18.0	17.6	18.2	19.2	20.0	17.7	17.6	17.8	18.0	19.0	20.1	21.7	23.6	26.4	26.1	25.2	20.6	16.4	13.6	12.9	12.9	14.0	18.7
11 Q	15.4	16.6	17.1	17.2	17.2	17.0	17.8	18.1	18.2	18.2	18.0	19.5	21.1	21.6	25.2	27.1	27.2	25.7	21.0	17.5	15.8	15.2	14.2	13.7	19.0
12 Q	15.1	15.8	16.1	17.5	17.8	17.3	17.3	17.5	17.2	17.6	18.5	19.2	21.1	21.3	23.2	26.1	26.9	26.2	22.5	19.1	15.2	13.9	13.4	13.0	18.7
13	12.7	14.3	15.7	16.6	16.5	16.5	16.9	17.5	18.2	18.6	18.9	19.5	20.8	22.1	23.3	23.9	23.2	23.0	22.1	20.3	15.4	13.5	12.1	11.8	18.1
14	13.0	14.9	15.7	15.9	16.5	16.6	15.9	16.3	17.5	17.3	18.3	20.5	20.5	22.3	23.1	25.5	26.1	24.2	24.2	20.1	16.5	11.4	9.7	10.9	18.0
15	12.1	15.1	17.0	19.9	20.9	19.4	21.2	20.3	18.3	17.2	17.8	19.2	19.2	19.4	21.4	24.1	22.8	22.0	23.5	21.3	16.5	15.2	15.0	13.8	18.9
16	12.6	14.1	16.3	18.1	18.9	19.3	18.4	18.1	19.1	23.0	18.9	17.8	18.6	20.3	22.3	23.1	22.8	21.4	19.4	18.0	16.7	15.1	13.7	13.0	18.3
17 D	15.0	15.8	17.7	17.9	19.4	21.9	20.1	20.4	22.0	21.7	16.9	16.2	15.8	24.3	28.5	31.2	29.6	23.0	15.1	20.0	18.0	8.8	4.6	1.7	18.6
18 D	-3.9	-10.4	0.3	23.6	24.9	31.0	23.0	28.2	33.0	30.0	31.5	17.2	19.1	17.2	18.0	15.8	22.3	26.0	24.6	23.5	18.2	17.6	17.0	17.2	19.4
19 D	19.6	21.0	20.2	21.1	22.7	26.0	30.8	24.0	27.4	23.4	23.4	20.3	17.5	19.4	22.1	25.7	28.2	27.6	24.0	21.9	18.8	17.2	16.1	15.8	22.3
20	15.8	17.2	20.5	18.2	17.5	17.7	18.9	18.0	17.9	18.1	18.6	18.6	20.6	21.4	23.8	25.7	26.6	26.0	22.8	19.6	16.9	15.1	14.8	14.0	19.3
21	13.1	13.3	15.1	17.2	17.6	17.3	17.6	18.0	18.5	18.7	18.7	19.1	20.3	21.4	22.9	24.6	24.3	24.8	22.4	21.3	19.2	14.5	13.9	12.9	18.6
22	14.7	16.2	18.7	18.8	18.3	17.7	17.9	18.3	20.0	21.6	20.8	16.5	20.8	24.6	25.7	25.8	25.0	24.0	19.9	16.8	14.7	12.3	12.7	12.4	18.9
23	12.0	12.3	15.1	16.5	19.9	18.8	18.1	22.4	19.2	18.1	16.1	16.1	19.8	23.9	24.8	25.3	26.8	24.9	19.4	14.8	14.0	13.7	12.8	13.3	18.3
24	15.3	16.3	17.4	18.1	18.0	18.1	18.7	17.9	16.4	17.6	18.2	19.1	20.9	21.0	21.4	25.0	27.6	27.6	26.0	19.4	14.6	12.1	11.4	12.7	18.8
25	14.8	16.9	18.7	19.4	19.7	19.5	21.7	20.1	20.0	19.4	18.4	18.0	19.2	19.6	21.2	23.6	26.1	26.3	24.4	20.3	16.3	14.2	13.2	13.6	19.4
26	14.5	15.8	18.1	20.0	22.8	19.0	17.6	17.2	17.8	19.0	16.8	17.0	18.7	20.6	22.5	21.7	24.6	25.4	20.6	16.9	13.0	12.3	13.1	13.7	18.3
27 D	14.9	17.2	18.6	20.5	19.6	20.9	20.0	23.3	20.0	18.6	17.7	18.7	21.1	23.6	25.5	27.6	27.1	25.4	20.6	18.8	14.1	8.8	9.4	10.4	19.3
28	13.2	16.5	21.2	19.2	18.7	20.0	23.9	24.2	21.3	21.2	16.2	17.7	19.6	20.8	24.6	27.2	28.0	27.4	22.5	19.7	17.1	14.6	12.8	12.4	20.0
29	12.0	16.6	18.7	20.2	19.4	21.4	18.9	17.7	17.9	17.6	16.6	17.3	20.0	21.8	22.6	23.2	23.7	22.3	18.7	16.3	15.3	14.6	15.0	15.2	18.5
30 Q	16.1	17.0	17.7	18.7	20.5	19.5	19.5	19.2	17.5	16.8	17.4	18.6	20.7	22.0	23.1	25.2	26.9	25.8	22.9	19.2	15.0	13.4	13.0	12.9	19.1
MEAN	13.7	15.1	17.2	18.7	19.3	19.3	19.4	19.3	19.3	19.0	18.6	18.4	19.9	21.5	23.3	25.0	25.6	24.5	21.3	18.4	15.6	13.7	12.9	12.9	18.8

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 18 VICTORIA Z = 53,000 GAMMA + JUNE 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	89	93	96	90	86	82	83	83	83	83	83	85	88	89	91	88	81	75	65	65	69	79	82	88	83
2	92	91	91	87	86	82	83	82	81	77	80	81	84	86	90	90	85	74	63	59	63	68	73	88	81
3	94	108	109	94	87	87	84	85	82	72	78	70	81	88	92	98	90	71	59	60	68	70	73	77	82
4 D	85	88	91	87	85	85	83	76	78	81	79	70	77	79	81	82	82	66	53	53	64	68	72	76	77
5	86	97	103	105	101	94	79	74	79	62	63	77	82	83	85	85	77	70	58	60	63	72	77	81	80
6	86	88	87	85	84	83	83	83	81	81	81	85	85	87	90	88	83	74	64	58	58	65	76	87	80
7	90	97	101	93	89	87	84	81	80	76	76	77	73	79	83	81	71	59	48	43	52	66	80	86	77
8	89	95	91	92	90	86	85	83	81	78	80	83	86	84	85	87	78	65	62	56	59	69	78	90	81
9 Q	102	104	104	93	92	89	88	88	85	84	81	75	81	85	85	83	75	67	57	49	44	53	64	74	79
10 Q	85	89	88	88	87	86	83	81	82	80	80	80	81	84	86	85	79	67	53	47	48	52	62	72	76
11 Q	84	84	84	83	81	81	80	81	77	78	77	78	82	85	87	84	73	65	52	47	50	55	63	73	74
12 Q	78	82	80	81	80	78	78	80	79	79	79	78	80	81	82	82	74	58	43	42	43	50	57	65	71
13	75	80	82	80	78	77	78	79	80	79	78	77	78	80	81	77	67	57	52	50	47	53	55	64	71
14	81	87	87	82	78	80	79	82	82	82	80	80	81	79	80	79	74	68	55	52	53	57	57	72	74
15	90	92	103	110	99	94	96	93	91	87	83	86	86	87	87	83	75	65	62	64	64	65	70	74	84
16	81	88	88	89	86	85	83	84	80	76	77	82	84	79	77	73	67	69	67	63	57	59	66	77	77
17 D	92	101	93	93	91	90	86	65	68	68	55	60	36	42	49	56	54	44	24	28	45	60	101	167	70
18 D	353	382	426	277	165	60	48	38	-109	-19	-150	-113	-60	-103	-98	-87	-46	36	65	85	101	108	111	120	66
19 D	137	155	156	162	173	164	87	52	56	61	51	63	64	67	80	90	92	90	85	89	92	94	100	104	99
20	116	129	134	109	104	102	101	93	96	96	98	97	98	94	94	92	86	78	68	67	73	77	83	87	95
21	92	94	99	96	97	92	94	94	93	92	93	95	96	98	99	96	92	85	80	78	74	81	85	95	91
22	100	103	108	101	96	93	93	94	77	77	76	62	71	85	88	90	87	78	68	67	71	76	86	92	85
23	104	110	105	105	104	100	100	98	91	94	88	73	62	64	75	83	86	78	72	76	83	88	91	91	88
24	97	103	99	95	94	94	94	94	92	86	86	85	86	83	78	76	76	72	63	66	72	71	78	84	84
25	93	102	105	101	97	97	97	95	95	93	93	94	97	94	96	95	86	79	76	73	74	79	83	81	91
26	88	94	96	98	101	96	94	92	90	86	83	77	89	95	95	87	76	68	61	62	66	69	77	81	84
27 D	82	96	96	97	94	96	100	90	83	91	92	91	86	92	94	91	81	76	66	56	59	70	77	86	85
28	93	104	113	103	97	99	97	83	66	72	83	82	93	90	83	88	92	88	81	80	83	80	82	84	88
29	93	109	112	111	105	103	99	94	95	88	79	79	84	86	84	86	85	82	73	71	78	79	87	91	90
30 Q	100	103	100	102	99	93	94	93	93	90	88	88	94	95	96	94	93	87	78	74	67	68	74	85	90
MEAN	101	108	111	103	97	91	87	83	76	78	72	73	77	77	79	79	76	70	62	61	65	70	77	86	82

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 19 VICTORIA H = 18,500 GAMMA + JULY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	490	491	494	493	491	493	494	496	496	500	498	505	504	508	511	506	505	507	511	501	482	474	473	477	496
2	487	496	494	500	492	496	496	497	502	505	510	509	509	515	517	512	516	513	503	488	480	485	488	476	499
3	478	499	502	507	506	504	507	513	514	512	515	517	518	517	509	495	490	498	501	499	499	484	477	475	502
4	489	498	497	495	493	494	499	498	500	499	499	501	508	511	505	499	497	490	483	476	475	479	483	486	494
5 Q	495	498	498	494	496	494	499	500	501	502	500	499	503	510	510	507	499	486	480	485	493	495	496	501	498
6	500	498	496	501	501	500	497	498	499	499	501	506	509	510	512	508	494	485	481	482	482	486	493	506	498
7 D	510	509	503	489	486	493	494	490	485	489	486	484	489	489	496	500	487	464	475	489	478	486	505	503	491
8	489	468	470	465	453	462	473	483	489	492	495	497	501	503	509	508	504	492	490	482	470	469	476	486	484
9	488	495	493	495	498	497	496	497	495	501	496	486	494	501	510	511	501	476	463	461	468	484	475	489	490
10	479	492	494	496	498	496	495	500	500	498	498	496	496	499	500	497	489	482	471	466	454	474	486	489	489
11	497	494	495	495	496	498	493	497	497	499	499	503	504	513	518	511	497	483	465	459	469	482	483	485	493
12	498	499	500	498	497	500	499	502	504	502	505	506	500	505	519	511	511	499	474	467	467	468	485	491	496
13 Q	498	495	495	495	494	490	495	498	498	499	498	501	507	518	515	511	505	490	474	468	471	480	491	497	495
14 Q	503	500	498	497	501	497	495	497	500	498	497	503	508	513	515	510	503	487	469	462	457	456	467	479	492
15	490	494	492	489	491	497	501	498	495	500	502	505	511	515	518	510	503	497	489	490	485	488	487	502	498
16	506	506	509	496	491	490	490	492	491	496	496	503	502	507	508	505	490	466	472	470	467	476	486	503	492
17	506	498	483	494	493	489	492	495	501	500	501	500	504	502	506	501	486	476	470	469	492	498	496	492	494
18	488	485	498	493	495	498	498	500	501	504	508	507	504	504	502	495	488	482	488	484	478	485	486	481	494
19	488	498	500	494	496	499	491	501	502	505	488	502	508	510	510	505	498	484	475	477	489	492	497	475	495
20	475	487	492	493	496	502	500	502	502	503	512	499	503	504	500	492	479	475	479	483	489	492	489	498	494
21 Q	497	498	492	494	494	500	498	499	499	500	501	501	500	500	498	486	478	468	472	481	487	493	499	508	493
22	506	497	496	497	503	502	500	501	501	503	503	507	512	518	527	518	512	494	496	485	484	503	510	508	503
23 D	507	502	498	489	501	505	508	510	514	517	511	513	515	509	511	503	493	502	500	492	488	497	507	502	504
24 D	495	492	490	495	497	495	497	493	491	489	488	489	498	495	496	509	510	487	478	485	499	496	492	470	493
25 D	483	489	488	486	486	477	465	466	494	465	481	481	502	487	492	508	494	475	466	461	476	487	485	464	482
26 D	480	495	500	494	488	483	498	509	462	491	494	493	493	498	488	494	484	477	476	474	479	481	493	490	488
27	500	501	503	493	503	478	482	486	493	495	501	498	503	502	503	500	485	466	466	460	460	468	481	485	488
28	489	487	488	488	491	500	495	490	486	487	496	496	498	508	517	510	497	480	464	454	454	463	475	484	487
29 Q	489	494	495	499	497	496	497	498	501	503	502	502	505	510	515	507	494	474	477	479	479	489	488	491	495
30	495	494	490	494	499	499	501	500	501	502	507	510	511	514	517	511	501	487	483	476	475	482	495	506	498
31	508	503	504	503	504	504	510	507	505	509	512	515	516	521	524	520	511	504	499	493	492	494	496	508	507
MEAN	494	495	495	494	494	494	495	497	497	499	500	501	504	507	509	505	497	485	480	477	478	483	488	491	494

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 20 VICTORIA D = 22 DEG 00.0 MIN EAST + JULY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	13.9	15.3	16.6	17.8	18.1	18.1	18.6	18.6	18.4	17.4	17.4	17.4	19.0	22.9	25.0	27.8	27.7	25.2	23.4	21.9	18.0	15.1	13.6	12.4	19.1
2	13.2	14.9	16.3	18.0	17.5	17.3	17.8	17.7	18.2	18.0	17.9	18.5	20.3	22.2	23.9	25.0	27.4	26.9	24.4	20.4	16.6	14.0	11.7	9.9	18.7
3	12.0	13.4	15.9	17.6	17.3	18.1	19.2	18.6	18.9	18.5	18.4	18.5	19.8	21.3	23.7	25.9	27.1	25.0	20.4	18.0	15.1	11.1	9.3	9.2	18.0
4	11.4	13.1	15.1	16.8	18.0	17.7	16.6	18.1	18.0	17.9	18.2	19.0	19.6	21.0	23.8	24.5	25.1	23.2	20.5	17.7	15.1	13.6	13.5	13.9	18.0
5 Q	14.4	15.9	17.3	17.5	17.5	16.9	17.4	16.9	17.1	17.4	18.1	19.4	20.5	22.0	23.6	25.0	24.0	21.0	18.0	15.1	13.3	11.3	11.9	13.1	17.7
6	15.4	16.9	18.4	18.3	17.4	17.2	17.4	17.5	17.8	18.5	19.0	19.1	20.1	21.4	24.1	26.0	26.3	25.1	20.9	15.8	12.7	10.9	10.0	10.7	18.2
7 D	12.8	13.8	15.7	17.8	19.1	16.9	17.6	18.1	18.5	17.6	19.0	19.5	19.7	21.4	24.2	26.5	24.7	23.5	19.5	10.5	7.5	8.5	9.5	10.5	17.2
8	11.2	13.7	15.0	19.4	18.7	26.8	25.5	18.1	17.9	16.4	17.2	17.8	19.2	22.1	25.1	26.1	24.9	23.9	20.2	15.7	12.7	12.5	12.8	13.5	18.6
9	15.3	16.5	17.6	17.4	17.6	17.3	17.3	17.0	16.9	17.1	18.4	22.5	23.6	24.8	27.1	25.9	26.4	25.1	21.5	17.6	13.8	11.8	12.1	12.0	18.9
10	14.4	15.6	18.0	17.0	16.8	17.2	17.0	17.3	17.9	18.1	18.6	19.7	19.7	23.1	24.9	26.6	28.3	27.0	20.8	16.8	14.0	12.2	12.5	14.3	18.7
11	15.5	17.2	18.3	18.2	17.7	17.7	19.9	21.2	19.4	19.0	17.8	18.5	19.1	22.6	25.7	27.8	28.3	27.0	25.3	18.3	15.1	13.5	13.1	13.0	19.5
12	15.1	17.3	18.9	19.0	18.2	18.2	18.3	21.9	18.5	17.8	17.4	17.5	18.7	22.2	22.3	23.7	23.5	22.6	21.4	19.1	16.3	14.1	13.5	15.1	18.8
13 Q	17.3	18.6	19.5	19.7	20.2	18.9	17.9	17.5	17.6	17.1	17.5	18.1	19.3	20.9	23.1	25.3	25.7	25.2	22.5	18.5	14.6	11.3	10.2	12.2	18.7
14 Q	14.3	16.6	18.7	18.6	18.5	19.6	18.5	17.8	17.3	17.6	17.7	18.5	20.1	21.6	24.0	26.0	26.5	24.4	21.2	16.9	13.3	10.5	10.7	12.2	18.4
15	14.2	15.9	17.7	17.9	17.2	17.3	18.9	19.4	18.7	17.6	17.8	18.8	19.5	20.8	22.9	24.7	26.6	26.2	24.5	20.3	18.2	17.0	15.8	14.2	19.3
16	14.1	15.3	15.1	17.4	17.9	19.0	18.5	17.7	18.4	18.4	19.8	20.3	21.5	23.0	25.3	27.6	28.4	27.9	20.6	17.2	13.7	12.5	11.2	11.8	18.9
17	13.3	14.9	16.7	18.8	17.4	18.8	18.0	17.5	17.7	18.4	18.2	18.9	20.5	22.5	25.2	26.5	28.0	26.4	23.2	16.9	13.6	11.4	11.2	13.0	18.6
18	14.6	16.5	16.0	16.2	17.0	17.4	18.5	20.6	18.2	17.9	17.8	18.6	19.4	20.6	21.7	22.1	24.5	23.1	19.8	17.8	16.0	14.6	14.8	15.4	18.3
19	16.1	16.5	17.5	17.8	17.4	17.3	17.0	17.3	18.2	20.4	23.1	20.3	20.7	21.9	24.1	25.5	24.3	22.9	20.9	17.4	15.2	13.3	13.2	14.7	18.9
20	16.2	15.7	15.6	16.1	16.6	18.0	18.9	17.9	17.9	17.5	18.5	19.4	20.6	22.2	23.9	24.7	24.2	21.6	19.7	17.1	14.8	14.0	14.4	15.3	18.4
21 Q	16.6	16.9	17.4	16.7	16.5	18.4	17.6	18.1	18.2	18.9	19.2	20.0	20.9	21.5	23.6	24.6	24.5	20.8	16.8	15.3	14.1	13.8	14.0	14.5	18.3
22	16.0	16.5	16.8	16.7	16.9	16.9	17.0	17.1	18.3	18.6	19.5	20.1	20.8	22.3	24.1	26.2	25.4	26.9	21.7	18.1	13.5	9.6	11.3	15.0	18.6
23 D	17.3	18.3	19.3	20.2	18.0	16.8	16.9	17.0	17.6	15.4	19.0	19.3	20.1	21.0	23.1	24.2	22.5	18.9	16.0	11.9	9.9	10.6	12.9	14.8	17.5
24 D	17.1	18.0	18.9	18.2	18.4	18.6	18.7	19.4	19.8	20.6	21.8	24.3	23.4	21.2	24.7	25.1	24.2	23.3	21.1	17.3	12.5	12.3	11.9	11.8	19.3
25 D	15.6	15.0	14.9	14.1	20.5	30.6	24.1	23.0	18.5	19.9	17.5	21.9	20.3	21.6	22.7	25.6	26.7	23.3	19.2	16.0	14.9	14.9	14.8	14.4	19.6
26 D	15.5	16.0	16.7	17.2	18.0	18.3	23.2	23.4	22.4	20.1	16.4	18.0	18.8	20.4	23.7	23.9	24.2	19.3	17.4	14.9	11.7	11.4	14.0	15.9	18.4
27	17.7	18.0	18.4	21.7	30.7	22.2	21.0	18.8	17.3	17.5	17.7	17.8	19.7	21.9	24.7	25.6	26.6	25.4	21.6	16.7	12.7	12.1	12.9	15.4	19.8
28	16.4	17.5	18.2	18.0	19.3	18.2	17.6	18.3	19.7	18.1	15.3	19.1	21.7	22.2	23.2	24.2	25.9	24.1	23.2	20.0	16.7	13.9	13.7	14.9	19.1
29 Q	16.0	17.1	17.8	18.0	18.2	17.6	17.3	17.1	18.7	17.5	16.9	18.4	19.7	21.0	21.9	23.4	24.3	22.6	16.8	14.8	13.6	12.9	13.3	15.1	17.9
30	16.5	17.8	18.4	17.9	18.4	17.9	18.0	18.1	18.9	18.6	18.8	19.4	20.4	20.4	23.3	23.5	24.2	23.1	23.4	19.5	16.5	12.4	10.3	11.1	18.6
31	12.6	14.3	16.3	17.0	17.7	18.4	18.0	17.5	17.4	17.8	18.0	18.1	19.6	20.4	22.6	25.0	26.8	25.2	22.9	19.2	14.3	13.1	11.9	12.2	18.2
MEAN	14.9	16.1	17.2	17.8	18.3	18.7	18.7	18.5	18.3	18.1	18.3	19.2	20.2	21.8	23.9	25.3	25.7	24.1	20.9	17.2	14.2	12.6	12.5	13.3	18.6

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 21 VICTORIA — Z = 53,000 GAMMA + — JULY 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	90	93	94	92	89	87	88	88	91	89	90	91	87	89	94	91	90	84	78	68	64	68	75	82	86
2	89	95	95	95	90	89	89	91	91	92	93	92	96	97	97	91	84	83	78	72	68	71	76	83	87
3	92	98	100	98	92	91	90	88	83	87	89	90	93	92	89	85	82	71	70	70	72	77	78	85	86
4	93	96	96	96	94	89	87	85	86	85	87	87	91	88	86	82	74	66	68	71	71	73	78	87	84
5 Q	94	96	95	91	88	86	86	85	85	85	86	88	89	90	90	83	81	77	68	62	66	73	78	84	84
6	89	94	95	92	89	86	63	57	84	84	84	85	88	90	91	92	93	86	78	72	69	62	57	66	81
7 D	90	99	104	105	104	96	95	94	94	92	87	87	86	87	92	91	84	75	68	55	71	86	97	109	90
8	117	130	141	141	145	137	117	109	101	91	86	96	105	106	102	96	89	81	77	73	73	71	72	78	101
9	87	92	92	88	89	87	87	88	87	87	86	81	89	90	90	87	78	71	63	59	63	72	77	85	82
10	89	99	103	97	94	93	93	91	89	88	85	86	82	81	86	85	80	70	70	74	71	72	77	85	85
11	94	91	90	88	86	88	90	88	87	86	85	86	88	92	94	88	83	76	67	59	66	75	74	83	84
12	92	95	96	91	87	86	86	85	83	84	85	84	78	71	83	84	82	83	83	85	85	81	84	91	85
13 Q	98	100	96	92	90	88	88	87	88	86	86	88	91	91	88	86	83	77	73	74	77	80	85	91	87
14 Q	99	101	96	91	87	87	87	87	89	86	87	90	93	94	96	97	90	76	71	65	63	69	73	81	86
15	88	95	100	93	90	88	91	88	90	91	92	92	95	97	96	93	88	86	84	79	73	76	81	85	89
16	93	98	108	109	112	111	103	98	98	97	97	95	95	96	93	91	82	69	66	66	65	72	83	90	91
17	99	99	97	96	93	95	95	92	92	90	90	89	90	87	89	87	84	76	65	58	68	73	82	86	86
18	91	87	95	93	91	90	91	88	89	87	81	83	86	89	93	87	88	84	80	80	80	80	87	90	87
19	93	95	99	94	90	90	88	88	89	85	83	89	92	94	93	87	81	73	67	62	66	70	82	85	85
20	85	89	89	85	86	88	88	90	90	90	81	82	89	93	90	85	79	71	68	67	71	79	86	90	84
21 Q	93	98	95	91	89	86	85	86	86	86	85	84	86	85	86	83	79	70	62	60	63	61	70	80	81
22	89	86	86	83	87	85	86	85	87	85	87	86	89	87	89	87	86	77	69	57	61	72	81	85	82
23 D	93	91	92	91	91	86	88	85	86	71	74	77	82	81	72	74	70	67	62	58	60	66	70	77	78
24 D	83	85	88	88	87	86	87	87	91	87	85	81	90	85	65	59	59	61	60	56	59	66	88	103	79
25 D	122	132	120	121	140	96	91	93	101	60	29	27	53	54	68	89	92	78	82	76	75	79	86	98	86
26 D	112	107	102	92	96	93	95	65	49	71	83	90	93	92	87	73	71	71	75	75	76	81	88	95	85
27	100	100	102	102	107	91	80	84	92	90	90	82	81	85	90	88	88	76	66	67	70	73	80	92	87
28	97	99	97	94	94	93	88	88	88	87	84	84	93	95	95	92	88	79	67	61	57	64	77	85	85
29 Q	92	96	97	93	90	89	89	88	88	87	83	85	91	89	92	93	95	83	72	66	68	69	79	91	86
30	85	87	90	87	87	85	86	87	90	88	89	88	88	89	91	89	88	78	73	67	68	68	75	80	83
31	86	88	91	88	87	84	84	82	83	83	83	83	84	84	86	84	83	75	68	64	61	64	69	81	80
MEAN	94	97	98	95	95	91	89	87	88	86	84	85	88	88	89	86	83	76	71	67	68	72	79	87	85

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 22 VICTORIA H = 18,500 GAMMA + AUGUST 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	528	504	508	496	466	475	480	485	482	479	484	483	489	495	495	489	475	470	469	475	486	488	492	497	487
2	490	488	484	490	498	498	493	492	496	493	495	499	503	515	519	525	519	502	490	483	472	480	499	502	497
3 Q	498	497	492	497	502	502	502	502	503	500	499	503	506	508	510	509	498	487	482	477	481	484	497	498	497
4 D	499	509	566	560	573	586	600	556	518	499	465	447	442	477	507	505	486	481	472	466	475	412	681	508	512
5 D	495	513	521	507	504	490	489	476	464	487	445	409	430	450	366	399	428	439	391	307	420	450	466	472	451
6 D	490	508	481	479	457	423	441	451	467	429	431	462	436	432	440	431	420	427	447	463	455	472	480	477	454
7	497	481	494	494	489	466	473	479	471	476	473	470	466	464	453	442	445	443	443	441	446	457	470	480	467
8	481	478	470	470	474	475	476	477	479	480	480	482	480	484	475	476	476	454	446	441	445	452	457	474	470
9 D	512	518	494	534	532	531	483	476	437	491	614	496	428	441	447	442	435	444	420	432	449	458	457	460	476
10	457	460	463	465	467	465	464	466	471	467	466	444	460	453	445	456	464	452	441	448	445	446	454	462	458
11	492	484	484	489	473	471	478	478	492	486	476	479	471	477	480	468	447	452	448	455	455	459	473	468	472
12	467	473	477	482	475	476	480	481	485	490	484	482	484	484	485	480	475	461	467	473	468	467	468	466	476
13 Q	485	485	488	490	486	484	483	485	486	490	489	489	488	489	489	479	458	455	467	459	460	468	471	478	479
14	483	492	481	489	491	492	493	493	496	496	495	496	496	502	495	490	487	475	465	468	473	468	468	470	486
15	481	485	484	493	485	471	470	480	491	492	493	497	500	498	496	482	479	465	457	466	478	489	487	489	484
16	484	500	492	489	488	492	492	493	494	494	496	496	499	493	489	493	485	477	466	459	458	465	473	475	485
17	485	488	496	496	497	500	497	501	506	501	496	499	502	503	502	509	495	476	471	469	470	476	484	489	492
18	484	488	486	489	492	488	485	490	488	490	482	493	493	489	499	493	480	458	436	447	458	466	478	473	480
19	480	486	479	469	480	477	479	490	497	502	503	503	505	513	497	485	498	498	491	492	484	477	477	481	489
20	485	490	497	498	491	494	494	495	500	504	514	511	510	508	502	492	487	472	460	469	476	474	481	486	491
21	490	477	481	501	507	491	484	492	496	499	510	500	499	501	500	484	478	469	464	470	477	474	481	482	488
22	479	488	492	495	494	488	499	498	494	500	500	493	497	495	499	491	477	470	461	463	474	485	493	497	488
23 Q	505	502	499	497	494	456	497	498	498	494	496	498	499	500	502	493	481	474	471	473	474	479	488	494	492
24 Q	499	456	493	491	492	496	496	499	496	496	500	499	499	499	498	492	487	478	475	469	468	469	479	489	490
25 Q	495	501	504	504	502	504	502	500	501	503	497	501	501	505	508	499	488	484	484	486	491	495	498	511	499
26	513	522	482	484	482	486	502	484	493	491	493	502	504	502	494	491	488	486	500	494	480	474	484	499	493
27 D	501	516	487	482	475	466	459	437	454	470	455	495	481	481	489	484	484	482	467	466	467	473	487	491	477
28	504	499	496	494	491	492	494	495	493	493	497	495	492	482	490	493	475	460	460	471	474	479	485	479	487
29	483	489	488	492	487	491	492	491	490	496	495	494	495	495	498	499	489	477	462	460	463	467	475	489	486
30	485	495	497	496	497	499	500	499	501	504	507	503	503	507	508	497	481	465	454	452	451	468	477	494	489
31	505	490	483	487	489	488	488	484	490	496	495	498	496	501	498	491	479	469	464	460	468	473	482	494	486
MEAN	491	494	492	494	491	489	489	488	488	490	491	488	486	488	486	483	476	468	461	460	466	469	485	485	483

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 23 VICTORIA D = 22 DEG 00.0 MIN EAST + AUGUST 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	12.2	12.5	12.2	14.2	17.2	17.5	18.0	16.5	17.1	17.5	18.7	19.1	21.5	22.8	24.9	26.2	25.8	23.8	19.8	15.6	14.0	13.0	14.1	15.3	17.9
2	16.7	16.9	17.0	17.1	17.8	18.5	18.3	18.6	19.7	20.4	19.4	20.4	20.1	20.9	21.7	24.0	25.8	24.4	20.7	17.7	14.6	9.9	10.6	13.5	18.5
3 Q	15.8	16.6	17.5	17.5	17.7	17.0	17.5	17.4	18.9	21.2	20.0	18.8	19.0	19.8	20.4	22.6	25.1	22.8	20.4	16.2	13.0	12.0	11.7	12.0	18.0
4 D	14.1	14.6	14.9	13.6	21.2	14.6	14.1	17.5	14.7	22.4	21.4	22.4	25.5	26.3	30.2	29.8	30.6	25.9	22.2	19.9	18.9	41.2	29.8	-14.3	20.5
5 D	-12.8	-3.7	-4.5	14.4	39.2	21.4	21.5	10.7	11.5	11.4	5.2	6.9	12.4	16.1	8.4	15.5	24.6	28.5	23.8	19.7	15.1	17.0	16.4	19.6	14.1
6 D	20.3	15.5	19.9	23.9	42.7	33.6	20.4	24.1	29.7	24.5	20.1	19.9	23.0	20.3	24.0	23.0	21.1	21.4	25.4	22.6	21.8	20.9	20.1	20.4	23.2
7	21.3	24.4	21.5	23.2	23.4	20.2	16.9	17.8	14.5	17.1	15.7	17.5	21.4	22.5	21.1	25.8	23.4	20.8	16.9	13.6	11.2	10.7	12.1	14.4	18.6
8	16.6	17.3	17.7	18.2	17.5	17.5	17.6	17.6	17.7	17.9	18.5	19.1	20.0	20.4	21.6	21.5	25.3	24.2	20.2	17.1	15.0	15.1	15.4	15.9	18.5
9 D	12.6	11.9	14.3	14.4	15.9	35.5	25.6	8.5	21.0	24.2	36.9	31.3	23.4	24.0	31.2	31.4	33.7	31.1	26.5	21.3	17.8	16.9	16.9	16.0	22.6
10	18.0	18.6	19.2	18.9	19.3	20.9	20.5	22.8	19.6	18.1	16.5	11.8	17.6	20.0	20.8	25.8	27.5	25.9	22.7	18.8	18.1	17.8	15.2	15.9	19.6
11	16.4	19.2	17.9	20.4	20.3	17.2	17.7	17.6	18.3	19.1	19.4	21.5	17.5	21.3	24.1	26.2	25.7	24.3	22.0	18.4	15.5	12.9	12.6	13.6	19.1
12	15.3	16.2	16.9	18.5	20.2	18.3	17.3	17.9	18.0	18.5	18.8	18.9	19.8	19.4	21.7	23.2	24.7	25.1	21.9	19.9	18.0	15.8	14.5	14.6	18.9
13 Q	16.2	17.5	17.9	18.0	18.9	21.5	18.7	17.4	18.4	18.0	18.2	18.8	19.7	20.4	21.5	23.3	24.6	23.5	20.8	18.4	15.7	12.6	12.7	13.9	18.6
14	14.9	15.1	15.0	16.2	16.7	17.4	17.7	18.0	17.7	17.7	18.0	19.5	21.0	21.2	23.8	25.5	26.0	26.4	21.9	18.3	14.8	12.0	11.7	12.8	18.3
15	14.7	16.2	13.6	20.8	21.2	22.1	25.2	22.3	26.7	19.0	19.2	17.8	18.9	20.7	22.7	25.1	25.7	25.3	24.5	17.5	12.4	12.0	12.6	12.8	19.7
16	15.3	13.4	16.7	15.3	16.3	17.2	17.9	21.9	21.4	17.8	17.3	17.6	18.2	19.4	22.0	23.1	25.0	25.0	22.5	18.9	15.2	11.7	11.1	13.1	18.1
17	15.5	17.3	19.1	17.2	17.4	17.0	17.8	17.9	17.6	16.7	17.6	17.4	17.2	19.3	19.3	23.8	25.7	25.2	21.4	17.6	15.2	14.5	13.6	13.3	18.1
18	15.9	16.8	17.8	18.1	20.5	18.5	18.5	18.2	19.0	19.6	18.8	19.9	19.1	18.2	22.0	24.9	25.2	23.6	16.9	12.3	10.9	11.6	12.1	12.6	18.0
19	15.4	16.6	19.2	23.5	19.8	19.4	18.7	22.3	18.3	16.2	17.4	17.7	18.2	17.8	17.7	19.7	21.7	22.0	19.6	18.6	17.1	16.2	16.5	16.3	18.6
20	16.7	15.6	15.5	16.1	16.6	16.4	16.6	17.6	18.8	18.6	19.3	20.7	20.1	20.6	20.6	21.6	25.2	23.7	21.6	16.0	14.9	13.0	13.6	14.6	18.1
21	16.1	15.6	18.0	19.3	26.2	22.0	21.4	18.0	18.1	19.1	17.4	19.2	21.4	22.2	22.7	22.3	24.2	23.9	19.7	15.6	15.1	14.3	14.3	15.3	19.2
22	17.2	17.7	17.1	16.2	16.4	19.5	19.5	16.9	13.2	19.0	18.8	16.6	17.2	19.3	22.0	23.8	24.8	23.1	20.7	17.9	15.2	13.8	14.8	16.0	18.2
23 Q	16.8	17.7	17.2	17.1	18.6	18.6	18.0	17.5	17.3	18.2	18.6	19.8	20.6	21.8	24.1	24.9	25.2	23.1	20.8	17.6	15.7	13.7	13.6	14.8	18.8
24 Q	16.5	17.3	17.9	17.6	17.9	18.2	18.5	18.4	18.4	17.8	18.8	19.0	19.9	21.0	23.8	25.7	27.1	24.9	20.1	17.0	15.3	13.8	13.0	13.2	18.8
25 Q	15.8	17.1	17.6	17.3	17.5	17.4	17.9	19.0	21.8	21.0	21.2	20.6	20.3	20.9	23.6	24.2	26.2	24.1	20.0	17.1	15.5	14.1	14.1	13.4	19.1
26	14.5	13.3	15.4	13.6	17.4	19.5	27.0	21.1	18.2	19.0	20.7	19.9	20.8	22.1	23.3	24.3	26.2	23.4	20.5	18.4	15.9	13.5	11.8	12.0	18.8
27 D	13.7	12.8	17.8	16.6	17.3	28.8	29.8	26.8	28.9	24.5	17.3	14.9	17.8	15.5	22.2	23.9	23.7	23.7	23.4	20.5	17.7	15.8	15.5	16.1	20.2
28	17.3	17.9	18.5	17.5	17.6	17.2	17.4	17.5	18.1	17.9	19.6	19.6	18.8	18.6	21.9	23.9	26.4	22.8	19.2	16.4	14.7	14.0	14.8	15.5	18.5
29	16.4	18.1	20.3	18.9	18.3	18.3	18.2	18.9	19.3	18.5	18.2	17.8	18.7	20.0	21.7	22.5	23.9	23.9	22.2	16.3	12.4	11.8	13.0	13.3	18.4
30	16.3	17.5	17.4	17.5	17.8	17.4	17.8	17.7	18.1	16.2	16.5	19.1	19.6	20.3	22.6	25.8	27.5	25.3	22.2	19.4	15.9	14.8	14.2	14.5	18.8
31	14.6	16.4	18.2	17.7	18.6	20.8	20.0	20.5	20.0	18.5	18.1	18.3	19.6	20.8	23.3	25.7	26.9	25.0	21.3	18.2	16.4	15.1	15.0	14.5	19.3
MEAN	15.0	15.8	16.8	17.7	20.1	20.0	19.4	18.5	19.0	18.9	18.8	18.8	19.6	20.4	22.3	24.2	25.6	24.4	21.3	17.8	15.5	14.9	14.4	13.7	18.9

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 24 VICTORIA Z = 53.000 GAMMA + AUGUST 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	90	96	113	130	133	125	114	105	100	98	101	96	97	93	96	97	91	77	73	70	68	75	86	93	97
2	101	102	99	94	94	93	92	88	90	87	91	90	91	94	95	97	98	91	81	79	71	72	81	83	90
3 Q	85	88	86	85	88	85	85	84	86	83	86	85	88	88	89	87	91	82	72	65	70	75	78	82	83
4 D	87	90	112	137	292	267	264	267	213	171	141	129	111	101	125	123	113	109	97	93	90	127	278	203	156
5 D	186	188	207	221	246	163	159	85	85	27	8	-27	49	60	10	-50	42	97	94	81	125	128	128	128	102
6 D	145	167	190	177	169	182	121	81	44	7	45	51	64	76	84	93	93	87	103	101	108	112	114	116	105
7	132	128	140	141	112	103	88	93	89	92	85	83	89	91	86	94	100	93	78	76	90	94	98	106	99
8	112	106	103	100	102	100	102	100	102	100	101	100	101	101	96	96	101	92	84	81	89	92	98	107	99
9 D	116	115	108	133	194	240	174	53	77	-15	-222	-31	58	76	110	102	99	97	86	85	90	101	106	107	86
10	114	109	109	104	105	108	110	105	100	101	98	72	61	78	80	95	103	95	89	90	87	99	110	114	97
11	124	120	120	122	107	105	105	105	102	81	71	86	91	94	102	99	91	93	92	89	88	95	109	110	100
12	110	106	111	109	110	107	106	104	104	101	101	98	102	101	105	101	101	97	93	89	91	93	101	98	102
13 Q	105	105	105	103	103	99	101	97	102	99	97	97	99	97	96	91	85	74	71	66	72	77	82	93	92
14	98	103	96	96	97	94	95	94	95	95	93	88	90	95	96	98	93	81	75	72	77	77	85	94	91
15	102	104	105	103	102	105	105	96	73	79	96	99	101	102	101	100	100	91	79	62	74	83	90	95	94
16	93	100	103	98	95	94	94	92	86	88	92	90	92	91	89	87	86	82	80	76	76	77	85	94	89
17	99	102	103	95	91	90	88	88	86	77	77	85	90	93	89	87	91	81	71	69	71	79	86	92	87
18	101	103	99	97	95	91	91	90	88	79	63	73	87	89	87	88	83	73	65	66	78	86	96	104	86
19	110	109	111	108	105	103	103	99	95	94	96	94	97	96	90	77	69	70	67	71	77	81	88	91	92
20	100	96	96	94	96	94	93	93	93	92	85	73	81	87	87	78	87	77	68	66	69	74	86	97	86
21	105	101	100	93	89	76	86	91	89	80	76	68	83	84	88	86	85	79	73	73	77	79	88	91	85
22	96	96	95	93	92	93	91	88	73	66	81	79	79	82	84	84	86	83	83	84	88	88	96	96	87
23 Q	95	92	92	90	90	90	91	88	91	88	89	90	91	92	94	92	82	70	66	69	77	75	81	84	86
24 Q	87	87	90	89	90	91	91	91	90	85	84	86	89	89	91	87	86	78	69	64	69	70	76	82	84
25 Q	88	91	92	89	88	86	89	88	83	80	79	80	83	82	84	84	82	78	73	69	75	74	77	81	82
26	81	92	92	99	119	130	102	89	96	94	96	94	93	92	91	88	88	83	79	75	78	77	81	82	91
27 D	85	96	96	101	108	122	83	76	50	62	54	21	51	50	71	94	98	98	98	95	96	96	99	97	83
28	101	96	97	91	91	91	91	91	91	91	88	85	87	81	87	87	83	79	80	81	82	87	86	90	88
29	94	94	99	95	94	92	94	93	93	93	91	88	91	91	93	96	96	82	67	70	78	81	88	94	89
30	102	104	96	91	91	88	89	88	88	88	77	78	87	92	92	87	83	73	72	74	80	87	96	99	88
31	106	102	99	97	96	94	94	88	94	92	93	92	92	94	94	90	85	75	75	72	81	83	92	93	91
MEAN	105	106	109	109	116	113	106	96	92	82	75	77	86	88	90	88	89	84	79	77	82	87	98	100	93

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 25 VICTORIA   H = 18,500 GAMMA +   SEPTEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 Q	491	489	500	501	502	505	502	498	501	507	505	502	504	504	504	495	489	482	480	477	476	477	479	491	494
2	493	494	497	499	499	498	499	503	503	501	501	504	506	506	506	488	474	472	467	470	479	488	489	481	492
3	483	489	494	499	501	502	505	506	508	506	512	508	509	506	505	495	484	476	476	479	490	491	504	508	497
4	507	500	502	504	498	501	507	506	506	504	506	506	503	505	501	494	482	473	468	474	481	495	508	512	498
5 Q	506	504	503	503	502	500	503	502	504	504	507	506	511	509	509	497	480	468	461	465	478	492	509	514	497
6	517	507	491	496	505	505	503	502	505	507	510	512	511	512	500	485	478	467	465	468	483	498	502	505	497
7	507	503	506	506	507	502	503	501	503	506	506	502	504	503	501	496	488	485	482	486	494	507	514	518	501
8	513	508	505	506	509	509	513	518	523	519	512	515	503	501	502	490	477	467	464	462	469	487	489	494	498
9	500	495	493	493	495	490	499	501	503	493	498	497	509	510	503	495	479	471	473	476	478	483	485	494	492
10	498	494	491	491	494	501	514	513	519	523	527	515	515	511	509	499	491	481	480	494	496	499	511	508	503
11	502	501	500	496	491	490	495	494	491	474	480	495	506	505	505	494	493	486	480	476	476	478	486	494	491
12	500	500	498	494	494	489	496	498	499	501	497	497	501	504	502	497	489	481	480	486	488	493	499	498	495
13 D	496	493	491	498	505	499	497	497	505	496	503	508	523	539	516	496	486	453	356	335	423	462	449	466	479
14 D	460	456	452	443	446	403	424	447	444	448	449	456	460	464	457	450	443	445	439	433	448	459	458	458	448
15 D	462	468	462	462	473	475	462	457	455	477	446	467	460	481	486	476	474	459	460	467	471	479	476	450	467
16	467	473	485	490	488	484	488	514	483	470	477	481	486	485	487	484	475	444	449	480	485	475	478	460	479
17 D	464	466	459	462	457	466	475	480	483	493	498	498	492	486	490	483	470	462	458	464	468	481	486	451	475
18	461	469	467	475	494	481	484	488	475	478	484	484	483	487	488	479	472	467	464	461	471	483	490	490	478
19	485	486	485	484	486	494	487	481	494	490	489	489	490	489	488	483	475	468	465	466	473	481	487	490	484
20 Q	491	491	492	490	493	495	497	495	498	499	500	501	502	500	498	490	477	467	468	473	481	490	501	501	491
21 Q	496	492	497	495	495	495	496	496	500	498	503	505	505	504	502	495	489	484	481	482	488	492	498	503	495
22 Q	504	503	503	500	499	502	500	505	503	503	506	507	511	509	504	496	476	470	473	484	486	487	495	498	497
23	503	502	501	502	501	501	504	503	505	509	516	510	509	509	510	499	485	474	466	469	477	491	489	494	497
24	492	495	497	487	493	490	489	501	512	490	497	497	496	498	488	478	462	474	471	461	446	463	479	483	485
25	493	495	497	494	490	497	493	499	500	498	500	503	505	504	504	498	488	474	465	468	480	489	494	493	493
26	497	498	495	490	489	486	490	491	491	491	493	499	506	502	504	502	491	485	481	473	469	474	486	490	491
27	485	490	488	485	487	501	493	492	491	492	497	496	500	496	492	495	493	484	469	463	465	478	482	489	488
28	491	491	499	498	499	502	497	492	487	493	497	504	505	507	506	506	504	500	489	483	479	469	476	482	494
29 D	485	476	474	468	462	467	471	474	487	476	483	484	485	495	497	486	462	444	446	451	452	457	471	476	472
30	475	471	473	473	470	467	466	477	485	486	489	491	493	493	492	487	481	471	471	465	468	473	476	479	478
MEAN	491	490	490	489	491	490	492	494	495	494	496	498	500	501	499	490	480	471	465	466	474	482	488	489	488

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 26 VICTORIA D = 22 DEG 00.0 MIN EAST + SEPTEMBER 1972

DAY	HOUR = 00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1 Q	16.0	16.0	16.9	16.6	17.0	18.6	18.6	18.3	17.8	17.4	20.2	19.6	20.5	21.3	23.5	24.9	25.4	24.5	22.3	18.8	16.9	15.9	16.2	16.8	19.2
2	17.5	17.4	16.9	17.2	17.2	17.4	16.9	17.7	21.2	21.4	20.8	19.8	20.1	21.3	23.0	25.6	24.5	19.1	15.3	13.6	12.8	14.2	14.9	15.7	18.4
3	16.2	17.2	16.9	16.4	16.7	16.8	17.0	17.4	18.0	19.5	19.3	19.8	20.1	21.0	22.5	22.5	23.6	22.1	19.8	16.7	14.9	13.5	14.5	15.1	18.2
4	15.6	16.6	16.7	16.7	16.9	17.4	17.1	17.4	17.7	18.1	19.0	19.4	20.3	20.5	22.8	23.9	24.9	23.4	20.5	16.1	14.1	13.1	12.5	13.9	18.1
5 Q	15.5	16.3	16.1	16.2	16.6	16.5	16.6	17.1	18.0	18.8	19.2	19.5	19.8	20.6	22.4	24.9	26.8	23.8	19.5	15.2	12.4	11.5	12.2	13.2	17.9
6	13.5	12.0	12.5	14.7	15.3	14.7	16.9	20.5	18.7	20.1	19.8	20.2	21.1	21.4	23.0	23.7	25.5	21.9	20.5	16.3	14.4	13.6	15.1	16.8	18.0
7	16.8	15.9	15.8	16.5	16.7	16.0	16.7	17.8	18.1	18.3	19.0	18.9	22.3	21.9	22.6	24.3	24.9	21.5	18.3	15.6	14.9	14.8	14.8	15.4	18.2
8	16.2	16.7	16.7	16.9	17.3	17.1	17.3	17.0	17.6	18.1	16.9	17.2	19.5	22.2	25.2	24.8	23.9	21.8	18.3	14.4	12.2	12.1	13.1	15.7	17.8
9	17.8	18.6	18.8	18.1	20.6	19.5	17.4	17.5	19.2	23.5	22.8	23.3	19.6	21.7	22.2	24.2	25.7	24.6	20.4	17.3	15.8	14.7	14.7	15.5	19.7
10	15.9	16.5	17.3	18.3	17.6	16.1	15.8	15.7	16.4	17.3	19.0	19.7	21.1	22.0	23.7	24.5	25.1	25.7	20.4	14.6	13.7	12.9	13.3	14.7	18.2
11	17.1	18.0	17.8	17.2	19.0	17.5	19.5	19.8	19.2	19.7	27.6	15.1	21.7	22.5	22.4	22.0	22.1	22.9	21.2	18.6	16.9	15.9	16.1	16.5	19.4
12	17.1	17.2	17.4	17.6	21.1	17.9	15.2	16.1	18.1	18.3	19.5	17.9	18.0	20.5	22.4	24.1	25.2	23.6	20.0	16.8	16.0	14.6	14.3	15.0	18.5
13 D	16.1	16.8	16.9	18.4	18.2	17.3	18.0	19.3	21.4	18.8	18.5	18.3	17.8	20.0	23.3	27.1	23.1	23.2	25.3	13.8	4.8	8.0	8.5	11.9	17.7
14 D	16.6	19.6	18.4	41.1	43.8	16.7	30.6	18.8	17.9	18.0	19.3	19.4	19.6	19.7	21.2	22.3	24.8	23.5	19.4	18.2	18.1	16.8	16.8	17.1	21.6
15 D	17.1	18.4	20.9	21.8	22.5	18.4	22.4	21.2	20.3	17.9	12.0	21.7	25.9	22.6	25.6	25.5	25.5	24.5	20.1	17.1	16.8	15.7	15.0	16.0	20.2
16	16.0	16.6	18.5	22.1	19.1	17.4	18.9	18.2	17.8	21.7	18.9	19.4	20.0	21.1	23.8	25.3	26.3	24.2	13.3	11.8	11.9	13.0	14.0	13.3	18.4
17 D	14.9	17.9	17.2	21.6	24.3	21.4	21.0	11.7	14.5	18.7	18.3	13.7	17.6	23.0	23.6	24.7	24.1	21.6	16.9	13.4	13.2	14.7	14.4	18.1	18.4
18	16.5	16.3	18.9	23.3	21.4	20.8	17.9	15.2	15.7	16.9	19.1	21.6	21.8	20.2	21.4	21.6	22.0	21.3	20.4	18.6	16.8	15.7	15.2	16.3	19.0
19	18.9	17.9	17.9	18.3	19.4	19.0	18.2	17.8	16.4	18.9	19.3	19.6	20.2	20.5	21.9	22.9	24.0	22.8	20.8	18.3	16.4	15.3	15.4	15.5	19.0
20 Q	16.9	17.0	17.5	17.4	17.7	17.6	17.6	17.4	17.7	17.9	16.8	18.5	19.9	20.5	22.1	22.9	23.0	20.6	17.5	14.7	14.0	14.2	15.1	16.9	18.0
21 Q	18.0	18.4	17.5	17.0	17.1	17.1	17.0	17.1	17.5	17.3	18.4	18.2	19.1	19.6	21.7	23.0	23.4	20.6	17.6	15.3	14.6	14.6	15.6	16.9	18.0
22 Q	17.4	16.8	17.0	17.2	16.9	17.1	16.7	16.8	18.1	19.1	20.3	20.1	20.5	21.1	22.4	23.5	24.0	19.2	14.6	11.9	12.3	12.4	13.9	15.8	17.7
23	17.1	16.5	16.5	16.5	16.9	16.8	16.7	17.0	17.3	17.9	18.9	19.6	14.2	23.8	24.7	25.1	23.1	19.8	18.0	14.2	13.2	13.3	15.4	16.1	17.9
24	17.9	17.6	16.8	20.5	19.9	18.0	19.1	18.5	14.1	17.0	18.0	21.1	21.5	20.6	22.7	21.7	19.5	18.9	17.5	17.9	15.4	12.5	14.1	15.3	18.2
25	16.9	17.1	17.5	17.5	21.1	17.1	17.7	18.0	17.5	17.3	17.9	15.8	19.7	20.1	21.4	23.8	24.5	22.9	20.9	17.2	15.0	13.8	14.3	15.4	18.3
26	16.4	16.6	17.1	17.2	19.2	17.1	17.1	17.5	18.2	18.8	17.3	18.0	17.3	19.5	20.3	22.6	23.7	21.3	19.8	17.9	15.1	13.2	14.5	15.8	18.0
27	16.1	15.9	15.6	16.4	19.2	20.3	19.7	18.9	20.3	20.2	21.2	20.8	20.1	21.3	21.4	21.5	21.5	22.3	21.7	19.1	16.1	14.3	14.3	14.0	18.9
28	15.2	16.4	16.9	17.3	18.2	19.2	17.9	18.4	20.7	19.9	19.7	18.8	17.5	18.7	19.2	21.4	22.8	21.9	21.3	18.6	16.8	13.0	12.3	12.9	18.1
29 D	13.6	15.0	21.3	15.8	18.0	19.5	20.8	21.5	20.0	21.1	21.8	23.1	25.6	21.4	22.5	24.7	21.6	16.8	14.2	13.2	12.8	11.3	13.1	14.1	18.4
30	14.5	13.6	14.9	14.3	16.7	18.2	18.3	19.5	20.0	18.8	18.7	19.0	18.6	19.0	20.3	21.4	22.0	21.1	19.4	16.5	14.6	14.1	13.8	14.5	17.6
MEAN	16.4	16.8	17.3	18.5	19.4	17.8	18.4	17.8	18.2	18.9	19.2	19.2	20.0	21.0	22.5	23.7	23.9	22.0	19.2	16.1	14.4	13.8	14.2	15.3	18.5

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 27 VICTORIA Z = 53,000 GAMMA + SEPTEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 Q	92	92	93	92	91	89	86	87	90	86	82	85	88	88	91	90	85	80	74	72	74	76	84	90	86
2	92	91	90	89	89	87	88	87	86	80	83	84	85	86	88	86	78	66	60	65	76	81	88	90	83
3	92	90	89	88	88	86	87	85	87	85	80	80	84	85	87	81	78	74	73	74	81	82	86	86	84
4	87	85	88	87	85	85	86	86	86	84	85	84	84	86	86	85	84	78	76	78	78	80	84	87	84
5 Q	87	85	85	84	86	86	85	86	86	85	85	82	83	81	86	86	81	70	64	64	67	69	75	79	80
6	86	85	86	86	88	88	93	91	95	92	89	86	87	84	85	85	83	77	77	75	79	79	81	82	85
7	82	81	80	81	82	80	82	81	82	81	81	78	73	78	82	82	79	67	66	67	72	73	73	73	77
8	72	70	72	74	76	77	77	77	79	77	73	54	48	55	59	65	66	63	61	60	62	67	72	80	68
9	85	80	79	79	82	80	83	82	79	69	69	70	78	77	74	72	71	68	67	70	77	78	82	81	76
10	81	85	86	87	88	88	86	85	87	83	84	79	78	76	81	80	82	69	58	66	74	79	83	82	80
11	80	75	77	77	80	82	82	81	75	30	48	61	58	73	78	75	75	69	68	67	67	72	77	81	71
12	80	80	80	80	83	81	82	69	77	74	75	76	77	80	82	83	80	72	70	70	76	79	82	80	78
13 D	80	79	79	80	78	78	80	80	75	76	80	79	82	67	25	25	51	62	40	63	97	102	104	104	74
14 D	97	97	140	296	182	50	106	113	109	104	105	105	106	105	106	98	97	98	98	98	106	104	104	103	114
15 D	108	107	110	110	110	84	91	83	91	81	35	44	37	81	96	99	97	90	89	87	92	95	99	95	88
16	104	99	102	100	94	91	94	78	49	54	82	88	93	93	92	91	85	75	73	69	71	79	95	99	85
17 D	109	121	119	113	116	109	99	68	66	85	91	67	47	58	84	90	87	77	77	82	83	87	92	95	88
18	102	104	108	108	97	95	97	80	69	57	54	62	81	87	91	89	91	86	85	82	85	86	91	95	87
19	99	94	95	92	94	89	85	87	84	83	86	85	84	86	89	89	90	82	82	78	78	80	85	82	87
20 Q	88	87	89	88	91	88	88	87	85	86	84	81	82	81	85	85	83	77	76	78	81	86	88	88	85
21 Q	88	86	86	86	86	86	87	85	84	84	84	83	82	80	83	83	78	72	71	75	79	80	84	83	82
22 Q	82	80	83	81	83	83	82	83	79	81	82	82	81	80	83	84	79	74	73	81	84	84	88	85	82
23	80	79	81	81	82	82	84	82	84	83	84	80	54	46	64	69	69	70	73	79	81	83	87	89	77
24	93	87	84	85	88	87	88	82	72	65	73	81	82	82	76	74	72	75	75	71	72	80	88	92	80
25	90	87	86	65	88	85	85	85	83	84	85	77	78	82	83	84	83	78	77	72	76	82	82	79	82
26	79	79	79	79	81	82	83	83	82	82	80	77	72	69	71	74	74	70	72	67	72	74	77	80	77
27	82	83	84	87	89	80	77	81	79	79	75	72	72	71	77	78	78	81	79	71	69	69	72	76	78
28	80	81	82	81	81	80	79	80	80	81	81	81	81	77	78	78	83	81	80	73	69	68	76	85	79
29 D	94	96	106	100	109	110	106	89	52	73	74	74	68	83	90	93	87	78	80	80	83	90	96	94	88
30	97	99	103	105	108	111	107	103	98	93	93	90	90	88	90	90	89	82	80	78	82	83	85	85	93
MEAN	89	88	91	95	93	86	88	84	81	79	79	78	77	79	81	81	81	75	73	74	78	81	85	87	83

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 28 VICTORIA H = 18.500 GAMMA + OCTOBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	484	480	474	480	486	486	487	492	493	499	501	502	501	499	498	490	485	490	487	478	476	474	485	491	488
2	488	494	497	497	495	495	496	497	499	501	502	501	502	502	502	497	499	494	486	469	476	482	489	490	494
3 Q	496	501	501	503	503	501	502	502	504	504	505	506	504	505	503	499	495	493	482	477	481	485	501	499	498
4	490	482	491	495	497	497	498	495	508	501	495	496	503	499	499	492	488	481	478	480	486	491	496	492	493
5 Q	493	497	499	499	498	497	497	496	498	498	501	500	500	499	497	489	486	485	483	482	480	486	492	492	494
6 Q	492	494	500	500	498	497	497	499	499	501	503	506	504	502	500	495	489	485	483	486	491	492	493	495	496
7	496	498	501	501	500	498	499	499	500	501	509	511	508	510	512	509	501	495	495	489	493	501	498	478	500
8 Q	488	498	496	495	496	496	494	496	498	501	502	503	503	504	504	498	495	492	480	470	475	482	490	495	494
9	500	503	505	502	503	499	500	504	505	505	508	509	511	509	507	501	500	494	486	486	496	494	494	489	500
10	486	486	494	500	503	501	502	504	502	504	510	507	511	513	503	501	499	492	496	492	497	494	492	486	499
11	487	477	460	467	456	466	458	460	470	497	492	489	492	484	492	478	478	478	470	464	471	481	490	495	477
12	504	502	500	501	501	502	501	504	506	505	507	506	505	505	501	496	473	475	458	424	457	481	485	467	490
13 D	440	451	464	482	485	479	478	480	488	484	488	489	493	495	481	487	487	482	470	458	463	464	478	492	477
14 D	458	466	469	481	478	469	483	484	488	503	478	491	491	487	470	465	462	469	451	456	464	468	477	488	475
15	489	492	490	484	489	489	483	487	485	489	493	493	491	493	497	491	486	479	470	468	465	478	486	476	485
16	499	486	482	472	471	477	485	482	491	485	493	483	499	492	492	482	485	478	473	471	473	479	482	484	483
17 Q	546	489	492	490	492	491	493	491	494	495	496	497	501	500	501	497	492	486	481	477	475	479	489	492	493
18	496	499	501	498	499	502	500	489	483	473	493	490	498	496	496	495	489	486	500	498	497	500	484	494	494
19 D	483	468	443	438	438	449	457	467	425	451	464	466	489	494	483	488	483	472	478	470	484	497	499	493	470
20	486	473	471	472	469	456	469	471	466	489	489	493	495	497	498	493	488	480	474	478	487	491	487	480	481
21	477	478	485	478	480	472	468	473	482	488	490	489	491	493	487	487	477	461	466	476	477	480	486	485	480
22	480	488	495	493	492	483	495	483	485	488	488	485	501	498	503	498	489	471	459	450	446	438	451	471	480
23	481	478	471	476	478	481	482	482	478	466	487	493	491	490	488	492	487	477	465	452	440	452	471	475	476
24	529	478	476	480	481	482	491	500	494	495	498	501	501	499	490	485	484	471	476	472	464	464	473	484	486
25	491	492	496	494	496	490	483	477	485	486	491	501	490	498	500	489	489	480	480	474	472	478	482	486	488
26	493	492	492	486	491	481	483	480	496	494	497	494	500	503	505	500	484	467	457	457	470	479	488	486	486
27	479	488	492	494	496	494	498	496	499	500	503	499	504	501	499	493	488	469	470	463	464	470	481	492	489
28	502	499	501	497	492	471	475	481	507	497	472	491	491	493	494	487	477	465	453	452	454	464	471	473	482
29 D	479	487	491	488	484	474	491	465	462	467	479	484	488	489	490	488	493	482	470	456	447	466	471	469	478
30	466	482	484	479	473	473	470	464	443	444	459	461	466	495	496	494	484	471	467	463	462	464	474	473	471
31 D	474	481	490	487	489	489	489	491	492	491	491	492	493	487	489	483	485	488	429	416	442	459	483	475	479
MEAN	489	486	487	487	487	485	487	487	488	490	493	494	497	498	496	492	487	480	473	468	472	478	484	485	486

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 29 VICTORIA D = 22 DEG 00.0 MIN EAST + OCTOBER 1972

HOUR = / DAY	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
1	15.3	16.5	15.7	16.1	17.0	17.5	18.5	17.2	17.5	16.9	17.3	17.4	17.7	18.4	18.8	20.1	21.1	19.3	19.7	18.0	15.4	13.7	13.3	13.6	17.2
2	15.7	15.9	16.4	16.3	17.0	17.1	17.7	17.8	18.1	17.9	18.2	18.1	18.9	18.4	20.3	20.9	21.9	21.9	22.0	20.3	16.9	15.3	14.4	14.9	18.0
3 Q	15.3	15.7	16.6	17.2	17.3	17.0	17.5	17.7	18.0	18.5	18.8	18.9	19.0	19.4	20.8	22.3	22.5	21.3	20.3	18.3	15.6	14.2	11.7	12.5	17.8
4	13.0	12.3	15.8	16.7	17.0	18.5	17.4	18.0	16.2	18.2	21.9	19.7	20.4	19.8	20.3	21.1	22.0	21.4	19.6	17.4	16.1	15.3	15.9	15.9	17.9
5 Q	16.4	16.5	17.2	17.6	17.7	17.7	17.7	17.6	18.2	18.5	18.7	18.7	19.0	19.3	20.3	21.1	21.3	21.4	19.6	18.5	17.5	16.7	16.6	16.2	18.3
6 Q	16.2	16.5	16.9	17.2	17.5	17.3	17.5	17.3	17.5	17.7	17.9	18.2	18.5	18.7	19.3	20.4	21.1	20.7	19.4	17.0	15.2	14.2	15.3	15.7	17.6
7	15.9	15.7	16.7	17.0	17.3	17.7	17.3	17.3	17.6	17.8	18.1	18.9	19.0	17.8	20.7	21.7	23.0	21.5	19.7	16.6	14.6	12.6	12.2	12.6	17.5
8 Q	13.9	16.5	16.9	17.2	17.8	17.9	17.8	17.5	18.0	18.1	18.2	18.4	18.7	19.3	20.7	21.6	23.1	22.8	21.2	18.4	17.0	15.0	14.5	14.7	18.1
9	15.7	16.4	17.1	17.4	17.7	18.0	18.0	17.1	17.5	17.7	18.3	18.4	18.8	19.3	20.4	21.2	21.8	21.8	18.9	15.6	12.8	12.2	12.0	13.8	17.4
10	15.2	15.7	16.2	17.3	17.6	17.4	17.5	17.3	18.2	17.7	20.9	20.7	16.5	18.5	18.6	20.2	22.3	20.5	18.4	18.4	16.0	14.3	13.7	13.0	17.6
11	14.0	13.7	16.3	19.5	18.9	18.1	20.3	20.1	21.1	24.1	22.5	20.3	19.3	19.6	17.2	18.3	21.4	22.0	21.9	19.6	16.8	15.8	15.9	15.7	18.8
12	17.1	17.5	17.8	17.9	18.2	18.1	18.3	17.9	17.9	17.6	17.8	18.0	14.0	15.7	20.4	22.1	23.4	21.6	18.7	18.0	13.3	14.9	13.9	16.6	17.8
13 D	15.8	15.3	18.1	22.3	19.5	18.1	18.5	18.4	19.1	16.8	16.2	17.3	18.9	17.5	15.4	19.7	21.0	21.3	18.9	14.7	13.1	13.2	15.8	15.1	17.5
14 D	17.9	19.3	16.5	17.9	18.5	24.3	20.7	18.7	20.5	19.5	22.2	18.2	19.0	17.8	15.4	14.4	16.0	19.7	20.9	19.2	16.6	15.1	14.7	16.2	18.3
15	16.8	17.6	18.4	18.0	20.7	20.1	18.1	17.6	17.8	17.8	18.3	17.8	20.2	19.2	20.2	21.9	22.7	21.7	20.4	16.9	15.6	14.9	14.4	16.2	18.5
16	17.4	17.6	17.5	20.4	20.6	18.1	17.5	18.2	16.2	16.5	18.0	19.8	20.2	18.7	20.7	21.1	20.8	20.7	20.3	18.2	16.5	15.8	15.9	16.4	18.5
17 Q	17.2	16.8	17.4	17.7	17.8	18.0	18.0	17.6	18.4	18.3	18.6	18.1	18.7	18.1	18.7	20.3	21.8	22.5	21.0	18.5	16.3	15.2	14.9	15.0	18.1
18	15.3	15.7	16.6	17.2	17.6	18.9	17.9	20.5	23.6	19.2	28.2	24.4	21.3	20.4	20.2	20.1	20.6	21.8	19.2	16.2	14.6	13.2	14.0	9.9	18.6
19 D	9.8	13.9	11.1	26.7	22.1	19.7	21.6	11.2	22.1	25.7	30.8	21.8	15.8	17.4	14.2	14.0	18.6	16.9	18.0	16.3	15.2	15.9	17.2	18.2	18.1
20	18.8	18.5	17.9	18.3	19.1	23.9	19.6	19.1	15.7	22.2	20.4	19.5	17.2	17.6	19.8	17.2	17.2	18.9	17.8	16.2	16.3	17.3	17.1	17.4	18.5
21	18.0	17.6	18.1	20.1	20.0	19.2	20.8	18.8	12.9	19.1	19.9	18.2	13.8	17.3	17.5	18.9	19.0	17.0	16.2	13.0	14.0	15.3	15.4	15.4	17.3
22	17.2	17.7	17.4	17.6	17.3	17.4	18.4	19.2	19.0	19.5	19.9	15.4	15.1	19.5	20.1	19.2	19.8	20.5	19.0	18.5	16.0	14.7	14.2	16.9	17.9
23	17.6	17.3	19.2	17.9	17.2	18.0	18.2	18.2	24.7	24.0	16.8	17.3	17.2	14.3	13.6	16.4	19.9	22.7	20.2	18.1	16.6	15.5	15.7	16.8	18.1
24	17.3	17.3	18.9	18.5	17.6	19.0	19.0	17.0	18.3	18.5	18.7	16.0	16.1	18.4	18.9	17.5	20.7	19.7	17.0	14.7	14.5	15.2	16.2	16.7	17.6
25	17.4	17.4	17.3	17.2	17.4	17.3	19.8	17.0	20.4	18.8	15.8	16.7	13.5	15.8	19.1	20.9	22.9	22.5	21.7	19.2	18.0	16.6	16.1	16.4	18.1
26	17.1	16.5	16.9	17.6	17.3	19.6	21.7	17.2	18.9	19.8	18.5	19.6	20.7	20.7	21.0	22.2	22.9	22.6	18.8	14.3	12.7	13.0	13.4	15.3	18.3
27	16.2	16.7	17.8	17.7	17.8	17.5	17.4	17.4	17.6	17.4	17.8	17.7	18.3	18.9	19.4	19.7	22.6	22.9	19.8	17.8	16.2	14.6	13.8	15.3	17.8
28	14.5	15.0	16.3	16.6	16.7	18.6	17.6	19.9	19.9	20.4	22.4	20.5	18.1	19.1	19.7	21.2	22.9	21.9	20.1	17.7	16.4	15.0	14.7	15.5	18.4
29 D	16.3	16.2	17.2	17.3	20.0	19.0	22.1	21.1	24.6	23.4	23.7	26.1	21.1	17.5	15.4	12.9	20.3	22.8	21.9	19.9	17.6	17.3	16.2	18.3	19.5
30	17.9	17.5	17.7	17.6	19.7	26.1	20.3	23.2	23.3	29.7	30.6	26.4	14.3	19.7	20.4	21.3	21.2	22.4	21.1	20.6	20.0	19.1	17.5	16.6	21.0
31 D	16.5	17.0	16.7	16.6	17.3	17.2	17.8	17.9	18.3	18.3	18.7	18.1	18.5	18.9	18.9	19.2	20.1	22.3	26.8	4.1	5.9	10.8	15.0	14.9	16.9
MEAN	16.1	16.4	17.0	18.1	18.2	18.8	18.7	18.1	18.9	19.5	20.1	19.2	18.0	18.4	18.9	19.6	21.2	21.2	20.0	17.1	15.5	14.9	14.9	15.4	18.1

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 30 VICTORIA Z = 53.000 GAMMA + OCTOBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	90	92	93	93	94	90	91	87	87	86	85	83	84	83	85	85	85	81	80	78	78	78	82	83	86
2	84	84	87	87	86	84	84	82	83	83	82	81	82	82	81	83	83	82	81	72	71	70	75	77	81
3 Q	79	83	83	83	84	82	83	82	81	80	80	79	80	80	83	84	84	79	71	71	71	70	74	78	79
4	82	82	89	90	88	86	83	84	79	62	62	73	77	79	83	84	87	84	83	76	72	71	78	78	80
5 Q	80	81	81	82	81	81	81	79	81	79	80	78	79	79	80	80	82	80	77	71	68	65	69	71	78
6 Q	75	78	80	79	81	79	80	79	79	78	78	76	76	76	77	79	80	76	74	70	72	72	75	75	77
7	72	76	77	78	79	79	80	79	79	77	79	77	75	73	73	76	75	72	68	59	58	63	68	67	73
8 Q	74	77	78	79	80	79	81	80	79	80	80	77	78	76	79	79	80	77	72	68	67	66	68	71	76
9	74	75	76	74	76	76	78	76	78	77	77	76	76	73	75	75	76	72	67	63	65	68	72	72	74
10	76	78	82	80	80	78	80	80	81	77	65	66	67	58	67	71	76	73	68	61	57	58	67	75	72
11	64	80	97	115	111	109	112	105	96	60	63	69	48	46	69	73	80	82	79	75	76	77	79	80	81
12	94	92	93	92	93	93	94	94	95	94	95	93	75	55	64	80	80	79	64	62	78	85	89	90	84
13 D	104	109	114	107	95	88	88	86	86	70	45	57	71	74	74	82	76	73	63	62	70	78	94	96	82
14 D	95	105	101	99	99	96	93	89	80	40	57	73	78	79	74	68	67	73	67	67	70	75	83	87	80
15	86	86	86	84	86	81	83	83	83	83	85	81	76	81	84	86	83	79	76	76	78	82	87	89	83
16	89	88	90	94	99	98	95	90	87	77	64	57	58	61	72	79	82	75	72	73	73	77	81	84	80
17 Q	88	87	87	86	85	84	84	82	82	81	81	81	82	81	83	83	82	78	70	67	67	72	76	77	80
18	82	82	84	84	84	83	82	82	76	44	46	63	71	72	80	83	82	82	76	72	72	71	75	79	75
19 D	84	101	132	169	139	127	123	59	37	18	19	15	8	38	59	60	73	81	84	87	90	90	88	85	78
20	86	88	90	92	94	97	97	88	57	64	83	86	81	79	81	83	84	85	81	82	84	85	83	83	84
21	85	84	87	89	92	93	97	92	72	70	81	77	73	67	80	78	85	81	80	81	85	87	89	88	83
22	85	89	88	88	89	90	92	84	89	85	79	63	53	64	72	73	79	76	66	65	70	72	83	89	78
23	92	94	98	103	102	100	101	94	78	77	83	81	80	72	69	80	85	87	82	76	79	89	97	95	87
24	97	93	95	96	98	99	97	87	86	87	87	83	75	78	78	81	83	78	73	76	81	85	90	88	86
25	88	86	86	86	84	85	86	86	87	81	76	69	62	57	67	75	79	80	77	73	78	81	84	84	79
26	85	84	85	85	86	87	89	87	82	73	78	78	75	77	78	80	78	71	64	64	69	75	80	79	79
27	82	82	82	81	81	81	80	80	81	81	82	80	80	80	81	80	83	81	79	76	78	77	76	80	80
28	85	83	84	83	86	90	96	98	92	45	38	67	81	84	87	85	84	80	77	76	77	78	82	85	80
29 D	87	87	87	85	85	84	48	45	53	57	53	60	63	64	65	53	65	71	72	67	75	80	80	85	70
30	87	90	90	89	87	85	83	77	62	42	34	36	4	19	64	75	78	78	76	73	72	75	80	81	68
31 D	83	85	87	85	84	84	84	82	83	81	82	81	82	80	81	83	82	78	54	62	67	73	80	78	79
MEAN	84	86	89	91	90	89	88	83	79	71	70	71	69	70	76	78	80	78	73	71	73	76	80	82	79

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 31 VICTORIA H = 18,500 GAMMA + NOVEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	476	484	486	557	425	404	375	311	210	133	9999	330	346	408	452	439	431	439	448	468	473	478	476	481	414
2 D	460	466	452	415	443	459	466	455	463	465	462	471	471	473	473	470	446	409	429	438	422	403	425	400	447
3	423	466	477	479	478	485	473	471	475	478	480	484	486	485	484	479	473	462	457	452	453	459	472	478	471
4	478	485	489	489	487	483	487	486	490	492	493	495	494	495	495	491	481	473	476	469	468	470	478	479	484
5 Q	490	492	496	495	498	496	497	495	496	496	495	495	497	497	497	495	490	476	477	471	473	475	485	490	490
6	497	497	499	497	498	499	498	499	502	500	499	499	503	505	508	502	502	496	493	488	486	486	495	498	498
7	502	503	504	499	496	491	490	491	490	485	493	498	499	498	502	498	499	493	491	485	483	479	483	486	493
8	494	489	492	489	495	492	493	493	496	492	500	499	495	497	499	495	493	491	483	476	480	487	490	486	492
9	497	497	497	492	491	493	492	487	492	488	490	494	504	498	502	490	493	486	481	477	473	476	488	489	490
10 Q	496	498	499	498	491	491	494	495	497	498	495	498	494	506	501	499	497	490	484	478	479	484	492	497	494
11	498	498	492	497	499	499	503	504	504	504	505	504	507	502	507	514	508	498	487	476	477	482	484	491	498
12	501	500	497	494	494	494	497	499	496	498	501	503	502	504	501	496	497	492	489	481	479	484	489	492	495
13 Q	517	495	499	499	494	493	493	493	498	497	500	499	500	499	497	498	499	495	483	474	469	474	486	493	494
14 Q	497	499	499	498	499	495	494	495	495	494	497	500	498	500	504	507	504	494	491	482	479	482	489	490	495
15 D	498	503	507	504	496	487	496	496	497	499	497	504	503	501	484	482	509	497	482	474	473	480	479	469	492
16 D	473	479	486	478	441	466	477	484	483	478	473	471	471	471	498	503	487	476	478	470	465	465	463	459	475
17	516	488	488	484	487	482	483	483	484	478	488	492	489	491	499	487	498	498	482	466	449	467	481	483	485
18	486	480	485	484	484	480	471	480	488	483	489	487	493	496	489	488	501	495	482	477	475	476	481	481	485
19	485	486	483	488	487	488	483	486	494	488	492	491	494	493	491	490	493	492	486	480	467	473	481	485	487
20 D	484	477	460	462	473	478	475	460	457	473	482	491	493	485	490	503	496	488	454	436	463	468	468	476	475
21	495	479	479	464	477	481	486	489	486	485	486	489	492	492	492	488	486	476	467	460	461	471	482	488	481
22	492	495	497	497	495	491	491	492	494	493	499	491	487	502	503	471	482	436	465	464	460	458	466	477	483
23	486	478	487	489	487	485	487	485	485	484	488	489	488	493	496	492	491	492	484	470	468	474	483	490	485
24	498	502	504	504	494	494	492	495	496	496	497	499	498	498	500	499	495	487	478	472	474	482	493	498	494
25	506	507	508	504	500	500	498	496	500	501	501	496	504	500	505	504	504	494	483	478	473	474	478	478	496
26	473	468	483	488	489	490	488	486	485	488	488	488	488	493	495	494	491	486	487	479	473	475	481	488	485
27	486	484	496	497	500	499	496	496	495	495	496	497	500	499	500	482	487	486	485	473	459	463	472	482	489
28	487	490	495	496	492	493	495	495	496	497	498	504	502	488	510	490	493	495	490	471	468	470	474	482	490
29	486	486	478	473	489	480	484	483	493	489	487	487	490	492	494	492	493	490	483	469	471	479	481	482	485
30 Q	492	496	497	497	497	495	494	493	495	495	496	496	502	505	503	500	503	496	484	472	468	476	488	490	493
MEAN	489	489	490	490	486	485	485	482	481	478	489	488	490	492	496	491	491	483	478	471	469	472	479	482	484

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 32 VICTORIA D = 22 DEG 00.0 MIN EAST + NOVEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	17.2	17.1	15.7	24.1	26.5	28.7	57.7	28.0	31.5	18.2	31.7	27.0	19.5	14.3	20.6	22.2	24.0	23.5	22.9	19.6	18.8	17.4	18.5	18.5	23.5
2 D	19.3	16.3	19.7	23.7	19.7	18.2	18.0	17.5	18.6	18.6	19.2	18.9	17.6	20.0	20.3	21.3	22.8	17.2	14.2	14.7	17.2	15.4	13.9	16.6	18.3
3	17.3	18.2	19.5	20.0	20.7	22.0	18.4	19.3	18.9	17.1	16.9	17.7	18.5	18.7	19.7	21.0	22.8	23.4	22.6	19.8	17.7	15.6	15.7	16.1	19.1
4	16.8	16.6	17.3	18.0	18.3	18.2	18.3	18.0	17.9	17.9	18.2	18.2	18.3	18.5	19.3	20.4	21.4	19.5	17.6	16.0	15.1	14.4	14.4	15.5	17.7
5 Q	16.3	17.1	17.5	17.6	17.9	17.6	17.9	17.7	18.1	17.8	18.2	18.1	18.4	18.2	18.6	19.5	21.6	21.6	20.7	18.9	17.0	15.2	15.3	15.7	18.0
6	16.2	16.8	17.3	18.4	17.3	17.4	17.5	17.5	17.8	17.3	18.9	17.9	18.6	18.5	19.3	20.0	21.1	20.1	19.0	18.4	17.7	18.0	17.1	16.6	18.1
7	17.0	17.0	17.6	17.7	18.1	19.2	19.8	19.6	18.4	12.8	20.3	16.6	20.5	21.2	20.4	21.1	21.0	19.3	18.0	16.9	16.0	15.3	16.1	16.2	18.2
8	17.3	17.9	18.3	18.0	18.1	18.8	17.4	16.7	16.8	17.2	16.1	17.6	17.7	17.2	18.6	18.9	19.1	18.7	17.8	16.0	15.7	15.4	15.2	16.3	17.4
9	16.8	17.5	17.9	18.2	18.6	18.8	18.2	17.7	17.3	17.4	18.6	15.4	19.6	20.0	20.7	19.8	22.0	21.2	18.7	17.0	16.6	15.6	15.5	16.1	18.1
10 Q	16.4	17.0	17.7	18.0	19.1	18.3	18.0	17.1	17.2	17.3	17.2	17.8	15.2	17.5	20.1	20.4	21.3	20.1	19.2	17.9	17.0	15.4	15.2	15.4	17.7
11	16.1	17.3	19.2	18.2	18.4	18.1	17.8	17.0	16.9	16.6	16.9	17.2	17.7	18.1	15.5	17.8	21.2	21.5	19.8	18.0	16.5	15.6	15.8	15.7	17.6
12	16.3	16.6	17.1	17.9	18.2	18.5	18.3	20.5	18.5	17.2	17.4	18.5	16.6	17.2	18.0	19.4	19.6	20.3	19.8	18.0	17.1	16.2	15.8	16.0	17.9
13 Q	16.1	16.9	17.8	17.6	17.8	17.9	18.8	17.8	16.9	16.9	17.3	17.4	17.8	17.9	18.4	19.6	21.5	21.7	20.9	19.7	18.0	16.5	16.1	15.6	18.0
14 Q	16.1	16.6	16.9	17.4	17.6	17.4	17.3	18.9	18.7	17.6	17.0	17.5	17.4	16.8	18.3	19.3	20.8	20.9	20.8	19.1	17.5	16.3	15.9	15.7	17.8
15 D	16.0	16.8	17.1	17.4	18.1	20.0	17.1	18.1	18.2	17.8	16.7	15.1	20.7	18.0	15.6	7.5	12.9	18.4	20.8	17.9	16.2	13.8	14.8	15.6	16.7
16 D	15.6	15.0	18.4	18.4	24.0	22.3	20.4	22.0	22.9	20.9	21.6	19.7	15.9	12.3	19.6	20.6	20.0	18.7	20.2	17.9	18.4	17.4	17.8	18.8	19.1
17	18.1	17.9	18.7	20.3	20.9	19.6	19.7	19.7	20.4	20.7	14.5	17.7	21.1	19.5	19.8	19.6	17.9	19.2	19.8	19.2	17.5	16.2	16.2	16.6	18.8
18	18.2	18.8	18.9	18.9	19.5	19.1	21.8	20.1	19.1	19.5	18.1	19.4	18.2	18.2	17.7	16.4	18.0	18.5	18.5	17.8	17.9	18.1	17.6	17.1	18.6
19	17.5	17.5	19.5	19.1	19.0	18.0	18.7	20.5	20.0	17.0	18.9	17.9	20.6	19.7	18.7	18.6	20.2	20.6	19.3	18.3	17.5	17.0	17.7	16.8	18.7
20 D	18.3	20.1	20.2	18.8	19.4	17.9	18.6	21.2	21.7	16.7	22.0	19.0	18.9	16.4	7.0	14.3	20.7	21.6	18.4	14.2	15.4	15.0	17.2	18.0	18.0
21	19.7	19.9	18.1	23.2	21.1	19.1	18.4	16.7	16.7	16.8	18.1	18.4	18.9	18.4	18.8	19.4	21.4	20.8	20.0	18.1	17.0	16.2	15.8	15.8	18.6
22	17.2	17.8	18.4	18.6	18.5	18.3	17.9	17.4	17.6	17.8	17.2	18.3	15.7	13.2	15.2	14.3	14.2	13.4	9.8	12.1	14.0	15.8	16.7	16.5	16.1
23	16.6	17.1	18.1	17.8	19.1	19.2	19.2	18.4	18.4	18.1	18.5	19.5	15.6	17.9	22.6	21.8	19.5	21.5	19.9	18.3	16.7	14.6	15.3	14.9	18.3
24	16.3	17.0	17.7	17.6	18.3	18.5	18.3	18.0	18.7	17.9	17.7	17.4	17.5	18.1	18.4	19.5	21.2	21.5	19.5	17.8	16.2	14.9	15.2	14.7	17.8
25	16.4	17.4	18.0	17.8	17.9	17.9	18.0	17.8	17.3	17.1	18.7	16.7	18.0	18.9	19.5	20.0	20.4	20.2	18.4	17.3	16.5	15.3	14.8	14.1	17.7
26	15.8	14.7	18.6	18.9	19.4	19.0	18.9	18.6	19.3	19.2	16.3	19.7	20.1	17.8	18.8	19.7	20.7	20.1	19.0	18.7	18.6	16.7	16.4	15.7	18.4
27	15.9	16.1	17.3	18.2	18.4	18.5	18.3	18.3	18.1	18.2	18.8	18.0	18.0	18.3	18.7	15.8	10.9	13.0	14.1	15.6	18.0	16.9	17.4	17.3	17.0
28	17.1	17.9	18.4	18.4	18.5	20.2	18.2	17.9	18.0	17.5	17.5	17.3	19.2	20.0	16.8	17.5	14.0	16.1	16.4	14.9	13.6	13.6	14.5	13.8	17.0
29	15.1	16.1	16.8	21.3	21.4	19.2	18.9	18.9	18.8	19.5	18.7	18.5	18.2	17.3	18.0	18.7	20.5	21.2	21.0	18.9	15.9	16.2	16.7	16.4	18.4
30 Q	16.4	17.3	18.1	18.2	18.6	18.4	18.4	18.3	18.3	17.9	17.9	17.5	17.5	17.7	18.1	18.2	19.5	20.4	20.4	19.2	17.2	16.0	16.0	16.0	18.0
MEAN	16.8	17.2	18.1	18.9	19.3	19.1	19.8	18.8	18.9	17.7	18.5	18.2	18.2	17.9	18.4	18.8	19.7	19.8	18.9	17.5	16.8	15.9	16.0	16.1	18.1

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 33 VICTORIA Z = 53,000 GAMMA + NOVEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1 D	85	94	181	398	250	173	-19	-45	-175	-275	-238	-179	-94	5	107	117	111	106	98	90	84	81	86	91	47
2 D	92	93	98	118	125	108	100	96	97	92	91	85	86	91	96	92	86	78	81	79	85	92	107	111	95
3	125	126	120	109	109	101	95	94	94	91	87	90	92	93	93	95	96	95	91	88	87	88	92	92	98
4	90	93	95	93	94	92	93	89	90	89	88	87	87	88	88	92	93	88	86	80	80	81	83	84	88
5 Q	88	91	91	90	92	89	90	88	87	86	86	84	85	84	86	89	90	86	85	81	82	82	85	86	87
6	87	86	87	88	88	87	87	86	86	84	83	84	83	83	84	84	85	78	73	70	74	76	77	77	82
7	81	80	81	81	82	83	85	85	85	58	40	55	68	77	82	84	82	76	72	72	75	79	82	81	76
8	85	85	88	84	85	86	87	84	86	83	80	78	79	77	81	83	86	83	80	78	80	84	86	82	83
9	84	84	82	82	82	84	83	84	84	80	78	72	71	75	77	79	85	82	77	77	76	79	82	82	80
10 Q	83	83	83	81	82	82	83	83	82	79	79	80	76	74	79	81	80	75	75	77	78	78	81	80	80
11	81	82	84	82	82	80	81	78	77	76	76	75	74	73	70	62	62	64	65	67	69	71	73	76	74
12	81	79	79	78	79	79	80	65	74	77	79	76	73	71	73	72	75	73	74	72	76	77	78	77	76
13 Q	80	78	79	78	77	76	78	76	76	75	77	75	77	75	75	77	79	76	72	72	73	75	78	79	76
14 Q	81	79	80	78	76	76	76	75	74	74	75	76	75	76	76	78	76	75	71	67	65	67	71	74	75
15 D	77	77	78	76	75	78	78	77	76	75	66	52	53	63	60	44	40	47	54	58	65	68	72	75	66
16 D	85	89	90	89	103	115	98	72	26	44	42	28	14	-12	40	68	71	73	77	77	76	80	83	85	67
17	89	87	86	85	87	84	83	80	75	66	52	47	55	61	71	68	80	78	76	75	73	79	82	83	75
18	86	84	88	86	86	84	82	80	72	73	71	68	75	78	76	74	78	75	70	71	73	77	77	76	78
19	79	79	83	84	86	85	86	83	77	69	74	68	66	73	73	72	72	71	70	70	69	74	74	76	76
20 D	77	78	86	91	92	88	83	81	72	28	44	73	75	70	27	3	37	57	53	61	76	79	79	81	66
21	82	87	85	88	91	86	80	70	63	70	75	77	77	78	77	77	79	76	75	75	75	77	79	78	78
22	79	80	81	79	79	79	79	79	79	77	72	69	64	58	47	43	52	54	57	60	67	75	81	82	70
23	83	81	84	85	83	82	85	83	84	81	82	78	68	54	65	72	70	72	69	68	69	73	76	75	76
24	78	78	81	76	77	76	76	77	77	74	75	74	73	73	74	76	76	73	68	66	68	69	76	75	74
25	77	76	75	74	75	75	74	75	73	74	74	68	66	70	72	70	69	62	58	62	64	67	70	75	71
26	82	91	102	91	85	82	81	79	79	75	60	59	65	72	75	73	75	70	67	66	67	69	74	77	76
27	78	79	81	79	79	76	74	74	74	74	73	73	74	75	74	67	64	57	58	59	67	70	73	80	72
28	81	81	80	78	78	77	77	75	75	74	73	74	66	58	41	42	47	49	49	50	57	63	70	75	66
29	79	83	85	91	93	84	83	78	75	60	63	69	74	75	75	77	80	78	77	75	73	72	78	77	77
30 Q	81	81	81	80	80	78	77	75	76	74	74	74	75	74	73	75	77	73	71	69	66	70	73	73	75
MEAN	84	85	89	96	92	88	80	76	69	62	62	63	66	69	73	73	75	73	72	71	73	76	79	81	76

HORIZONTAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES, UNIVERSAL TIME

TABLE 34 VICTORIA H = 18,500 GAMMA + DECEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	494	494	485	482	482	480	479	474	485	488	489	489	495	496	497	497	497	491	486	479	479	481	488	493	488
2	497	499	499	496	494	494	499	491	489	495	493	497	500	500	504	507	505	491	488	478	481	485	492	499	495
3	505	504	502	497	498	498	499	496	500	500	500	501	503	503	502	498	502	499	497	487	483	485	495	499	498
4	502	504	505	501	502	499	488	483	491	494	497	499	499	498	498	495	497	495	490	488	486	485	489	495	495
5 Q	500	501	499	497	497	496	499	497	496	499	500	499	500	502	502	504	504	502	499	490	487	491	495	499	498
6 Q	504	506	507	506	505	504	504	500	502	504	508	507	511	508	511	511	512	505	499	491	489	493	503	503	504
7	500	497	495	495	492	493	498	501	502	506	508	500	507	507	504	504	504	503	499	488	489	494	500	504	500
8	507	503	502	496	496	493	497	492	500	495	494	497	498	499	494	495	501	497	491	482	483	486	484	491	495
9	503	507	508	506	504	504	500	500	502	500	501	504	505	504	506	502	501	501	497	487	484	485	489	493	500
10 Q	500	505	501	501	501	498	497	494	494	492	497	497	499	499	500	500	501	498	493	486	484	490	494	497	497
11	502	502	503	503	504	501	498	499	499	499	499	500	501	504	507	506	506	498	492	485	486	487	494	499	499
12	508	509	515	509	505	504	503	505	504	505	507	508	512	509	512	512	515	505	496	490	489	501	514	505	506
13 D	475	483	492	490	489	464	470	474	485	503	477	503	491	492	486	481	477	472	488	474	461	438	464	475	479
14	479	483	486	482	479	485	483	479	485	484	491	489	484	490	497	493	498	499	493	484	479	484	483	487	487
15 D	492	497	498	498	490	498	498	494	487	512	495	477	480	476	494	492	492	495	492	492	475	433	435	467	486
16 D	478	471	455	442	475	471	458	474	466	462	460	491	487	488	487	487	477	477	459	478	477	476	468	459	472
17	477	485	484	480	479	481	475	492	486	476	463	488	486	489	495	494	488	488	482	474	468	468	475	480	481
18	489	489	488	486	486	490	498	487	483	486	492	486	489	494	490	495	493	490	486	479	472	475	487	494	488
19	500	500	499	494	492	493	492	491	494	491	497	496	496	495	496	500	499	486	490	479	475	476	476	481	491
20	492	497	496	491	493	492	491	489	490	490	498	496	499	499	498	499	501	499	493	484	480	478	488	495	493
21 Q	498	500	499	496	496	493	494	493	492	493	494	495	496	500	502	503	505	503	494	485	479	482	491	502	495
22	509	513	515	511	510	506	505	504	507	511	511	511	506	514	509	503	514	511	499	476	482	482	477	479	503
23 D	497	491	468	491	504	491	470	471	488	487	487	494	494	495	501	491	500	487	474	455	473	475	478	489	485
24	488	471	491	489	496	487	475	476	481	485	490	493	494	495	496	497	498	493	488	479	477	479	484	486	487
25	496	503	505	502	500	498	498	496	496	496	499	499	503	505	506	508	506	505	501	491	486	481	488	497	499
26	504	504	501	495	497	497	496	496	497	496	496	493	493	494	497	504	501	496	491	482	478	481	489	494	495
27 Q	496	499	500	496	494	495	496	495	497	496	496	497	498	498	501	500	501	499	491	482	478	485	493	502	495
28	507	504	507	506	505	505	504	507	507	505	505	506	508	506	510	510	511	509	505	499	494	492	495	499	504
29	499	505	504	504	494	497	499	497	502	495	498	503	506	504	502	495	498	512	505	490	485	482	475	487	497
30 D	497	494	486	484	487	486	485	488	485	503	495	497	494	497	500	501	499	500	499	488	450	456	483	489	489
31	491	493	490	485	483	485	484	486	489	486	503	497	498	494	498	498	501	498	492	492	493	490	486	465	491
MEAN	496	497	496	494	494	493	491	491	493	495	495	497	498	499	500	499	500	497	492	484	480	480	486	490	493

DECLINATION

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 35 VICTORIA D = 22 DEG 00.0 MIN EAST + DECEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	16.2	17.3	18.2	17.8	19.8	18.7	20.3	20.1	18.9	17.9	18.4	17.8	18.0	18.4	18.5	19.3	20.0	20.7	19.7	19.3	18.6	17.5	17.1	16.6	18.5
2	16.5	17.6	18.2	18.3	18.3	18.4	19.6	17.8	19.0	19.0	18.7	18.5	18.3	18.1	17.8	18.5	20.1	19.1	17.8	18.5	17.9	16.4	16.2	15.5	18.1
3	16.2	16.9	17.3	17.5	17.8	18.3	17.9	17.9	17.8	17.7	18.4	18.3	18.9	18.1	18.7	18.9	19.2	18.8	18.5	17.8	16.5	15.4	15.8	16.7	17.7
4	17.2	17.4	17.9	18.3	18.5	18.0	18.1	19.4	18.5	18.3	18.3	18.2	18.7	18.6	18.7	18.8	19.3	19.7	19.5	18.2	18.0	16.6	16.3	16.1	18.2
5 Q	17.1	17.3	18.0	18.1	18.2	18.3	17.9	18.0	18.0	17.7	17.9	18.0	17.7	17.6	17.9	18.0	18.7	19.4	19.4	18.7	17.8	16.7	16.3	16.2	17.9
6 Q	16.9	17.3	17.7	18.7	18.4	18.3	18.2	17.9	17.9	17.3	17.2	17.2	17.8	17.5	18.2	18.5	19.5	20.4	19.7	18.4	17.3	16.3	15.5	15.7	17.8
7	16.9	17.5	17.5	18.3	18.7	18.8	19.2	18.2	18.0	18.9	18.6	18.8	19.2	20.0	19.6	19.3	20.1	20.2	19.1	17.5	16.6	15.7	15.5	15.9	18.3
8	17.0	17.4	18.1	18.1	18.5	18.9	17.5	17.7	17.1	17.8	17.2	18.4	18.6	18.6	18.7	17.6	19.6	19.3	18.7	18.2	16.8	15.6	15.1	15.3	17.7
9	16.4	17.1	17.9	18.1	18.6	18.4	18.4	17.9	17.7	17.3	17.3	17.4	17.5	17.9	18.2	18.6	19.0	20.2	19.2	18.4	17.8	16.0	15.7	15.1	17.8
10 Q	16.2	16.7	17.2	18.1	18.8	18.1	18.3	18.4	17.6	17.3	17.6	17.5	17.7	17.6	18.2	18.3	19.3	19.4	19.6	18.0	16.8	16.1	16.5	16.2	17.7
11	16.1	16.7	18.3	17.7	18.0	17.6	17.7	17.5	17.5	17.7	17.6	17.3	17.8	17.5	17.9	18.3	19.5	20.5	19.5	17.7	16.1	15.5	15.4	15.5	17.5
12	16.6	17.3	17.5	17.9	18.2	18.1	18.9	17.6	17.5	17.5	17.4	17.4	17.6	17.5	18.0	18.5	19.8	20.7	19.9	18.8	17.4	16.0	15.6	14.9	17.8
13 D	14.2	14.5	17.1	18.7	19.7	24.8	21.8	21.1	20.3	20.2	26.6	21.9	21.2	17.8	13.8	14.9	13.1	15.3	14.0	14.2	14.6	14.5	11.9	14.4	17.5
14	18.7	18.6	18.6	18.8	18.8	19.5	18.0	19.3	19.2	17.7	16.4	18.7	15.7	13.3	17.9	17.8	16.7	18.7	18.8	18.6	18.1	16.8	17.0	16.9	17.9
15 D	17.7	17.6	17.9	18.3	18.5	17.7	17.3	18.0	19.5	15.7	23.0	26.8	27.2	17.8	18.3	17.9	18.8	19.0	17.1	14.8	15.0	16.9	16.5	16.4	18.5
16 D	17.9	17.2	19.3	28.6	19.6	18.7	21.5	29.4	20.3	16.1	11.7	15.9	23.1	18.1	18.9	18.4	15.7	11.8	13.8	16.6	16.1	16.3	16.2	16.9	18.3
17	16.7	18.2	18.5	18.6	19.0	19.0	20.1	18.0	18.4	19.5	13.0	17.5	19.3	14.1	19.8	18.7	18.4	18.1	16.9	17.7	18.4	17.1	17.3	17.4	17.9
18	17.5	17.5	17.8	18.0	18.1	17.9	16.6	17.3	17.8	17.1	17.2	17.8	17.7	18.7	18.7	16.9	17.7	18.9	19.1	19.1	18.9	18.0	17.4	16.6	17.8
19	16.8	17.5	17.8	18.0	18.2	19.6	19.0	18.1	18.0	18.1	17.6	16.9	18.1	17.6	17.0	16.4	18.5	18.6	17.4	17.7	16.3	15.7	15.9	15.5	17.5
20	17.1	17.4	18.1	19.2	18.7	18.5	18.5	17.9	18.1	17.8	19.0	19.7	19.8	18.7	18.9	18.7	18.3	18.1	18.3	17.9	17.1	15.5	16.2	16.1	18.1
21 Q	16.8	17.3	18.0	18.1	18.4	18.1	18.0	17.6	17.5	17.4	17.4	17.3	17.3	15.4	17.3	18.5	19.8	20.2	20.1	19.0	18.1	16.9	16.1	15.4	17.7
22	16.1	16.8	17.5	17.8	18.1	17.8	18.1	17.6	17.3	17.0	17.1	17.6	16.2	18.1	20.1	18.0	20.5	18.8	18.5	18.3	15.2	14.3	15.9	12.7	17.3
23 D	15.1	14.1	14.9	16.5	15.7	18.4	23.6	22.5	17.9	17.1	17.5	18.2	19.7	16.9	19.8	18.5	20.3	19.5	20.6	19.5	16.5	15.0	15.8	16.0	17.9
24	16.1	18.4	20.6	17.9	18.3	18.3	20.4	22.2	20.2	18.9	17.7	18.2	18.1	18.1	18.1	18.3	18.8	18.6	18.7	18.1	17.0	15.7	15.9	15.7	18.3
25	16.8	17.3	17.7	18.0	18.5	18.6	18.7	18.3	18.1	17.3	17.4	17.4	17.5	17.8	17.8	18.5	19.2	19.9	20.1	18.9	17.8	17.5	17.1	16.2	18.0
26	16.6	17.7	18.2	18.3	18.5	18.4	18.4	18.1	17.3	17.7	18.7	19.4	18.5	18.3	16.9	17.9	19.3	20.2	20.5	19.2	18.0	16.3	15.7	15.8	18.1
27 Q	16.3	16.6	17.6	17.8	18.6	18.0	18.2	17.9	17.9	17.7	17.3	17.5	17.7	17.8	17.7	18.1	19.0	20.4	20.3	19.3	17.8	16.5	15.9	15.2	17.8
28	16.1	17.1	17.7	18.0	18.4	18.1	18.0	17.7	17.9	17.5	17.5	17.5	17.7	18.6	17.8	18.1	19.2	19.6	19.2	17.9	17.2	16.6	14.2	14.5	17.6
29	15.0	14.8	15.5	17.2	17.0	16.9	17.5	18.3	20.0	18.8	17.1	16.9	17.8	17.1	18.7	17.0	16.0	18.1	19.4	19.3	18.1	17.2	14.0	15.7	17.2
30 D	17.1	16.0	15.7	17.5	18.0	18.0	18.7	18.9	19.4	20.3	18.3	19.2	17.6	15.6	16.8	17.3	17.4	18.5	17.2	18.9	19.0	12.1	16.0	16.6	17.5
31	16.9	17.7	17.6	17.1	17.6	18.1	18.8	17.8	18.4	22.5	16.8	18.8	20.8	17.2	17.3	18.3	18.3	18.6	18.2	17.1	16.5	17.1	16.3	15.8	17.9
MEAN	16.6	17.1	17.7	18.4	18.4	18.5	18.8	18.9	18.4	18.0	17.8	18.3	18.7	17.6	18.1	18.1	18.7	19.0	18.7	18.1	17.2	16.1	15.9	15.8	17.9

VERTICAL INTENSITY

MEAN VALUES FOR PERIODS OF SIXTY MINUTES. UNIVERSAL TIME

TABLE 36 VICTORIA   Z = 53,000 GAMMA +   DECEMBER 1972

HOUR =	00 TO 01	01 TO 02	02 TO 03	03 TO 04	04 TO 05	05 TO 06	06 TO 07	07 TO 08	08 TO 09	09 TO 10	10 TO 11	11 TO 12	12 TO 13	13 TO 14	14 TO 15	15 TO 16	16 TO 17	17 TO 18	18 TO 19	19 TO 20	20 TO 21	21 TO 22	22 TO 23	23 TO 24	MEAN
DAY																									
1	78	79	78	80	83	82	84	81	82	78	78	76	76	76	75	77	79	75	72	70	70	70	73	73	77
2	75	76	76	76	75	76	74	71	70	68	71	72	73	73	74	76	77	74	73	71	70	68	72	72	73
3	73	74	74	74	77	76	75	73	74	71	71	71	71	72	72	71	74	71	71	68	69	70	70	71	72
4	72	73	75	72	75	75	75	77	79	77	76	75	73	72	72	74	74	73	72	72	72	71	72	72	74
5 Q	74	74	73	73	74	74	73	73	73	72	71	70	70	70	70	71	73	72	70	70	69	71	71	71	72
6 Q	72	71	71	71	71	71	71	71	71	70	70	68	69	68	69	69	72	70	66	67	66	67	67	66	69
7	71	70	73	76	78	79	81	78	77	74	73	70	69	67	69	71	75	73	70	69	69	71	72	71	73
8	66	70	70	69	72	74	75	75	75	74	72	73	72	72	71	74	78	74	74	74	73	73	71	72	73
9	73	71	71	69	70	70	70	70	70	68	69	69	69	67	68	67	70	70	66	65	68	68	70	71	69
10 Q	72	72	71	70	71	70	71	73	72	71	72	72	71	71	71	70	72	71	71	70	72	71	72	71	71
11	73	71	72	71	70	69	69	69	70	70	69	70	69	70	69	69	67	66	63	60	62	64	68	68	68
12	72	70	70	68	68	67	68	69	69	71	69	70	69	67	68	67	69	67	64	63	62	63	65	63	67
13 D	65	75	79	76	75	81	90	81	73	41	44	31	44	53	45	48	48	54	62	65	67	68	78	83	64
14	84	84	83	82	86	84	83	82	80	80	76	73	71	68	66	68	74	69	66	69	73	74	76	77	76
15 D	77	77	76	75	75	77	74	71	71	37	14	30	21	8	38	61	69	68	63	61	62	60	88	88	60
16 D	90	88	94	104	106	95	89	74	75	69	20	20	32	62	68	75	72	66	61	72	69	72	70	74	72
17	82	81	81	80	84	81	81	72	64	64	50	58	59	47	59	69	70	68	64	66	68	68	71	73	69
18	74	75	75	76	76	76	72	71	72	70	67	66	69	66	64	72	74	76	76	75	73	74	74	73	72
19	74	73	72	72	73	74	74	72	72	72	72	66	68	68	72	73	73	72	69	68	67	68	70	71	71
20	76	77	77	77	80	79	79	77	77	76	71	69	69	71	72	73	73	72	72	72	72	73	74	74	74
21 Q	75	74	73	72	73	73	73	73	72	72	71	69	69	67	68	71	72	71	68	68	68	69	71	70	71
22	72	72	70	69	69	69	69	69	69	68	67	66	60	45	51	59	65	60	58	55	56	58	64	70	64
23 D	77	77	81	91	94	93	100	89	86	80	78	75	72	72	69	70	76	68	68	66	74	74	76	79	79
24	81	81	89	83	82	80	83	79	79	80	80	79	78	75	76	74	77	75	74	73	72	75	76	77	78
25	81	79	77	75	75	73	73	74	73	72	74	74	75	72	73	71	70	67	65	62	65	67	71	74	72
26	75	73	72	71	72	70	72	71	71	66	66	66	65	66	70	71	72	71	68	69	67	71	74	75	70
27 Q	77	76	76	75	75	74	74	73	73	73	73	74	74	73	74	73	75	74	71	69	68	72	77	77	74
28	74	73	72	70	70	68	68	68	69	67	69	69	62	62	65	67	66	66	64	62	61	63	64	67	67
29	70	72	73	74	78	79	77	75	71	66	69	68	66	67	64	62	58	60	61	62	63	66	65	71	68
30 D	74	75	77	80	82	81	81	81	78	73	57	65	65	66	68	68	70	70	66	65	57	66	73	73	71
31	74	73	75	77	78	78	82	81	77	72	62	53	61	66	69	70	72	70	67	69	69	67	67	65	71
MEAN	75	75	76	76	77	76	77	75	74	70	66	65	66	65	67	69	71	69	68	67	68	69	72	73	71

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY (GAMMAS) (ALL DAYS)

TABLE 37 VICTORIA — H = 18,500 GAMMA + — 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	480	479	481	491	498	500	494	491	491	489	489	496	490	496	488	486
1- 2	481	481	481	492	494	505	495	494	490	486	489	497	490	497	487	487
2- 3	478	482	483	494	492	505	495	492	490	487	490	496	490	496	489	487
3- 4	479	481	483	491	492	493	494	494	489	487	490	494	489	493	488	486
4- 5	478	483	482	491	493	489	494	491	491	487	486	494	488	492	488	485
5- 6	479	482	482	492	494	488	494	489	490	485	485	493	488	491	487	485
6- 7	477	481	483	493	496	487	495	489	492	487	485	491	488	492	489	484
7- 8	476	481	484	494	498	488	497	488	494	487	482	491	488	493	490	483
8- 9	477	481	487	496	500	488	497	488	495	488	481	493	489	493	492	483
9-10	477	483	491	496	500	491	499	490	494	490	478	495	490	495	493	483
10-11	478	482	491	496	501	489	500	491	496	493	489	495	492	495	494	486
11-12	479	483	492	497	500	488	501	488	498	494	488	497	492	494	495	487
12-13	481	487	492	498	501	493	504	486	500	497	490	498	494	496	497	489
13-14	483	488	493	498	503	495	507	488	501	498	492	499	495	498	498	491
14-15	482	486	492	497	502	498	509	486	499	496	496	500	495	499	496	491
15-16	480	487	488	491	496	494	505	483	490	492	491	499	491	495	490	489
16-17	479	485	483	483	490	489	497	476	480	487	491	500	487	488	483	489
17-18	474	476	477	473	484	481	485	468	471	480	483	497	479	480	475	483
18-19	465	468	466	469	481	478	480	461	465	473	478	492	473	475	468	476
19-20	458	462	459	469	478	477	477	460	466	468	471	484	469	473	466	469
20-21	457	459	457	472	482	478	478	466	474	472	469	480	470	476	469	466
21-22	462	459	461	476	484	480	483	469	482	478	472	480	474	479	474	468
22-23	470	464	466	481	488	486	488	485	488	484	479	486	481	487	480	475
23-24	475	472	476	486	491	489	491	485	489	485	482	490	484	489	484	480
MEAN	475	478	480	488	493	489	494	483	488	486	484	493	486	490	486	483

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION (MINUTES) (ALL DAYS)

TABLE 38 VICTORIA D = 22 DEG 00.0 MIN EAST + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	18.5	17.8	15.9	15.2	14.4	13.7	14.9	15.0	16.4	16.1	16.8	16.6	16.0	14.5	15.9	17.4
1- 2	19.4	18.4	17.0	16.2	16.1	15.1	16.1	15.8	16.8	16.4	17.2	17.1	16.8	15.8	16.6	18.0
2- 3	20.2	19.3	17.7	17.4	17.9	17.2	17.2	16.8	17.3	17.0	18.1	17.7	17.8	17.3	17.4	18.8
3- 4	20.5	19.8	18.5	18.1	18.6	18.7	17.8	17.7	18.5	18.1	18.9	18.4	18.6	18.2	18.3	19.4
4- 5	21.3	20.4	19.2	18.7	18.8	19.3	18.3	20.1	19.4	18.2	19.3	18.4	19.3	19.1	18.9	19.8
5- 6	21.3	20.7	20.3	19.3	18.9	19.3	18.7	20.0	17.8	18.8	19.1	18.5	19.4	19.2	19.0	19.9
6- 7	21.3	21.0	20.6	19.7	18.8	19.4	18.7	19.4	18.4	18.7	19.8	18.8	19.5	19.1	19.3	20.2
7- 8	21.3	20.7	20.6	19.8	18.7	19.3	18.5	18.5	17.8	18.1	18.8	18.9	19.3	18.8	19.1	19.9
8- 9	20.8	20.5	20.4	20.4	19.1	19.3	18.3	19.0	18.2	18.9	18.9	18.4	19.4	18.9	19.5	19.6
9-10	20.3	20.3	20.7	21.0	19.1	19.0	18.1	18.9	18.9	19.5	17.7	18.0	19.3	18.8	20.0	19.1
10-11	20.5	21.0	21.1	21.0	19.1	18.6	18.3	18.8	19.2	20.1	18.5	17.8	19.5	18.7	20.4	19.5
11-12	20.9	21.3	21.3	21.1	19.2	18.4	19.2	18.8	19.2	19.2	18.2	18.3	19.6	18.9	20.2	19.7
12-13	20.3	20.8	20.9	21.3	20.4	19.9	20.2	19.6	20.0	18.0	18.2	18.7	19.9	20.0	20.0	19.5
13-14	19.8	20.9	20.8	21.9	21.9	21.5	21.8	20.4	21.0	18.4	17.9	17.6	20.3	21.4	20.5	19.0
14-15	20.1	20.6	21.4	23.1	23.6	23.3	23.9	22.3	22.5	18.9	18.4	18.1	21.3	23.3	21.5	19.3
15-16	20.4	21.4	22.7	24.1	25.1	25.0	25.3	24.2	23.7	19.6	18.8	18.1	22.4	24.9	22.5	19.7
16-17	21.4	23.4	23.7	24.6	25.3	25.6	25.7	25.6	23.9	21.2	19.7	18.7	23.2	25.6	23.3	20.8
17-18	22.4	24.0	24.2	23.7	23.9	24.5	24.1	24.4	22.0	21.2	19.8	19.0	22.8	24.2	22.8	21.3
18-19	22.3	22.9	23.0	21.3	21.5	21.3	20.9	21.3	19.2	20.0	18.9	18.7	21.0	21.3	20.9	20.7
19-20	21.0	21.2	20.5	18.4	18.4	18.4	17.2	17.8	16.1	17.1	17.5	18.1	18.5	18.0	18.0	19.5
20-21	19.6	19.8	18.7	16.7	15.4	15.6	14.2	15.5	14.4	15.5	16.8	17.2	16.6	15.2	16.3	18.4
21-22	18.1	18.4	17.3	15.3	13.9	13.7	12.6	14.9	13.8	14.9	15.9	16.1	15.4	13.8	15.3	17.1
22-23	17.6	17.4	16.2	14.6	13.1	12.9	12.5	14.4	14.2	14.9	16.0	15.9	15.0	13.2	15.0	16.7
23-24	18.0	16.8	15.5	14.6	13.1	12.9	13.3	13.7	15.3	15.4	16.1	15.8	15.1	13.3	15.2	16.7
MEAN	20.3	20.4	19.9	19.5	18.9	18.8	18.6	18.9	18.5	18.1	18.1	17.9	19.0	18.8	19.0	19.2

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY (GAMMAS) (ALL DAYS)

TABLE 39 VICTORIA Z = 53,000 GAMMA + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	101	98	97	93	94	101	94	105	89	84	84	75	93	99	91	90
1- 2	102	100	100	96	98	108	97	106	88	86	85	75	95	102	93	91
2- 3	103	100	102	98	98	111	98	109	91	89	89	76	97	104	95	92
3- 4	104	101	103	98	95	103	95	109	95	91	96	76	97	101	97	94
4- 5	104	101	104	98	92	97	95	116	93	90	92	77	96	100	96	94
5- 6	104	100	104	97	91	91	91	113	86	89	88	76	94	97	94	92
6- 7	102	100	102	94	90	87	89	106	88	88	80	77	92	93	93	90
7- 8	101	99	98	92	89	83	87	96	84	83	76	75	89	89	89	88
8- 9	99	97	95	88	85	76	88	92	81	79	69	74	85	85	86	85
9-10	97	94	92	85	82	78	86	82	79	71	62	70	81	82	82	81
10-11	93	92	90	82	84	72	84	75	79	70	62	66	79	79	80	78
11-12	91	89	86	80	83	73	85	77	78	71	63	65	79	80	79	77
12-13	89	86	85	78	85	77	88	86	77	69	66	66	79	84	77	77
13-14	86	86	88	79	85	77	88	88	79	70	69	65	80	85	79	77
14-15	85	87	90	81	84	79	89	90	81	76	73	67	82	86	82	78
15-16	86	89	92	81	82	79	86	88	81	78	73	69	82	84	83	79
16-17	91	94	90	81	78	76	83	89	81	80	75	71	82	82	83	83
17-18	93	93	87	77	72	70	76	84	75	78	73	69	79	76	79	82
18-19	93	90	82	75	67	62	71	79	73	73	72	68	75	70	76	81
19-20	94	88	81	75	65	61	67	77	74	71	71	67	74	68	75	80
20-21	95	89	83	78	69	65	68	82	78	73	73	68	77	71	78	81
21-22	96	89	86	81	74	70	72	87	81	76	76	69	80	76	81	83
22-23	97	92	89	85	79	77	79	98	85	80	79	72	84	83	85	85
23-24	98	94	93	88	86	86	87	100	87	82	81	73	88	90	88	87
MEAN	96	94	92	86	84	82	85	93	83	79	76	71	85	86	85	84

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY (GAMMAS) (QUIET DAYS)

TABLE 40 VICTORIA H = 18.500 GAMMA + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	493	482	481	490	493	496	496	496	498	503	498	500	494	495	493	493
1- 2	493	487	486	492	494	494	497	496	496	496	496	502	494	495	493	495
2- 3	491	487	488	496	495	495	496	495	499	498	498	501	495	495	495	494
3- 4	490	488	490	497	494	499	496	496	498	497	497	499	495	496	496	494
4- 5	489	489	491	497	493	501	496	495	498	497	496	499	495	496	496	493
5- 6	489	487	490	497	494	501	495	496	499	496	494	497	495	497	496	492
6- 7	487	488	490	499	497	498	497	496	500	497	494	498	495	497	497	492
7- 8	486	487	492	500	500	500	498	497	499	497	494	496	496	499	497	491
8- 9	486	487	492	504	501	501	500	497	501	499	496	496	497	500	499	491
9-10	487	486	494	505	501	502	500	497	502	500	496	497	497	500	500	492
10-11	487	488	493	507	501	504	500	496	504	501	497	499	498	500	501	493
11-12	488	489	494	509	502	502	501	498	504	502	498	499	499	501	502	494
12-13	488	491	494	509	503	504	505	499	507	502	498	501	500	503	503	495
13-14	490	492	496	507	506	507	510	500	505	502	501	501	502	506	503	496
14-15	490	492	495	505	504	506	511	501	503	501	500	503	501	506	501	496
15-16	491	490	493	497	494	497	504	494	495	496	500	504	496	497	495	496
16-17	490	485	486	487	484	486	496	482	482	491	499	505	489	487	487	495
17-18	484	473	476	478	478	476	481	476	474	488	490	501	481	478	479	487
18-19	473	464	469	477	481	474	474	476	473	482	484	495	477	476	475	479
19-20	467	459	467	482	487	477	475	473	476	478	475	487	475	478	476	472
20-21	465	459	465	489	493	482	477	475	482	480	474	483	477	482	479	470
21-22	472	462	469	492	493	486	483	479	488	485	478	488	481	485	484	475
22-23	482	468	473	494	494	494	488	487	496	493	488	495	488	491	489	483
23-24	490	481	481	495	496	499	495	494	501	495	492	501	493	496	493	491
MEAN	485	482	485	496	495	495	495	491	495	495	493	498	492	494	493	490

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION (MINUTES) (QUIET DAYS)

TABLE 41 VICTORIA D = 22 DEG 00.0 MIN EAST + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	18.2	18.2	17.6	16.7	15.4	15.2	15.7	16.2	16.8	15.8	16.3	16.7	16.6	15.6	16.7	17.3
1- 2	19.2	18.6	18.0	17.2	16.5	15.9	17.0	17.2	16.9	16.4	17.0	17.0	17.2	16.7	17.1	18.0
2- 3	19.8	19.1	18.5	17.8	17.6	17.0	18.1	17.6	17.0	17.0	17.6	17.7	17.9	17.6	17.6	18.6
3- 4	20.3	19.5	19.0	18.2	18.5	17.5	18.1	17.5	16.9	17.4	17.8	18.2	18.2	17.9	17.9	18.9
4- 5	20.6	19.6	19.3	18.4	18.6	18.2	18.2	18.1	17.1	17.6	18.2	18.5	18.5	18.3	18.1	19.2
5- 6	20.5	19.6	19.5	18.5	18.5	18.0	18.3	18.5	17.4	17.6	17.9	18.2	18.5	18.3	18.2	19.1
6- 7	20.5	19.9	19.6	18.7	18.6	18.3	17.7	18.1	17.3	17.7	18.1	18.1	18.6	18.2	18.3	19.2
7- 8	20.4	19.5	19.8	18.9	18.7	17.9	17.5	17.9	17.3	17.5	18.0	18.0	18.5	18.0	18.4	19.0
8- 9	20.2	20.0	19.1	19.4	18.7	17.6	17.8	19.0	17.8	18.0	17.8	17.8	18.6	18.3	18.6	19.0
9-10	19.9	19.9	19.8	19.5	18.6	17.6	17.7	19.2	18.1	18.2	17.5	17.5	18.6	18.3	18.9	18.7
10-11	19.9	19.8	20.3	19.7	18.9	17.9	17.9	19.4	19.0	18.4	17.5	17.5	18.8	18.5	19.3	18.7
11-12	20.2	20.3	20.1	20.2	19.1	18.9	18.9	19.4	19.2	18.5	17.7	17.5	19.2	19.1	19.5	18.9
12-13	20.1	20.6	19.9	21.1	20.2	20.4	20.1	19.9	20.0	18.8	17.3	17.6	19.7	20.2	19.9	18.9
13-14	20.1	20.9	20.4	22.1	21.9	21.4	21.4	20.8	20.6	19.0	17.6	17.2	20.3	21.4	20.5	19.0
14-15	20.7	21.3	21.3	23.4	23.7	23.4	23.2	22.7	22.4	20.0	18.7	17.9	21.5	23.2	21.8	19.6
15-16	21.3	22.3	22.9	24.7	24.6	25.5	24.9	24.1	23.8	21.1	19.4	18.3	22.7	24.8	23.1	20.3
16-17	22.6	23.8	24.8	25.1	25.0	26.2	25.0	25.6	24.5	22.0	20.9	19.3	23.7	25.5	24.1	21.7
17-18	23.9	24.6	25.4	24.2	23.7	25.2	22.8	23.7	21.7	21.7	20.9	20.0	23.2	23.8	23.3	22.4
18-19	23.9	23.8	24.0	21.3	20.6	21.5	19.1	20.4	18.3	20.3	20.4	19.8	21.1	20.4	21.0	22.0
19-20	22.3	21.5	21.6	18.3	17.5	17.9	16.1	17.3	15.2	18.1	19.0	18.7	18.6	17.2	18.3	20.4
20-21	20.2	19.4	19.6	17.0	15.8	14.9	13.8	15.0	14.0	16.3	17.3	17.6	16.7	14.9	16.7	18.6
21-22	18.3	17.8	17.8	16.1	15.5	13.8	12.0	13.2	13.7	15.1	15.9	16.5	15.5	13.6	15.7	17.1
22-23	17.5	16.9	16.9	15.6	15.2	13.2	12.0	13.0	14.6	14.6	15.7	16.1	15.1	13.4	15.4	16.5
23-24	17.7	16.5	16.2	15.8	15.1	13.3	13.4	13.5	15.9	14.8	15.7	15.7	15.3	13.8	15.7	16.4
MEAN	20.3	20.2	20.1	19.5	19.0	18.6	18.2	18.6	18.1	18.0	17.9	17.8	18.9	18.6	18.9	19.1

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY (GAMMAS) (QUIET DAYS)

TABLE 42 VICTORIA Z = 53,000 GAMMA + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	98	96	93	89	89	90	95	92	87	79	83	74	89	92	87	88
1- 2	98	97	95	90	93	92	98	93	86	81	82	73	90	94	88	88
2- 3	98	97	97	92	95	91	96	93	87	82	83	73	90	94	90	88
3- 4	97	98	97	91	92	89	92	91	86	82	81	72	89	91	89	87
4- 5	97	97	96	91	89	88	89	92	87	82	81	73	88	90	89	87
5- 6	97	97	95	90	88	85	87	90	86	81	80	72	87	88	88	87
6- 7	96	96	95	90	88	85	87	91	86	82	81	72	87	88	88	86
7- 8	96	96	95	90	86	85	87	90	86	80	79	73	87	87	88	86
8- 9	95	95	93	90	86	83	87	90	85	80	79	72	86	87	87	85
9-10	96	94	92	89	86	82	86	87	84	80	78	72	85	85	86	85
10-11	95	94	91	89	87	81	85	87	83	80	78	71	85	85	86	85
11-12	95	93	91	89	85	80	87	88	83	78	78	71	85	85	85	84
12-13	94	93	90	88	88	84	90	90	83	79	78	71	86	88	85	84
13-14	94	92	90	88	89	86	90	90	82	78	77	70	85	89	85	83
14-15	94	94	90	89	87	87	90	91	86	80	78	70	86	89	86	84
15-16	96	98	93	89	83	86	88	88	86	81	80	71	86	86	87	86
16-17	99	99	93	85	80	79	86	85	81	82	80	73	85	83	85	88
17-18	98	97	88	80	74	69	77	76	75	78	77	72	80	74	80	86
18-19	97	93	84	73	68	57	69	70	72	73	75	69	75	66	76	84
19-20	96	90	82	73	67	52	65	67	74	69	73	69	73	63	75	82
20-21	94	89	81	74	70	50	67	73	77	69	73	69	74	65	75	81
21-22	94	87	82	76	74	56	70	74	79	69	74	70	75	69	77	81
22-23	95	89	85	78	79	64	77	79	84	72	78	72	79	75	80	84
23-24	96	92	88	78	83	74	85	84	85	74	78	71	83	82	81	84
MEAN	96	94	91	85	84	78	85	85	83	78	79	71	84	83	84	85

MEAN VALUES OF MAGNETIC ELEMENTS

HORIZONTAL INTENSITY (GAMMAS) (DISTURBED DAYS)

TABLE 43 VICTORIA H = 18,500 GAMMA + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	466	471	479	496	493	536	495	499	473	467	478	488	487	506	479	476
1- 2	472	476	471	493	478	556	497	514	472	471	482	487	489	511	477	479
2- 3	469	475	472	496	477	571	496	510	468	471	478	480	489	514	477	476
3- 4	470	475	470	484	481	504	491	512	467	475	483	481	483	497	474	477
4- 5	467	480	463	477	488	475	492	508	469	475	456	489	478	491	471	473
5- 6	472	481	458	479	486	468	491	499	462	472	459	482	476	486	468	474
6- 7	472	482	463	486	490	458	492	494	466	480	458	476	476	484	474	472
7- 8	469	481	465	478	495	460	494	479	471	477	441	480	474	482	473	468
8- 9	468	477	476	478	501	449	489	468	475	471	422	482	471	477	475	462
9-10	462	481	494	477	496	467	490	475	478	479	410	493	474	482	480	462
10-11	469	472	485	475	498	457	492	482	476	480	466	483	478	482	479	473
11-12	467	476	485	481	493	447	492	462	483	484	453	492	476	474	483	472
12-13	473	481	484	484	498	461	499	443	484	491	457	489	479	475	486	475
13-14	475	482	485	490	500	465	496	456	493	490	468	490	483	479	490	479
14-15	476	472	481	485	501	479	497	450	489	483	479	494	482	482	485	480
15-16	459	481	476	475	491	477	503	452	478	482	479	490	479	481	478	477
16-17	469	479	472	469	482	479	494	451	467	482	474	489	476	477	473	478
17-18	464	462	470	466	480	470	481	455	453	479	462	486	469	472	467	469
18-19	456	449	460	461	477	477	479	439	432	460	458	482	461	468	453	461
19-20	445	450	450	459	457	470	480	427	430	451	457	477	454	459	448	457
20-21	439	445	449	469	463	468	484	453	452	460	459	467	459	467	458	453
21-22	450	448	458	475	470	467	489	453	468	471	459	456	464	470	468	453
22-23	458	452	464	483	485	487	496	514	468	482	462	466	476	496	474	460
23-24	460	453	473	486	486	497	486	482	460	483	457	476	475	488	476	462
MEAN	464	470	471	479	486	481	491	474	468	476	461	482	475	365	474	469

MEAN VALUES OF MAGNETIC ELEMENTS

DECLINATION (MINUTES) (DISTURBED DAYS)

TABLE 44 VICTORIA D = 22 DEG 00.0 MIN EAST + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	19.0	17.5	13.2	13.2	10.6	11.8	15.7	9.6	15.7	15.3	17.3	16.4	14.6	11.9	14.3	17.5
1- 2	20.2	18.1	15.3	14.7	14.2	11.7	16.2	10.2	17.5	16.3	17.1	15.9	15.6	13.1	16.0	17.8
2- 3	20.1	19.7	16.7	15.5	17.3	14.7	17.1	12.3	18.9	15.9	18.2	17.0	17.0	15.4	16.8	18.8
3- 4	20.6	20.1	17.8	16.9	18.0	20.1	17.5	16.6	23.7	20.2	20.5	19.9	19.3	18.1	19.7	20.3
4- 5	21.6	21.1	18.0	17.5	18.8	21.2	18.8	27.3	25.4	19.5	21.5	18.3	20.7	21.5	20.1	20.6
5- 6	20.9	20.6	21.7	20.1	18.5	23.5	20.2	26.8	18.7	19.7	21.4	19.5	21.0	22.3	20.0	20.6
6- 7	21.8	21.9	22.1	22.7	18.4	22.2	20.1	22.3	22.6	20.1	26.4	20.6	21.8	20.7	21.9	22.6
7- 8	23.2	21.9	22.0	21.7	18.7	23.0	20.2	17.5	18.5	17.5	21.4	22.0	20.6	19.8	19.9	22.1
8- 9	23.2	21.3	21.5	25.1	20.4	24.3	19.4	21.2	18.8	20.9	22.6	19.5	21.5	21.3	21.6	21.6
9-10	20.7	21.3	21.4	26.3	19.7	22.4	18.7	21.4	18.9	20.7	18.4	17.9	20.7	20.6	21.9	19.6
10-11	21.6	23.0	23.1	26.0	20.0	21.6	18.7	20.2	18.0	22.3	22.2	19.4	21.3	20.1	22.4	21.6
11-12	23.0	24.3	22.9	25.4	19.4	18.4	20.6	19.1	19.2	20.3	19.9	20.4	21.1	19.3	22.0	21.9
12-13	22.5	22.5	22.7	23.2	20.0	19.1	20.5	20.4	21.3	18.7	18.5	21.8	20.9	20.0	21.5	21.3
13-14	21.8	20.8	22.4	23.7	22.1	21.6	21.1	20.4	21.3	17.8	16.2	17.2	20.5	21.3	21.3	19.0
14-15	20.7	18.3	22.1	24.0	24.1	23.8	23.7	23.2	23.2	15.9	16.6	17.5	21.1	23.7	21.3	18.3
15-16	17.2	17.6	23.1	23.7	26.6	25.6	25.1	24.7	24.9	16.0	17.2	17.4	21.6	25.5	21.9	17.3
16-17	17.1	22.4	21.9	22.6	26.3	26.1	24.5	26.7	23.8	19.2	20.1	17.1	22.3	25.9	21.9	19.2
17-18	19.8	22.5	21.4	20.1	24.1	25.4	21.7	26.1	21.9	20.6	19.9	16.8	21.7	24.3	21.0	19.7
18-19	21.3	21.1	20.5	18.5	21.9	21.2	18.6	24.3	19.2	21.3	19.3	16.5	20.3	21.5	19.9	19.6
19-20	21.0	18.7	18.7	16.4	20.8	20.9	14.1	20.8	15.1	14.8	16.9	16.8	17.9	19.2	16.3	18.3
20-21	20.3	18.7	17.8	15.1	15.0	17.4	11.3	18.3	13.1	13.7	17.2	16.2	16.2	15.5	14.9	18.1
21-22	18.8	17.9	16.3	14.5	12.5	13.6	11.5	22.4	13.3	14.5	15.8	15.0	15.5	15.0	14.6	16.8
22-23	17.9	17.4	15.4	14.8	12.2	12.3	12.6	19.7	13.6	15.8	16.4	15.3	15.3	14.2	14.9	16.8
23-24	18.4	16.7	15.3	15.3	12.2	11.8	13.5	11.6	15.4	16.5	17.5	16.1	15.0	12.3	15.7	17.2
MEAN	20.5	20.2	19.7	19.9	18.8	19.7	18.4	20.1	19.3	18.1	19.1	17.9	19.3	19.3	19.2	19.4

MEAN VALUES OF MAGNETIC ELEMENTS

VERTICAL INTENSITY (GAMMAS) (DISTURBED DAYS)

TABLE 45 VICTORIA Z = 53,000 GAMMA + 1972

U.T.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	SUMMER	EQUINOX	WINTER
0- 1	106	98	101	90	105	150	100	124	98	91	83	77	102	120	95	91
1- 2	108	100	107	98	112	164	103	131	100	97	86	78	107	128	101	93
2- 3	108	101	111	106	110	172	101	143	111	104	107	81	113	132	108	99
3- 4	110	103	119	112	104	143	99	154	140	109	154	85	119	125	120	113
4- 5	110	102	127	116	99	122	104	202	119	100	129	86	118	132	116	107
5- 6	111	100	130	118	98	99	91	195	86	96	112	85	110	121	108	102
6- 7	109	99	123	96	97	81	91	160	96	87	68	87	100	107	101	91
7- 8	105	98	105	93	94	64	85	112	87	72	56	79	88	89	89	85
8- 9	102	93	104	78	83	35	84	94	79	68	19	77	76	74	82	73
9-10	97	84	99	74	76	56	76	50	84	53	-6	60	67	65	78	59
10-11	75	76	94	64	84	25	72	5	77	51	1	43	56	47	72	49
11-12	73	64	78	61	84	34	72	29	74	57	12	44	57	55	68	48
12-13	85	51	70	56	90	41	81	67	68	60	27	47	62	70	64	53
13-14	88	61	78	56	90	35	80	73	79	67	43	52	67	70	70	61
14-15	85	59	86	64	89	41	77	80	80	71	66	58	71	72	75	67
15-16	73	59	90	65	88	46	77	72	81	69	65	64	71	71	76	65
16-17	76	77	85	71	84	53	75	89	84	73	69	67	75	75	78	72
17-18	78	82	84	72	78	62	70	98	81	75	72	65	76	77	78	74
18-19	85	82	83	75	73	59	69	96	77	68	73	64	75	74	76	76
19-20	90	84	82	79	67	62	64	91	82	69	73	66	76	71	78	78
20-21	95	88	83	87	74	72	66	102	92	74	77	66	82	79	84	82
21-22	101	92	90	91	81	80	76	113	96	79	80	68	87	88	89	85
22-23	101	96	94	99	87	92	86	145	99	85	85	77	95	103	94	90
23-24	103	99	101	100	94	111	96	130	98	86	89	79	99	108	96	93
MEAN	95	85	97	84	89	79	83	106	90	78	68	69	85	89	87	79

THREE-HOUR RANGE INDICES

VICTORIA 1972

TABLE 46

JNUARY

DAY	D	H	Z	K
1	1011 1111	0001 0121	0000 0000	1011 1121
2	1022 0231	1032 0231	0001 0010	1032 0231
3	0132 0220	0132 1101	0020 0000	0132 1221
4	2242 0111	3330 0001	0110 0000	3342 0111
5	1122 1110	2121 1000	0001 0000	2122 1110
6	0200 1000	0100 0000	0000 0000	0200 1000
7	0000 1111	0000 0010	0000 0000	0000 1111
8	0000 0100	0001 0010	0000 0000	0001 0110
9	1021 2100	1110 1000	0000 0000	1121 2100
10	2000 0121	2000 0012	0000 0000	2000 0122
11	3323 3221	3333 2211	2212 2100	3333 3221
12	1011 2000	2101 1000	0000 0000	2111 2000
13	1000 1000	1000 0002	0000 0000	1000 1002
14	0000 0000	2100 1000	0000 0000	2100 1000
15	0113 5431	0123 4321	0001 4120	0123 5431
16	1124 4633	2333 3622	0015 3411	2334 4633
17	3421 3332	3421 2332	1300 1220	3421 3332
18	4543 4422	3433 3322	1313 3100	4543 4422
19	2122 3212	2221 2311	0020 1101	2222 3312
20	0323 3321	0332 3111	0021 0100	0333 3321
21	0235 6521	1133 6512	1003 6601	1235 6522
22	2364 3442	3354 2333	1143 2320	3364 3443
23	5654 4212	3534 2112	3333 3201	5654 4212
24	0113 1111	0122 1121	0011 0000	0123 1121
25	0341 1231	0231 2223	0122 1011	0341 2233
26	1545 2221	3434 2221	1225 3210	3545 2221
27	1343 4431	2232 3221	0032 2210	2343 4431
28	2135 3432	1133 1323	0013 1222	2135 3433
29	1511 3421	2411 3322	0200 3210	2511 3422
30	2111 2101	2111 1002	0000 0000	2111 2102
31	0200 2211	1200 1211	0000 1000	1200 2211

FEBRUARY

DAY	D	H	Z	K
1	0023 3211	1012 3111	0000 3000	1023 3211
2	2344 3331	1232 3221	0122 1100	2344 3331
3	1102 3322	1112 2301	0000 2100	1112 3322
4	1243 3100	2222 2001	0112 0000	2243 3101
5	0232 2222	0011 1111	0000 0000	0232 2222
6	1121 0121	0120 0011	0000 0000	1121 0121
7	0020 0222	1020 0113	0000 0001	1020 0223
8	1301 0100	2212 0101	0001 0000	2312 0101
9	0001 0011	0111 0011	0000 0000	0111 0011
10	1132 2232	3321 1122	0010 0011	3332 2232
11	2023 3211	2022 2001	0001 0000	2023 3211
12	0121 0000	2220 0000	0000 0000	2221 0000
13	0105 4432	0212 3234	0004 4222	0215 4434
14	2343 1322	3232 1222	1121 0000	3343 1322
15	1553 3221	2332 2112	0121 0001	2553 3222
16	2332 2110	2221 1101	0000 0000	2332 2111
17	0203 5553	1103 4433	0003 4221	1203 5553
18	2231 0104	2331 0004	0020 0002	2331 0104
19	4210 3311	3010 2210	2000 1100	4210 3311
20	3123 3102	2222 2011	0001 0000	3223 3112
21	1321 1231	2201 1110	0000 1000	2321 1231
22	0031 1201	0021 0001	0000 0000	0031 1201
23	0002 2231	1112 2221	0000 0000	1112 2231
24	1246 6622	1235 5533	0045 5521	1246 6633
25	3332 3311	4431 2212	1210 2210	4432 3312
26	0121 0101	2220 0000	0010 0000	2221 0101
27	0002 1012	0001 1012	0001 0000	0002 1012
28	0332 0000	1221 0000	0010 0000	1332 0000
29	0000 0000	0010 0000	0000 0000	0010 0000

THREE-HOUR RANGE INDICES

VICTORIA 1972

TABLE 47

MARCH

DAY	D	H	Z	K
1	0012 3211	0121 2012	0000 0000	0122 3212
2	0113 3212	1122 1122	0002 2001	1123 3222
3	2243 2412	1231 2311	1043 1300	2243 2412
4	2044 1100	1033 1001	0032 0000	2044 1101
5	0011 0001	0010 0011	0000 0000	0011 0011
6	1433 0015	1322 0015	0103 0003	1433 0015
7	5454 3223	5555 4213	4343 2001	5555 4223
8	0011 2520	2112 1421	0000 0200	2112 2521
9	1223 4321	1322 2211	0003 3000	1323 4321
10	0010 0000	1010 0012	0000 0000	1010 0012
11	2320 0110	2220 0010	1000 0000	2320 0110
12	0000 2211	0000 0011	0000 0000	0000 2211
13	0023 2101	2112 1001	0003 2000	2123 2101
14	1032 0101	1021 1002	0020 0000	1032 1102
15	0003 1103	0002 0013	0001 0001	0003 1113
16	4423 4213	4313 3213	3334 3101	4423 4213
17	2423 3222	3323 2222	1223 1001	3423 3222
18	2441 0200	3242 0000	1030 0000	3442 0200
19	0012 2001	1110 1012	0000 0000	1112 2012
20	0030 1110	1020 0111	0000 0000	1030 1111
21	0002 1211	1101 0103	0000 0001	1102 1213
22	2201 1121	3211 0022	1000 0000	3211 1122
23	0013 3111	2122 1002	0003 2001	2123 3112
24	1434 3320	2333 2211	1333 2100	2434 3321
25	1432 0211	2221 0111	0100 0000	2432 0211
26	1122 1333	1212 1213	0001 0011	1222 1333
27	3443 1332	3332 122[illegible]	1220 0011	3443 1333
28	2332 2100	3322 10[illegible]	1120 0000	3332 2101
29	1144 2323	2224 [illegible]33	1034 4212	2244 2323
30	5444 4231	4342 331	3243 2010	5444 4331
31	1443 1221	133[illegible] 2[illegible]3	0122 0010	1443 2223

APRIL

DAY	D	H	Z	K
1	0052 3222	2141 2123	0032 1002	2152 3223
2	1612 0100	3421 0111	2300 0000	3622 0111
3	0010 0110	1110 0011	0000 0000	1110 0111
4	2322 4431	3332 2332	2110 2120	3332 4432
5	3443 4210	3432 3111	2322 2000	3443 4211
6	0133 2220	1022 3111	0012 2000	1133 3221
7	0233 3211	0132 1102	0022 2000	0233 3212
8	0100 0221	1100 0112	0000 0001	1100 0222
9	2001 1000	3000 0000	1000 0000	3001 1000
10	0131 0012	1121 0012	0010 0000	1131 0012
11	0321 0110	1211 0111	0000 0000	1321 0111
12	0112 2223	1212 2223	0000 0101	1212 2223
13	3223 2221	2221 2122	2100 0000	3223 2222
14	1122 0001	3231 0002	0020 0000	3232 0002
15	0232 1200	1120 1011	0010 1000	1232 1211
16	0211 0002	2221 0002	0000 0001	2221 0002
17	2032 1101	2122 1102	0012 0000	2132 1102
18	3434 3331	3333 3233	3324 2011	3434 3333
19	0024 4110	2223 2011	0002 3000	2224 4111
20	0011 2223	1022 1113	0000 1101	1022 2223
21	4555 4220	4343 2120	2333 3000	4555 4220
22	0000 1231	0000 2233	0000 0010	0000 2233
23	0112 2001	2232 2003	0013 2000	2232 2003
24	0021 1100	0021 0101	0000 0000	0021 1101
25	0001 0100	0011 0002	0000 0000	0011 0102
26	0110 0000	1100 0001	0000 0000	1110 0001
27	0001 1420	1010 2312	0000 0100	1011 2422
28	2243 5420	4333 4431	2134 4320	4343 5431
29	1566 5332	2453 5323	2463 5213	2566 5333
30	4114 3211	4224 2013	3114 0001	4224 3213

THREE-HOUR RANGE INDICES

VICTORIA 1972

TABLE 48

DAY	MAY D	MAY H	MAY Z	MAY K	DAY	JUNE D	JUNE H	JUNE Z	JUNE K
1	3342 3121	4342 3122	2343 200	4342 3122	1	0122 1120	2121 2122	1000 0000	2122 2122
2	2554 2222	2433 1122	0334 011	2554 2222	2	0222 1211	2221 3212	1110 0001	2222 3212
3	1103 2210	2111 2221	0001 000	2113 2221	3	2213 3321	3222 3223	2222 3211	3223 3323
4	1312 2210	2221 1211	1000 100	2322 2211	4	2323 2321	3332 3333	1222 1111	3333 3333
5	0201 1210	2211 0122	0100 000	2211 1222	5	2342 2220	3332 1112	1223 0000	3342 2222
6	1142 3321	3121 2112	1032 100	3142 3322	6	0000 2212	2120 1212	0000 1000	2120 2212
7	1001 0100	2100 0012	0000 000	2101 0112	7	1232 2110	3322 2102	1100 1001	3332 2112
8	0010 0110	0010 2110	0000 000	0010 2110	8	0220 2210	2210 1122	1200 0000	2220 2222
9	0144 3121	2332 1212	0033 100	2344 3222	9	1100 0000	2212 0001	1101 0000	2212 0001
10	1143 1111	3232 2112	0032 1000	3243 2112	10	0330 1100	2211 0100	0000 0000	2331 1100
11	0222 1221	1221 1122	0001 1010	1222 1222	11	1120 1000	3120 0011	1000 0000	3120 1011
12	1333 3110	2332 2101	0130 2000	2333 3111	12	0000 1000	2210 2001	0000 0000	2210 2001
13	1011 0221	3111 1112	2000 0010	3111 1222	13	0000 1111	2211 0123	1100 0001	2211 1123
14	1122 2000	3211 1111	1000 0000	3222 2111	14	1021 2231	2222 1333	1100 0111	2222 2333
15	0010 1174	1122 0165	1100 1044	1122 1175	15	2431 2221	3322 2222	2310 0000	3432 2222
16	4234 2101	6333 2122	4302 1001	6334 2122	16	1134 2111	2223 3223	1011 1011	2234 3223
17	2222 2211	4322 2222	2210 2100	4322 2222	17	1345 5755	3343 4655	2133 4336	3345 5755
18	4344 2000	4432 2012	2213 1000	4444 2012	18	8877 5432	9767 5544	8878 6643	9877 5544
19	0000 0000	1010 0002	0000 0000	1010 0002	19	3474 4110	4453 2212	3453 3100	4474 4212
20	1102 1000	2101 2002	0001 0000	2102 2002	20	3131 2100	4230 2112	3220 1000	4231 2112
21	0000 0101	2110 0112	0000 0000	2110 0112	21	0100 1121	2110 2122	0000 0000	2110 2122
22	0221 0000	2220 0011	1110 0000	2221 0011	22	1234 4112	3132 3223	2233 3001	3234 4223
23	1000 1322	3102 2223	1000 0000	3102 2323	23	2343 3211	4332 2213	2223 2100	4343 3213
24	2310 0110	2211 0110	1100 0000	2311 0110	24	1033 2330	3223 2331	2111 2220	3233 2331
25	0010 0112	1212 0123	0000 0000	1212 0123	25	0022 2311	2011 2222	1000 1100	2022 2322
26	0302 1221	3312 2223	2101 0000	3312 2223	26	0323 2321	2322 1222	0111 2211	2323 2322
27	2000 1232	3100 1323	2100 1112	3100 1333	27	0242 1332	2232 2333	2021 1212	2242 2333
28	1123 3441	3234 3423	2113 1210	3234 3443	28	2244 3220	3333 3222	2243 2110	3344 3222
29	1332 2211	3322 2222	1122 1000	3332 2222	29	2223 2120	4222 2323	2102 0101	4223 2323
30	3412 2221	4322 3343	2200 0120	4422 3343	30	0222 0000	2111 1001	1100 0000	2222 1001
31	1442 2202	3342 2223	1221 0001	3442 2223					

THREE-HOUR RANGE INDICES

VICTORIA 1972

TABLE 49

JULY

DAY	D	H	Z	K
1	0011 2110	1001 2120	0000 0000	1011 2120
2	0111 1221	2211 1233	1100 0111	2211 1233
3	2221 1110	3231 2112	1110 0000	3231 2112
4	1010 0100	3100 2110	0000 0000	3110 2110
5	0010 0010	2100 0121	1000 0000	2110 0121
6	0100 0101	1110 0003	0000 0001	1110 0103
7	1321 2231	3321 1232	2200 0020	3321 2232
8	2553 2100	4322 0121	1232 0000	4553 2121
9	0003 2212	2112 2223	0001 0001	2113 2223
10	2111 2110	3211 1212	2200 1000	3211 2212
11	1132 0121	2122 1112	0000 0001	2132 1122
12	0031 3001	2221 3212	0100 2001	2231 3212
13	0100 1100	1100 1101	0000 0000	1100 1101
14	0121 0000	2110 0011	0100 0000	2121 0011
15	0120 0011	2121 0123	1110 0001	2121 0123
16	2331 1231	2221 1232	1110 001	2331 1232
17	1321 1111	3221 1122	1100 000	3321 1122
18	2222 0200	3211 1112	1001 000	3222 1212
19	0124 1211	1223 1123	0002 000	1224 1223
20	1332 1110	1123 0101	0000 200	1333 1111
21	0200 0010	1110 0111	0000 000	1210 0111
22	0000 0332	2100 2333	0000 001	2100 2333
23	0323 3210	2322 2312	0102 200	2323 3312
24	0002 3143	1001 2334	0000 302	1002 3344
25	2555 3212	3445 4224	3435 322	3555 4224
26	1264 2221	2252 2322	2043 021	2264 2322
27	0552 1110	1432 1212	0331 000	1552 1212
28	0323 1100	1322 2100	0102 000	1323 2100
29	0022 0010	0011 1111	0000 000	0022 1111
30	0000 2111	1002 1232	0000 000	1002 2232
31	0210 0012	2110 0022	0000 000	2210 0022

AUGUST

DAY	D	H	Z	K
1	3421 1100	4422 1112	2220 0000	4422 1112
2	1132 1020	2321 2012	2010 0011	2332 2022
3	0113 2210	1111 1112	0000 0000	1113 2212
4	4874 4459	6786 5359	4776 3249	6886 5459
5	7876 6754	7656 6675	6676 5753	7876 6775
6	5776 3342	6655 3343	5575 3231	6776 3343
7	5543 2411	5432 3323	3522 1101	5543 3423
8	0001 2223	3100 2324	1000 1112	3101 2324
9	4677 5332	6577 3333	4788 5322	6677 5333
10	2144 4223	3234 3333	2124 3322	3244 4333
11	3423 3221	3433 2233	2323 2112	3433 3233
12	1301 1210	3312 1222	2101 0000	3312 1222
13	1321 0101	1201 0222	0000 0000	1321 0222
14	1112 2221	3211 2222	1001 2111	3212 2222
15	2252 1222	3342 2213	1143 0012	3352 2223
16	3332 1200	3221 2112	1220 0000	3332 2212
17	2122 3111	2122 1212	1112 1100	2122 3212
18	0322 3232	2223 3223	1013 1101	2323 3233
19	2341 2321	3332 3332	2110 2210	3342 3332
20	2123 2332	3223 2333	1003 1211	3223 2333
21	2444 2322	3433 2223	1313 1101	3444 2323
22	2353 2121	3232 1111	1043 0000	3353 2121
23	1221 1100	1111 0100	0000 0000	1221 1100
24	0012 0000	0111 0100	0001 0000	0112 0100
25	0032 1112	1112 1113	0010 0002	1132 1113
26	2552 1333	5342 1234	2450 0012	5552 1334
27	3556 4111	4345 3211	2445 4000	4556 4211
28	0102 2321	2211 2222	0002 1010	2212 2322
29	1212 1121	1111 0112	0000 0000	1212 1122
30	1003 2220	2002 1212	1002 0000	2003 2222
31	2431 0111	3231 0111	1010 0000	3431 0111

THREE-HOUR RANGE INDICES

VICTORIA 1972

TABLE 50

SEPTEMBER

DAY	D	H	Z	K
1	0223 0000	2222 0100	0001 0000	2223 0100
2	0032 1111	0011 0102	0000 0000	0032 1112
3	0002 0112	1012 0003	0001 0001	1012 0113
4	0110 0121	1330 0112	0100 0001	1330 0122
5	0000 0111	1110 0112	0000 0000	1110 0112
6	3131 2312	3322 2222	1000 0100	3332 2322
7	1202 3201	1202 2101	0000 1000	1202 3201
8	1113 2211	3232 2112	1003 2100	3233 2212
9	0323 2001	1223 1001	0012 0000	1323 2001
10	2322 1331	1233 2233	0012 1111	2333 2333
11	0346 3210	1224 2211	0034 3000	1346 3211
12	0433 2100	0322 1000	0120 0000	0433 2100
13	0341 4563	1242 5475	0021 5452	1342 5575
14	3961 1221	4952 2222	6950 0210	4962 2222
15	3645 4311	3544 4324	1435 4101	3645 4324
16	2455 0242	2242 1343	1244 0111	2455 1343
17	3454 4323	3342 2214	2244 3101	3454 4324
18	3544 3210	3443 1100	0233 2000	3544 3210
19	2331 1000	1330 0000	0220 0000	2331 1000
20	0103 1000	0101 1001	0001 0000	0103 1001
21	1002 0000	1000 0000	0000 0000	1002 0000
22	0021 1222	0021 0112	0010 0001	0021 1222
23	0002 5332	1112 3222	0002 3111	1112 5332
24	2353 3321	3332 2322	1132 2110	3353 3322
25	1323 1111	1331 0012	0111 0000	1333 1112
26	0323 2210	1222 1111	0001 2000	1323 2211
27	1323 2200	2322 2101	1211 1000	2323 2201
28	0222 2011	2222 2022	0000 0000	2222 2022
29	4344 3332	3343 3232	2243 3112	4344 3332
30	2321 0111	2231 0112	1110 0000	2331 0112

OCTOBER

DAY	D	H	Z	K
1	2120 0112	2210 0112	0000 0001	2220 0112
2	0000 1121	1000 0022	0000 0000	1000 1122
3	1000 0212	1100 0113	0000 0001	1100 0213
4	3234 1100	2133 0001	1032 0000	3234 1101
5	0000 0100	0000 0001	0000 0000	0000 0101
6	0000 0001	1000 0001	0000 0000	1000 0001
7	0001 2112	0002 1124	0000 0001	0002 2124
8	1000 0110	1000 0010	0000 0000	1000 0110
9	0120 1222	0010 0112	0000 0001	0120 1222
10	1004 3221	1112 2111	0002 2000	1114 3221
11	5544 3312	4345 2212	3333 3101	5545 3312
12	0000 4333	1011 3343	0000 3221	1011 4343
13	3424 3212	3323 3112	2213 1001	3424 3212
14	4444 3322	4344 3223	2134 1111	4444 3323
15	0401 2201	0310 1112	0101 0000	0411 2212
16	0433 2210	2322 2110	0123 2100	2433 2210
17	0001 0000	0001 0000	0000 0000	0001 0000
18	0235 2323	0224 1213	0024 0101	0235 2323
19	4576 4320	4464 3222	4463 4100	4576 4322
20	2443 3431	2322 2322	0043 1101	2443 3432
21	0354 3321	1232 2222	0043 2100	1354 3322
22	1134 4322	1133 1122	0023 2010	1134 4322
23	3245 3322	2233 2212	0031 2200	3245 3322
24	3333 3320	2131 2221	1021 0000	3333 3321
25	0034 4110	1022 3000	0012 2000	1034 4110
26	1443 2111	0241 1002	0032 0000	1443 2112
27	0000 1213	1001 1212	0000 0001	1001 1213
28	2243 1101	2254 0001	0134 0000	2254 1101
29	1353 5413	2343 2223	0042 2212	2353 5423
30	1545 5322	2344 4112	1233 5000	2545 5322
31	1000 1574	1010 1564	0000 0342	1010 1574

THREE-HOUR RANGE INDICES

VICTORIA 1972

TABLE 51

DAY	NOVEMBER D	H	Z	K	DAY	DECEMBER D	H	Z	K
1	7788 6243	7977 6244	7887 7133	7888 6244	1	1320 0000	2121 0000	0000 0000	2321 0000
2	5423 3333	5433 3444	3312 2222	5433 3444	2	0031 0111	0131 0111	0010 0000	0131 0111
3	3433 0100	4331 0001	3210 0000	4433 0101	3	1100 1211	1120 0111	0000 0000	1120 1211
4	0001 0201	1101 0111	0000 0000	1101 0211	4	0030 0000	1120 1000	0010 0000	1130 1000
5	0000 0101	1000 0001	0000 0000	1000 0101	5	0000 0000	0000 0001	0000 0000	0000 0001
6	1202 2211	1102 1111	0000 0000	1202 2211	6	0010 0100	1011 0000	0000 0000	1011 0100
7	0235 2210	0123 0010	0004 2000	0235 2210	7	0123 2220	1122 3220	0001 1010	1123 3220
8	2113 3101	2102 1102	0001 0000	2113 3102	8	0222 1211	0112 1212	0000 0100	0222 1212
9	1123 2210	1112 1101	0001 1000	1123 2211	9	0000 0111	0000 0121	0000 0000	0000 0121
10	0212 2100	0110 2000	0000 0000	0212 2100	10	1020 0000	1011 0000	0000 0000	1021 0000
11	1100 3211	2000 2111	0000 1000	2100 3211	11	0001 1000	0000 0001	0000 0000	0001 1001
12	0131 2200	1231 1100	0020 0000	1231 2200	12	0020 1212	1111 2103	0000 0001	1121 2213
13	0020 0100	1120 0000	0000 0000	1120 0100	13	3454 5334	4344 3323	2233 3112	4454 5334
14	0021 1100	0011 1001	0000 0000	0021 1101	14	2322 3220	1221 2211	0001 1100	2322 3221
15	0213 4422	0212 4423	0003 2210	0213 4423	15	1225 5234	0234 4135	0004 4213	1235 5235
16	3443 5322	2443 4323	0353 5211	3443 5323	16	3555 4332	3434 3233	1334 4221	3555 4333
17	1324 3221	1223 2321	0013 2200	1324 3321	17	2145 4311	1134 4211	0023 2100	2145 4311
18	2142 2312	2042 2311	0030 0100	2142 2312	18	1233 2101	1232 2102	0011 1000	1233 2102
19	2254 2101	2232 1111	0032 1000	2254 2111	19	1221 1121	1111 0211	0000 0000	1221 1221
20	4335 5522	3334 3232	1134 5410	4335 5532	20	0212 1001	1102 0000	0001 0000	1212 1001
21	3442 0101	3331 0111	1220 0000	3442 0111	21	0001 2000	0000 2001	0000 0000	0001 2001
22	0002 3432	0002 3422	0001 2200	0002 3432	22	0001 4333	1001 3332	0000 3111	1001 4333
23	1122 4322	2112 3211	0000 3100	2122 4322	23	2343 3332	4332 2332	2131 1220	4343 3332
24	1002 1011	2211 0011	0000 0000	2212 1011	24	4143 1100	4332 1000	2020 0000	4343 1100
25	0003 2222	0112 2112	0000 1100	0113 2222	25	0000 0011	1000 1012	0000 0000	1000 1012
26	3213 3121	3111 2110	2122 1000	3213 3121	26	0022 2000	1001 2100	0000 0000	1022 2100
27	0001 1431	2100 1332	0000 0100	2101 1432	27	0100 0000	0100 0000	0000 0000	0100 0000
28	1321 4321	2302 3311	0100 3100	2322 4321	28	0001 2212	1100 0011	0000 0000	1101 2212
29	2423 1000	1332 1000	0221 0000	2433 1000	29	2333 2333	1332 1323	0020 0101	2333 2333
30	0000 0100	0000 0102	0000 0000	0000 0102	30	3224 3333	3224 2233	0013 0012	3224 3333
					31	1134 3212	2234 2113	0023 1001	2234 3213

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a three-component aeromagnetic survey of british columbia and the adjacent pacific ocean

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DEPARTMENT OF ENERGY, MINES AND RESOURCES

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a three-component aeromagnetic survey of british columbia and the adjacent pacific ocean

W. HANNAFORD and G. V. HAINES

Abstract. The geomagnetic components D, H, Z, and the total intensity F were measured at 4.6 km to 6.2 km altitude along flight lines traversing British Columbia and extending 1,400 km westward over the Pacific. The determination of systematic errors, mainly due to aircraft magnetic fields, is described. The corrected data, reduced to sea level and averaged over five-minute (≃35 km) intervals, are listed. Further smoothing was applied to produce contoured charts of D, H, Z, and the Z anomaly field. Some features of the Z anomaly chart are discussed. One anomaly, prominent over a large area in northeastern British Columbia is fitted by models and compared with Precambrian Shield anomalies of similar scale reported by others. IGRF residuals derived from the five-minute averages are shown as profiles in D, H, Z, and F. The regional field, in the form of a 3rd-degree polynomial, is compared with IGRF.

Résumé. Les composantes géomagnétiques D, H, Z et l'intensité magnétique totale, F, ont été enregistrées à des altitudes de 4.6 à 6.2 kilomètres, le long de lignes de vol parallèles au-dessus de la Colombie-Britannique, jusqu'à 1,400 km à l'ouest, au-dessus du Pacifique. Les auteurs décrivent le procédé de détermination des erreurs systématiques, principalement dues aux champs magnétiques de l'avion. Les données, rectifiées et ajustées au niveau de la mer, sont présentées sous forme de moyennes sur cinq minutes de vol (≃35 km). Un adoucissement a été appliqué afin de dresser des cartes à courbes de niveau de D, H, Z et des anomalies de Z. Quelques particularités de la carte des anomalies de Z sont examinées. Une anomalie proéminente sur une vaste région du nord-est de la Colombie-Britannique est reproduite par modèles et comparée à des anomalies d'échelle similaire, du Bouclier Précambrien, notées par d'autres auteurs. Les données résiduelles, par rapport au Champ Géomagnétique International de Référence (IGRF), obtenues à partir des moyennes sur cinq minutes, sont présentées sous forme de profils graphiques de D, H, Z et F. On compare l'IGRF avec le champ régional, représenté par un polynome du troisième degré.

Introduction

From January to March 1969 the Dominion Observatory (now the Earth Physics Branch) carried out an airborne magnetic survey of British Columbia and an adjacent area of the Pacific Ocean. A map of the survey indicating the actual flight lines is given in Figure 1. The total length of these lines is approximately 76,000 km, covering an area of 3.4 million square kilometres. Across the Cordillera and the continental shelf the nominal separation between flight lines is 20 nautical miles (37 kilometres). Alternate lines are extended westward over the Pacific to distances of 1,300–1,500 km from the coast.

The aircraft, a Douglas DC6-B chartered from Pacific Western Airlines, was generally flown at altitudes between 15,000 and 20,000 feet, (4,600 and 6,200 metres) except during flights No. 25 and No. 29 when altitudes up to 22,200 feet were necessary because of cloud conditions and high mountains.

The aircrew consisted of the aircraft captain and two co-pilots, two navigators, a flight engineer and a steward, all Pacific Western Airlines personnel. Four members of the Earth Physics Branch, Division of Geomagnetism (including the authors) formed the magnetometer crew.

Navigation

The survey lines over land were flown in daylight during periods when good visibility was expected so that the aircraft's position could be determined by map reading. Flights over the Pacific Ocean were conducted after evening twilight and three-star position fixes were obtained every 20 minutes.

The survey area is favoured with good Loran coverage which proved to be a valuable navigation aid, particularly over the ocean. In addition a Canadian Marconi Doppler navigator system provided ground speed and drift information for keeping the aircraft on track and also for interpolating positions and re-plotting the survey lines when the flights were completed.

The aircraft was also fitted with a unit for receiving Omega transmissions. However this unit was seriously deficient inasmuch as it did not include lane counters. Furthermore, reception of the Omega signals from Norway was rather poor in the survey area, and for these reasons the Omega navigation system was rarely used.

The navigator's estimate of the average error in the final determinations of the aircraft's position (at intervals of 20 minutes or less) is one nautical mile over land and two or three nautical miles over the ocean. The aircraft's position between fixes is assumed to lie on a great circle path and is interpolated accordingly.

Instrumentation

The three-component fluxgate magnetometer used in carrying out this survey is essentially a modern version of the Dominion Observatory's original gyro-stabilized airborne magnetometer which has been rigorously described by Serson *et al.* (1957). A description of the present model was presented by Hannaford *et al.* (1967).

Continuous measurements of geomagnetic declination D, horizontal intensity H, and vertical intensity Z were recorded on strip charts in analogue form. Digital samples of D, H, and Z taken at three-second intervals were recorded on magnetic tape and were also fed into an averaging system. One hundred digital samples of each element are thus accumulated over a five-minute interval, whereupon the average value of each set is then displayed on a digital counter and subsequently logged by the magnetometer operator. The three corresponding five-minute averages are assigned to the geographical position at the centre of the

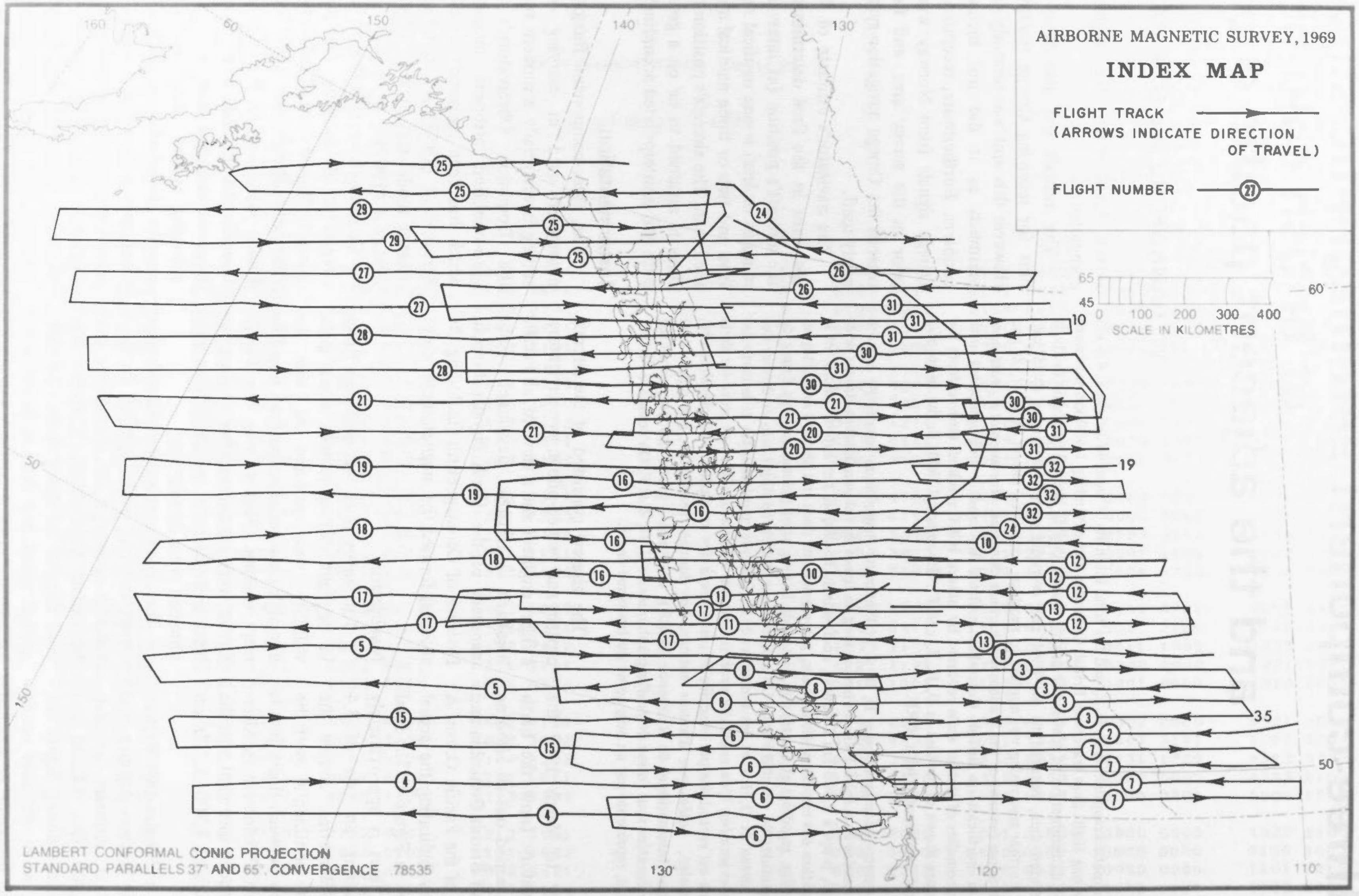

Figure 1. Flight lines of the aeromagnetic survey reported in this paper. The flight number is given on each line as an aid in locating the data listed in the Appendix. The text refers to lines 10, 19 and 35 in connection with Figures 6 and 7. These lines are identified by number at their eastern end.

averaging interval where they represent the geomagnetic field as obtained by smoothing over a distance of approximately 35 km. The data presented in this report are based on these five-minute averages and also on similarly smoothed measurements of total intensity F which were independently obtained with a proton precession magnetometer (PPM). The PPM sensor was located in the end of a stinger which extended 4 metres beyond the rear end of the fuselage.

Corrections to the data

The attitude and orientation of the three-component fluxgate sensors are controlled by mechanical linkages with a gyro-stabilized platform and the entire assembly is mounted at the rear of the main cabin where the magnetic field of the aircraft is relatively small. However at this location the undesired fields from magnetic materials and electrical currents may still be several hundred gammas in magnitude. To compensate for this contribution from artificial sources, appropriate corrections are applied to the magnetic measurements and the ultimate accuracy of the geomagnetic data depends largely on the accuracy with which these corrections can be determined.

The corrections for aircraft magnetism are derived from information which is obtained in two ways.

(a) The aircraft is flown directly over a magnetic observatory or other suitable checkpoint, making at least two passes on each of four different headings (approximately 90° apart). The airborne measurements of D, H, and Z are adjusted for altitude and compared with the corresponding values on the ground. This procedure is called a "swing".

(b) The entire collection of survey data is analyzed for systematic errors which are dependent on aircraft heading.

The swing procedure (a) by itself will yield sufficient information to obtain an estimate of the aircraft's magnetic field and also of constant errors which can be attributed to the instrumental system. Four swings were conducted during the course of the survey and the observed discrepancies of D, H, and Z, due mainly to the field of the aircraft, were resolved into three magnetic vectors, P along the forward axis of the aircraft, Q along the transverse axis (positive toward starboard) and R downward. In general the aircraft's field may be a combination of permanent and induced magnetization. However, a solution using the swing discrepancies to determine P, Q, and R in terms of both permanent and induced parts indicated that induced magnetization was not present in sufficient strength to be measured, whereas the field intensity at the fluxgate sensors due to permanent magnetization was approximately 466 gammas.

The four swings provided 34 determinations of P, Q, and R. The resulting mean values and standard errors in gammas were as follows.

$$\bar{P} = +85 \pm 13$$
$$\bar{Q} = +159 \pm 13$$
$$\bar{R} = -429 \pm 32$$

Accordingly, the horizontal component of the aircraft's field, $(P^2 + Q^2)^{1/2}$, is 180 gammas, whereas the horizontal intensity H was 11,000 gammas or greater during the swings and throughout the survey area. Hence the error in D caused by the aircraft's field is less than 1°, and its radian measure can therefore be considered equal to the tangent. It follows then that the corresponding correction, δD, is given in radians by the following equation

$$\delta D = -d - (P \sin \psi m + Q \cos \psi m)/H \quad \ldots 1$$

where ψm signifies magnetic heading and d is a constant to absorb all errors due to instrumental misalignment. The value of d deduced from the swings was -2.42 ±0.05 degrees. The H correction, identified as δH, is the vector sum of $-P$ and $-Q$, plus a constant term h (which was found equal to zero). Hence

$$\delta H = -h - P \cos \psi m + Q \sin \psi m \quad \ldots\ldots 2$$

The vertical component R, of the aircraft's permanent field is independent of heading and presumably constant, at least through the duration of a swing. Allowing for the vertical gradient, the observed difference between a measurement of Z in the aircraft and that taken on the ground probably includes a significant instrumental error in addition to R. The two quantities cannot be determined separately; however there is no need to do so. A single constant term is used to compensate for both sources of error, but in practice this quantity is considered to consist entirely of R. Therefore the Z correction, δZ, is simply

$$\delta Z = -R \quad \ldots\ldots 3$$

Of the corrections described above, δD and δH can be improved by analyzing the corrected D and H observations for residual errors that are systematically dependent on the aircraft's heading. If the aircraft completes one flight line, then changes heading by 180° and completes an adjacent line, an error in the estimate of δH would result in consistently high values of H associated with one of these lines, and consistently low values of H associated with the other. Then if a smooth and ideally fitted reference field is subtracted from the measured H along each of these two flight lines, the mean residual value for one line will be positive by an amount equal to the error in the estimated strength of the aircraft's field in the direction of H, and the mean residual value for the other line will be negative by an equal amount. By similar reasoning, a poor estimate of the aircraft field in the magnetic east-west direction will yield D residuals which are positively or negatively biased, depending on the direction in which the line was flown.

In this analysis the D and H residuals were obtained by subtracting the International Geomagnetic Reference Field (IGRF, see references IAGA 1969 and IAGA 1971) from the corresponding swing-corrected five-minute averages. However, the IGRF does not fit the observed geomagnetic field well enough for the test to be applied exactly as described above. For example, over most of the area near the southern edge of the survey, the average level of the actual geomagnetic H component is approximately 100 gammas higher than IGRF (see Figure 12). This amount of offset in the residual H values is somewhat greater than that due to heading dependent errors, but assuming that the residuals along two adjacent lines are equally offset by the misfit, the heading-dependent error can be estimated by comparing their mean values. If the lines were flown in opposite directions the error will increase one mean, and reduce the other by an equal amount. Thus the difference between the two means is twice the difference between the actual component of the aircraft field parallel to H and the value of that component as deduced from the swings.

By a similar comparison of the means of D residuals along adjacent flight lines, the error in the swing-derived value of the aircraft field component perpendicular to H (in the horizontal plane) can be estimated. Then the two orthogonal error vectors can be resolved in the direction of the aircraft's forward and transverse axes to yield an estimate of the error in the assumed values of P and Q.

This method was applied to the D and H residuals along 66 flight lines which were selected in suitable pairs. The errors thus indicated were processed by least-squares to derive an improved estimate of the aircraft's horizontal field, namely $P = 100\gamma$ and $Q = 119\gamma$. Using these values in Equation 2, the rms difference between the calculated correction δH and the residual-derived estimates is 41γ, whereas δH calculations according to the swing-derived P and Q differed from the swing observations by 67γ rms. The improved estimates of P and Q were adopted in arriving at the five-minute averages of D and H listed in the Appendix to this report and presented graphically in the various figures.

Approximately two thirds of the Z values reported herewith were derived from the proton magnetometer measurements of Total Intensity F, combined with corrected values of H from the fluxgate magnetometer, using the relationship $Z^2 = F^2 - H^2$. The rms difference between these Z values and the corrected fluxgate Z is 46γ, or the equivalent of 11 per cent change in the vertical component of the aircraft's field at the fluxgates. Since the proton sensor is located in a tail stinger where the aircraft's magnetic field was found to be much smaller ($16 \pm 9\gamma$), and the PPM is free from drift, the Z values derived from it are undoubtedly more accurate. Unfortunately the proton magnetometer did not function continously through the survey and for the time intervals during which it was out of order the values of Z are derived from the fluxgate magnetometer.

In addition the Z and H data have been adjusted to values at sea level. For this purpose the observed components were assumed to diminish as the inverse cube of the distance from the earth's centre. To the level of the highest altitudes flown, this gradient is adequately approximated as −0.047 per cent of the geomagnetic component per kilometre of altitude. This simple reduction to sea level was adopted because the convenience in applying or removing it outweighs the uncertain error in ascribing a geocentric dipole gradient to the non-dipole part of the field which, at a maximum, may be 6 per cent of that observed at flight altitude.

The overall accuracy of the survey data was tested by finding the points where two flight lines intersect and then comparing the two values observed for each geomagnetic component. Both half-minute averages and five-minute averages centred on the points of intersection were compared. The discrepancies (or differences, ignoring sign) are summarized in Table I. Since each discrepancy combines the errors from both intersecting lines, the rms discrepancy divided by $\sqrt{2}$ (given in Table I) would be a good estimate of the standard error of the data if there was a large number of intersections and they were randomly distributed. However there was at most 18 intersections which provided valid comparisons and this small sampling was not random. Therefore Table I is presented merely as a rough indication of the quality of the data. The figures reflect the combined effect of all the sources of error, i.e. magnetometer and platform inaccuracy, uncertainties in the aircraft field, navigation errors and temporal geomagnetic variations. The measurement of D is subject to further inaccuracy because of more complex instrumentation, and also because of the error in astronomical bearings observed by sextant and in calculations of azimuth using geographical positions which are themselves subject to error.

Consideration was given to the possibility of reducing the errors due to diurnal variation and geomagnetic disturbances. Whitham and Niblett (1961) have made estimates of this type of error and the improvement that may be achieved by applying corrections based on temporal variations monitored at ground stations within the area of this survey. Their investigations showed that between two stations the rms difference in the time-variant part of total intensity increased with distance, at least up to 100 miles where it became as large as the time-variant part itself. Thus it would appear that no improvement of the data could be achieved by applying corrections based on the variations recorded at a magnetic observatory located 100 miles or more from the points of observation. This conclusion is supported by Morley (1953) who found that errors resulting

Table I. Statistics of Discrepancies Between Averages Centred on Line Intersections

Component	half-minute averages			five-minute averages		
	no.	mean	rms/$\sqrt{2}$	no.	mean	rms/$\sqrt{2}$
H	17	78	65	12	61	59
Z	17	40	41	14	59	54
F	17	36	35	17	53	47
D	18	43	44	13	39	43

no. = number of intersections involved.

mean and rms/$\sqrt{2}$ values are in gammas for H, Z, and F; in degrees for D.

from temporal variations at one station could not be significantly reduced by corrections derived from the variations observed either 87 miles away at roughly the same latitude or 130 miles away on the same longitude. A similar result was obtained in using observatory magnetograms to derive time-varying corrections to the observations made at 70 intersections that occurred during a three-component airborne survey of northern Europe (Hannaford and Haines, 1969). The rms discrepancy for the corrected data was virtually the same as that for the uncorrected data, in all three components. In the latter case the greatest distance to the nearest magnetic observatory was 320 km (190 miles) compared with approximately 1,600 km in the case of this survey. In view of the wide-ranging distances involved it is extremely doubtful that the accuracy of the data from this survey could be improved by adjustment according to the information available from ground stations, and it is indeed quite possible that the errors might be thus increased. Consequently no attempt was made to correct the data for diurnal variation or geomagnetic disturbances.

Survey results

The five-minute averages of the geomagnetic elements and their corresponding geographical positions are listed in the Appendix.

The same values of D, H, and Z were used as computer input data to produce a contoured map for each of the three components. The General Purpose Contouring Program (GPCP) is a CALCOMP computer software package developed and marketed by California Computer Products, Inc.

In determining the configuration and smoothness of the contours this program subjects the imput data to a degree of smoothing which depends on two parameters specified by the user. The smoothing parameters chosen in this case produced satisfactory results over the larger part of the survey area where the flight lines were spaced 20 nautical miles apart. However, over the Pacific Ocean, where every alternate survey line extends beyond the continental shelf and the data density is therefore reduced by a factor of one-half, the same degree of smoothing yielded contours with undulations of short wavelength and curvatures which suggested more detail than was justified by the accuracy and distribution of the source data. These features were smoothed out by hand while the original contours over the area of higher density were unaltered. The resulting maps of D, H, and Z are shown in Figures 2, 3 and 4. Figure 5 is a contoured map of anomalies in the vertical component Z, derived by subtracting IGRF values of Z from the corresponding five-minute averages. The differences (Z residuals) were then put into the Calcomp GPCP contouring program with the same values of smoothing parameters as were used for D, H, and Z.

To indicate the amount of smoothing applied to the data in arriving at the four contoured maps presented here, in Figure 6 the profiles of instantaneous Z residuals along two survey lines are shown for comparison with (a) the five-minute averages and (b) the contour map cross-sections along the same two lines. Obviously there is considerable relief due to anomalies less than 40 km in width and ranging up to 300 gammas in amplitude along most of the unsmoothed profiles, and this relief is severely reduced or completely removed by the five-minute averaging. The additional low-pass filtering introduced by the contouring program extends with diminishing effect up to wavelengths of 80 to 100 km, depending also on the extent of the anomaly in the direction perpendicular to the profile.

The unsmoothed profiles are characterized over the Pacific (left side of Figure 6) by a continuous sequence of positive and negative anomalies, each 10 to 40 km in width. In a previously published, lightly-smoothed version of the Z anomaly map (Haines *et al.*, 1971) these anomalies were shown to form a striped pattern of magnetic lineations with a north-south trend similar to those revealed by earlier surveys of the northeast Pacific (Raff and Mason, 1961; Pitman and Hayes, 1968). They are readily explained by the hypothesis of seafloor spreading proposed by Vine and Matthews (1963). As usual, the lineations were somewhat imperfect because of factors which tend to obscure and distort them. One of these factors is the irregular pattern of background anomalies which emerges clearly in Figure 5, where the heavier smoothing has removed all evidence of the lineations. The remaining pattern is characterized mainly by a scattering of roughly oval anomalies, both positive and negative. They may be caused by a distribution of serpentinized peridotite intrusions in the oceanic crust. Serpentinites found among the rocks dredged from the sides of deep scarps near the mid-Atlantic ridge have an average natural remanent magnetization (NRM) of 23 x 10^{-4} emu cm^{-3}; quite significant in comparison with the NRM ($\simeq$50 x 10^{-4} emu cm^{-3}) of submarine lavas forming the thin upper part of oceanic crustal layer 2, which is the main source of magnetic lineations, and considerably greater than the NRM ($\simeq$0.3 x 10^{-4} emu cm^{-3}) of the metabasalts and metagabbros which form the underlying and somewhat thicker layer 3. (See, for example, Aumento, 1972, on the composition and structure of oceanic lithosphere, and Irving *et al.*, 1970, on the magnetic properties of dredged samples.)

Over the Pacific area of the present Z anomaly map, the only prominent trend appears as a negative trough running east-west in the vicinity of latitudes 47°N and 48°N, west of longitude 129°W. The axis of this trough coincides closely with the Sedna fracture zone as proposed and located by Atwater and Menard (1970). However there is no similar indication of possible fracture zones farther north in the Gulf of Alaska, although Pitman and Hayes (1968), and Atwater and Menard (1970) have used offsets in the magnetic lineations to show that at least two such fracture zones probably exist. Moreover it is quite evident that the smoothed Z anomaly field is somewhat flatter in the northern part of the Gulf of Alaska than it is in the southern part below latitude 55°N.

The anomaly pattern over the continental area is basically unchanged by the smoothing which was applied. The

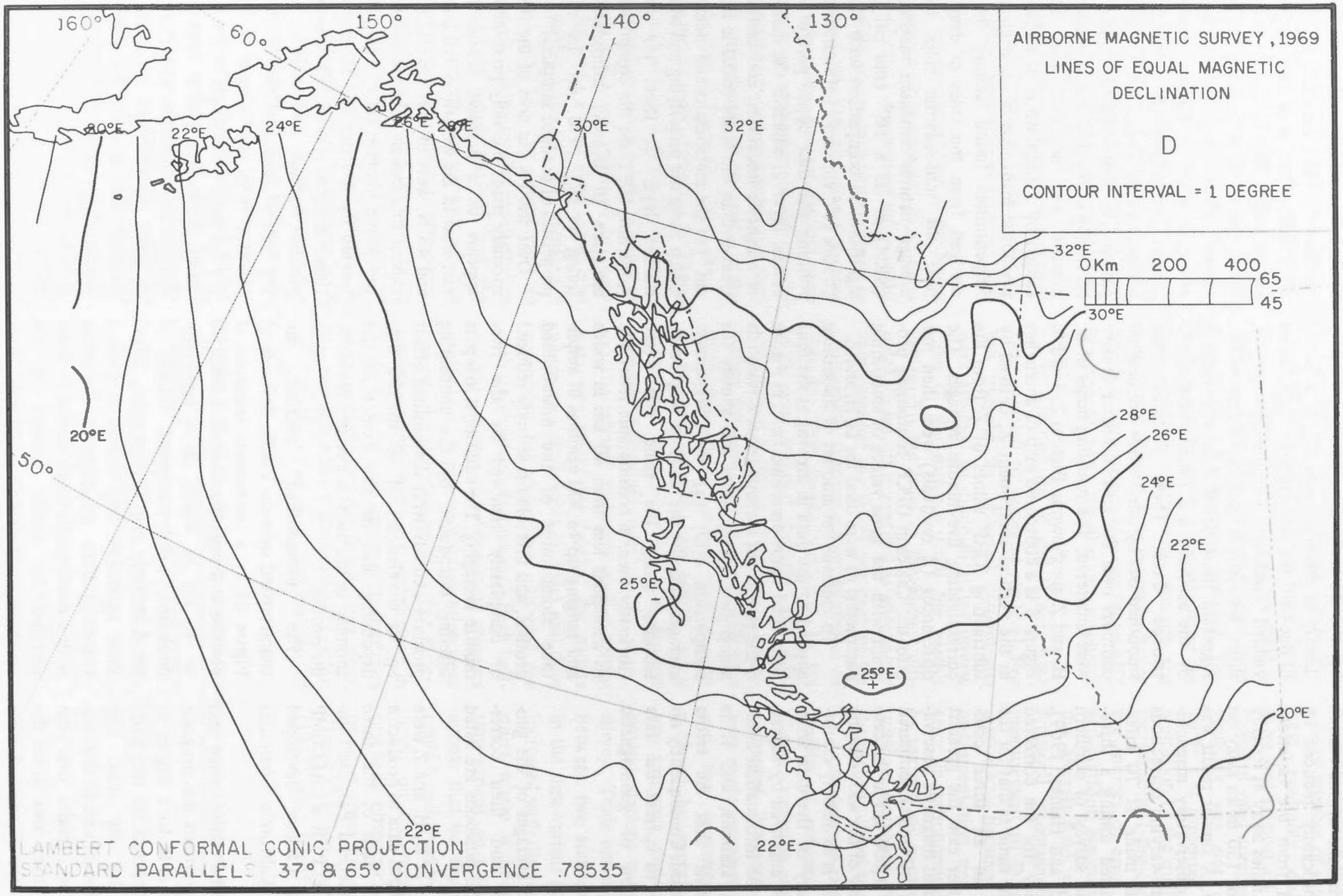

Figure 2. A contour chart of magnetic Declination.

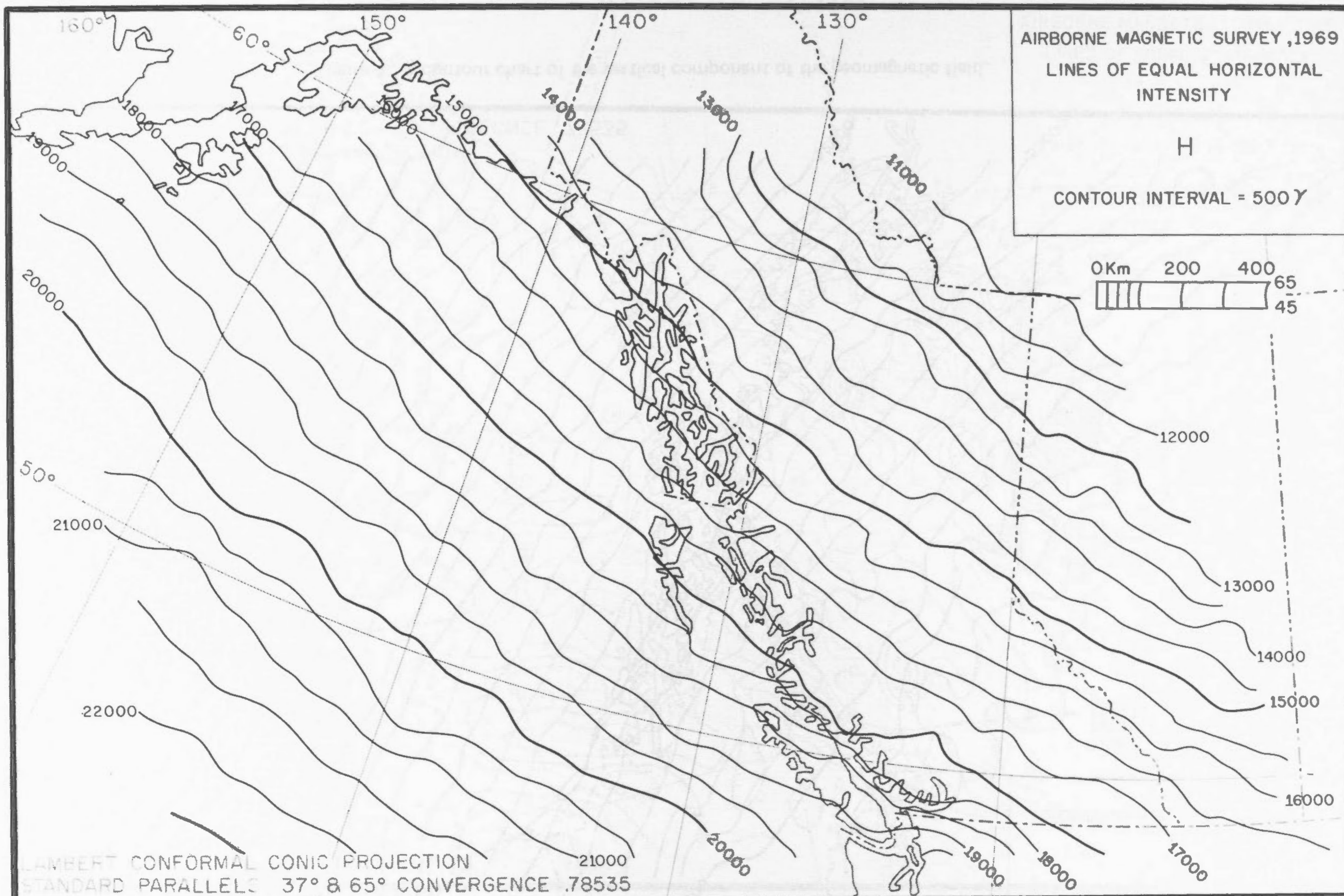

Figure 3. A contour chart of the horizontal component of the geomagnetic field.

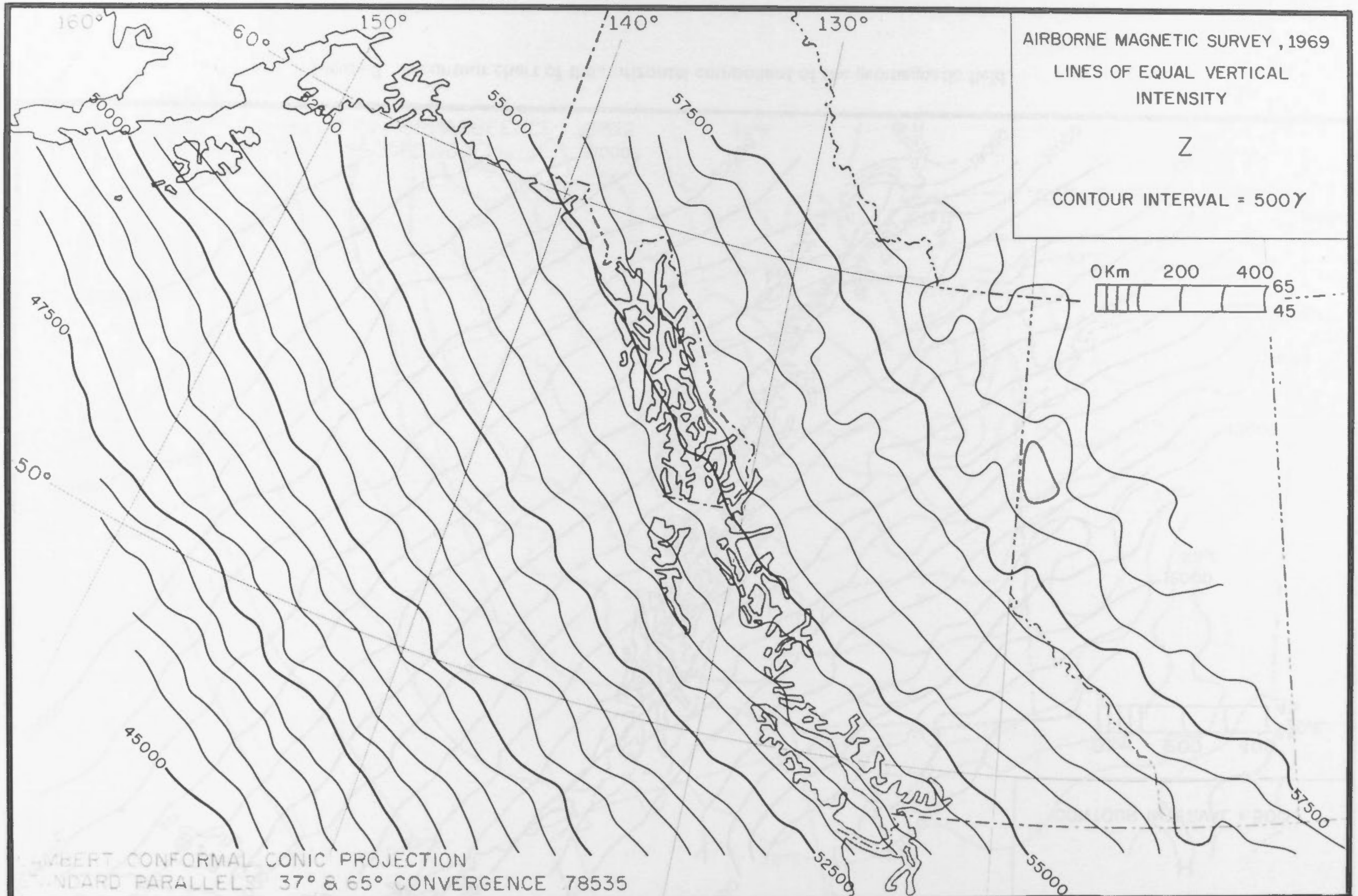

Figure 4. A contour chart of the vertical component of the geomagnetic field.

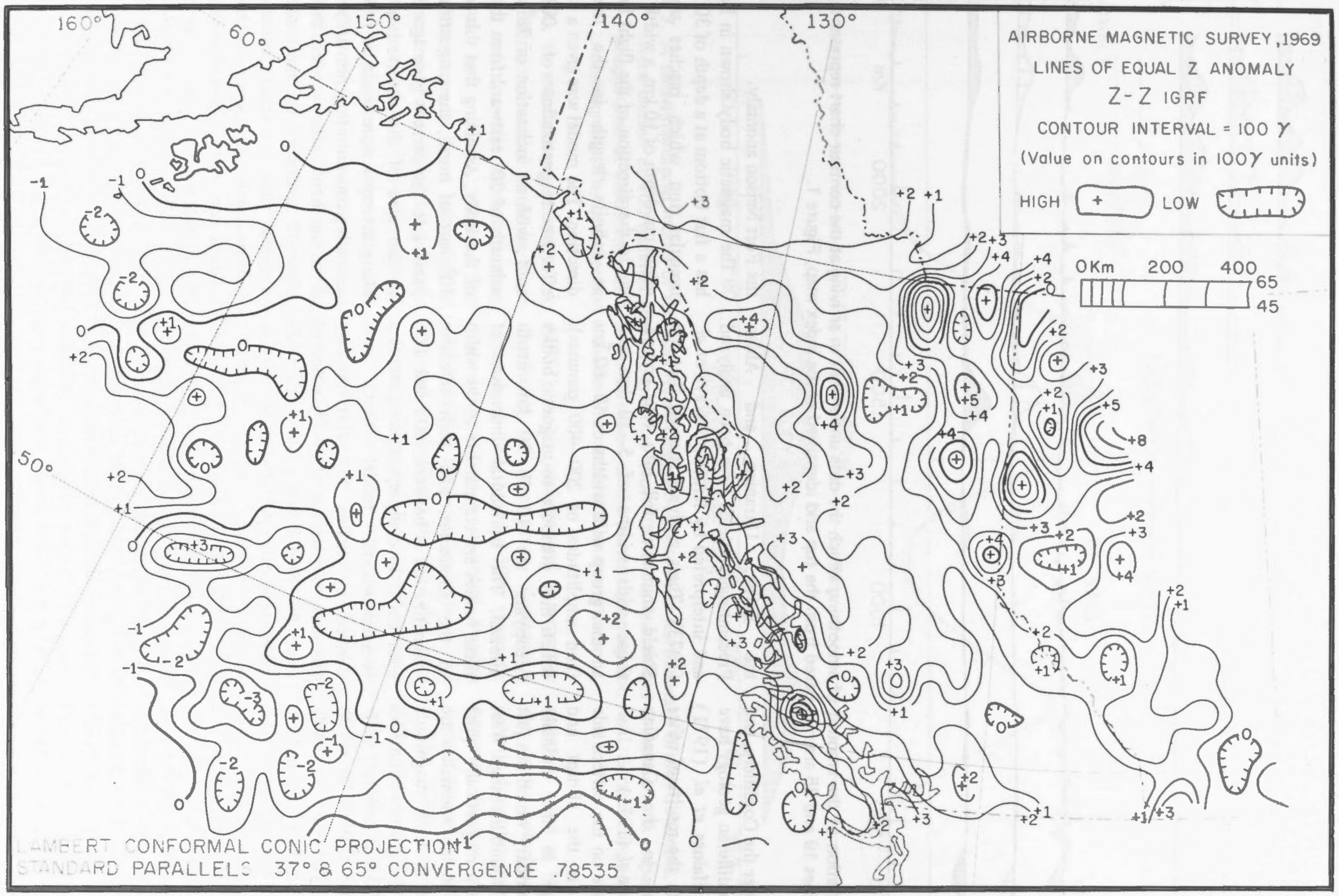

Figure 5. A contour chart giving a highly-smoothed indication of the IGRF residual anomalies in the vertical component of the geomagnetic field.

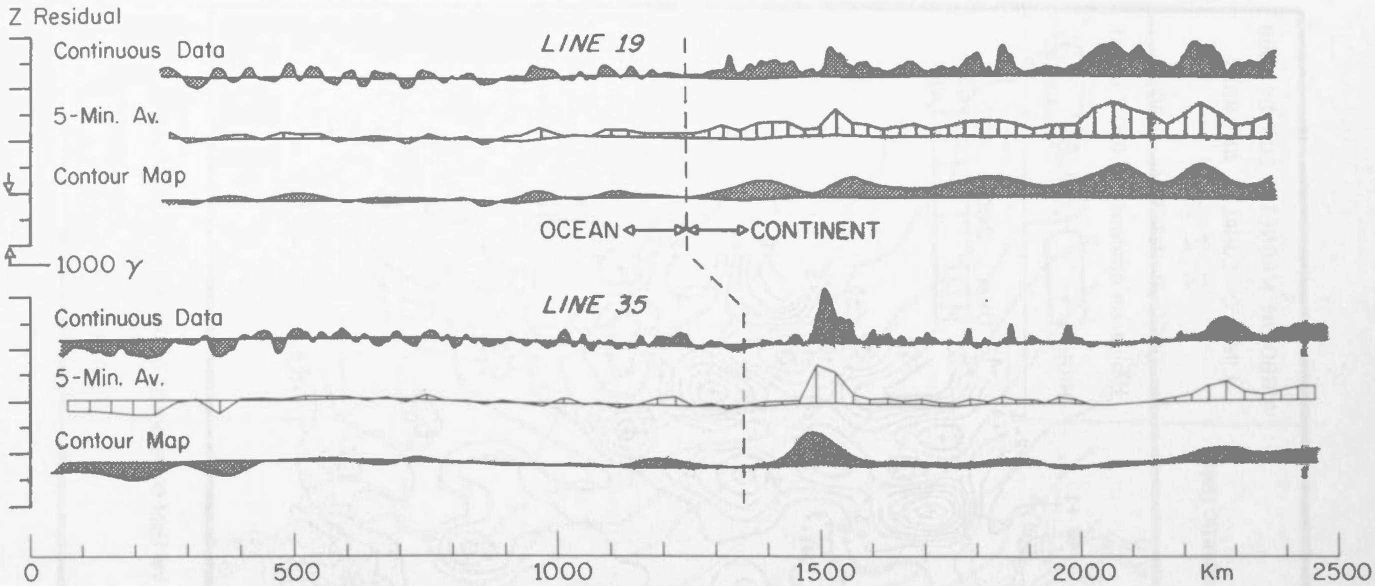

Figure 6. An illustration of the amount of smoothing which the data underwent in arriving at the contour chart representations. Survey lines 19 and 35 are numbered from the top and identified in the index map, Figure 1.

magnetic features over the Cordillera, and their relation to Cordilleran geology have been discussed by Haines *et al.* (1971) and assimilated with the results of other geophysical studies in the Canadian Cordillera by Berry *et al.* (1971).

An obvious feature on the eastern side of the Cordillera is the abrupt and pronounced change in the anomaly pattern across a boundary which lies just west of the Rocky Mountains range. West of this boundary is a magnetically quiet zone and east of it the anomalies are exceptionally large in both magnitude and breadth. Here, the positive anomalies rise to peaks of 500-800 gammas, quite high considering the altitude at which they were observed. The peaks are closely clustered and merge at their bases to form elongated, magnetically high ridges with a general northerly or northeasterly trend extending to the northeast corner and eastern edge of the survey area where the central plains comprise 2 to 3 km of sediments overlying the Precambrian basement rock. It seems most probable that the sources of the large, broad anomalies lie deep within the buried Precambrian Shield, and that this Shield extends at depth to the boundary where the magnetically quiet zone begins.

The magnetic anomaly patterns over the Baltic, Ukranian and Aldan Precambrian Shields have been analyzed and interpreted by Krutikhovskaya *et al.* (1973). Their analyses showed that the Shield anomalies fell into two groups, those with widths of 5–10 km and another group with widths of 40–80 km (and amplitudes of 200–400 gammas), which they attribute to magnetic bodies occupying the 10 to 30 km depth interval. The horizontal dimensions of these bodies are comparable to the width of the anomalies, and their effective magnetization is between .002 and .005 emu cm^{-3}. In comparison, we present a two-dimensional model which was derived by fitting the corresponding anomaly to a section of profile observed over the Shield zone, along the 420 kilometres at the east end of line 10 (see index map, Figure 1). It begins at (126°40′W, 58°57′N) above the Rocky Mountains in northeastern British Columbia, and runs eastward across the foothills and onto the plain, ending at (118°48′W, 59°28′N) in the northwest corner of Alberta. The town of Fort Nelson, B.C. is 46 km south of the profile and within the 100 km x 200 km area covered by a great magnetic high which rises to 700 gammas above the average field in the surrounding region. We call it the Fort Nelson anomaly.

The magnetic body shown in Figure 7 has a flat bottom at a depth of 30 km, an irregular top which reaches up to a minimum depth of 10 km, a width of 310 km in the direction of the flight line, and an infinite length in the transverse direction. The model was given a uniform effective magnetization of .006 emu cm^{-3}, with an inclination of 78° and an azimuth of 20° eastward from the strike of the body. Assuming that this strike is 10° east of north, the magnetization is parallel to the present geomagnetic field in the area of the observed anomaly. Many attempts were made at fitting the anomaly, concentrating primarily on the Z component. The model shown in Figure 7 is one of the more successful attempts, but an equally good fit is obtained with shallower models if the body is very slightly altered in shape and the magnetization is reduced by a small fraction. The shallowest plausible model is that where the uppermost surface of the body coincides with the top of the Precambrian. In this case the minimum depth is 3 km and the effective magnetization becomes .005 emu cm^{-3}. Obviously the shape of other two-dimensional bodies with an irregular bottom surface could be made to

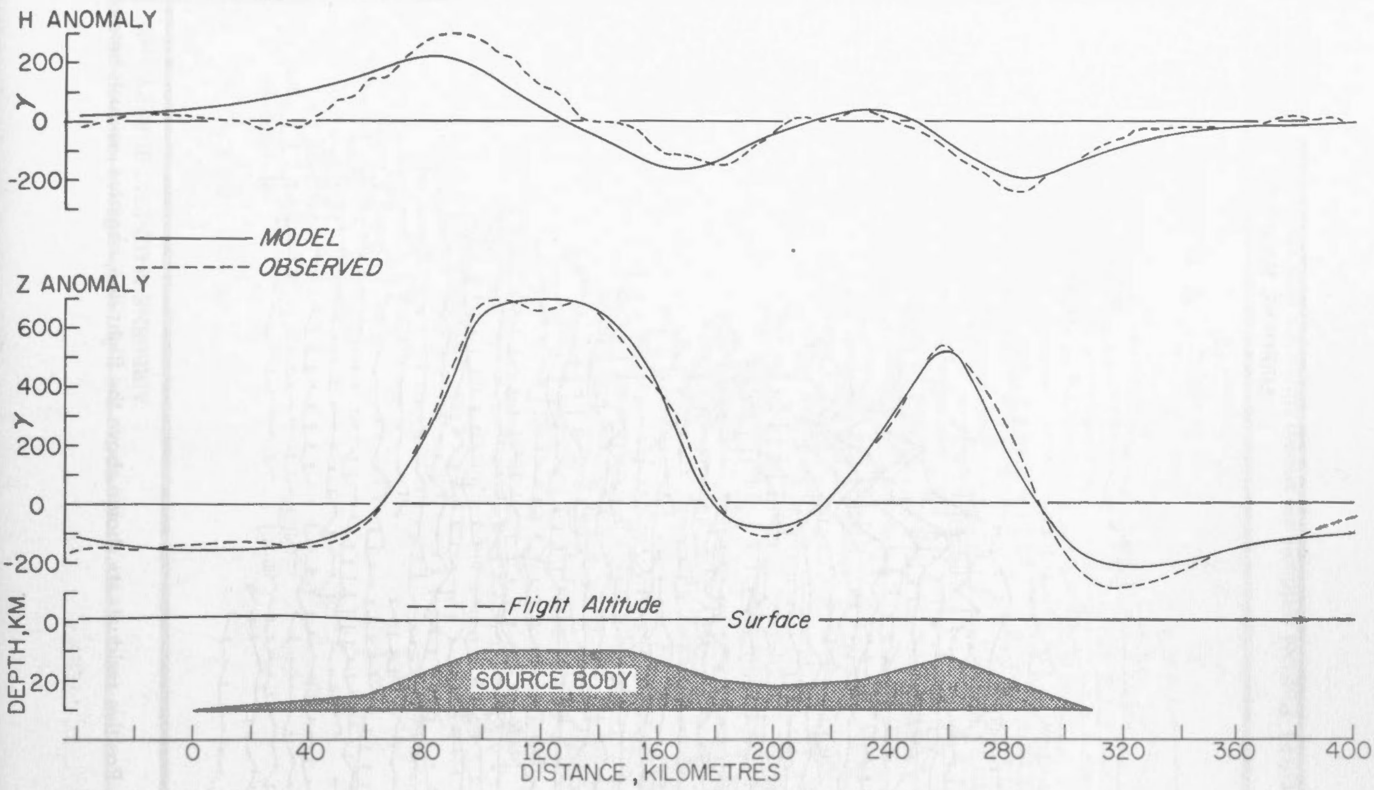

Figure 7. A two-dimensional model of the Fort Nelson magnetic anomaly in northeastern British Columbia. Zero-intensity levels were chosen at 100 gammas and 215 gammas above IGRF for the H and Z components respectively. The body is magnetized at 0.006 emu cm^{-3} in the direction of the present geomagnetic field. Surrounding rock is assumed to be non-magnetic. The body section is shown with no vertical exaggeration.

generate a satisfactory anomaly. A three-dimensional model would be more realistic, and since the anomaly is then generated by a finite volume, the magnetization must be at least slightly greater and the body, if anything, deeper in comparison with the two-dimensional models. Alternatively, removing the constraint of uniform magnetization would of course allow a countless number of additional possibilities. However, without rigorously exploring the more complex models it is sufficiently evident that if the total magnetization of the hypothetical body is to be kept below an exceptionally high level for that of known Precambrian platform rocks, the resulting model must be extraordinarily thick and massive, extending down to remarkable depths of 20 to 30 km, perhaps even deeper if the Curie point depth has not already been reached. In many respects the situation here is quite similar to that described by Riddihough (1972) in his analysis and interpretive discussion of the great Kopparberg anomaly, a very broad +500γ magnetic high centred over west-central Sweden and straddling the boundary between the exposed Baltic Shield and the Caledonian orogen. In this work Riddihough presents four models with lens-shaped cross-sections. Three of these are uniformly magnetized at .0040, .0032 and .003 emu cm^{-3}. The first extends from 2.5 to 17.5 km in depth, while the two weaker models reach from ground level to 22.5 km depth at their thickest point. In comparison the Fort Nelson anomaly is 200γ greater in amplitude and the source body must on the average be about 60 per cent greater in bulk magnetization or thickness, or a compromised combination of both.

Apparently anomalies of this type are not uncommon in Shield areas. If the real source of the Fort Nelson anomaly is as deep as the model in Figure 7, the question arises as to whether the top of the body coincides with the Conrad seismic discontinuity. To our knowledge, however, there is yet no evidence of the Conrad discontinuity in that area.

The IGRF was subtracted from the five-minute averages to obtain the residual values of D, H, Z, and F that are shown as profiles in Figures 8 to 11. In each of these profile charts it is evident that the residuals are predominantly positive over a part of the survey area and predominantly negative over another part. For example, the Z and F residuals exhibit a positive bias in the northeast and a negative bias in the southwest. In these same areas the H residuals have the opposite bias. The effect occurs because the IGRF, being an eighth-order series of spherical harmonics, is incapable of representing wavelengths shorter than 5,000 km. In comparison, the longest survey lines are only half as long as this low-wavelength cutoff. Thus the consis-

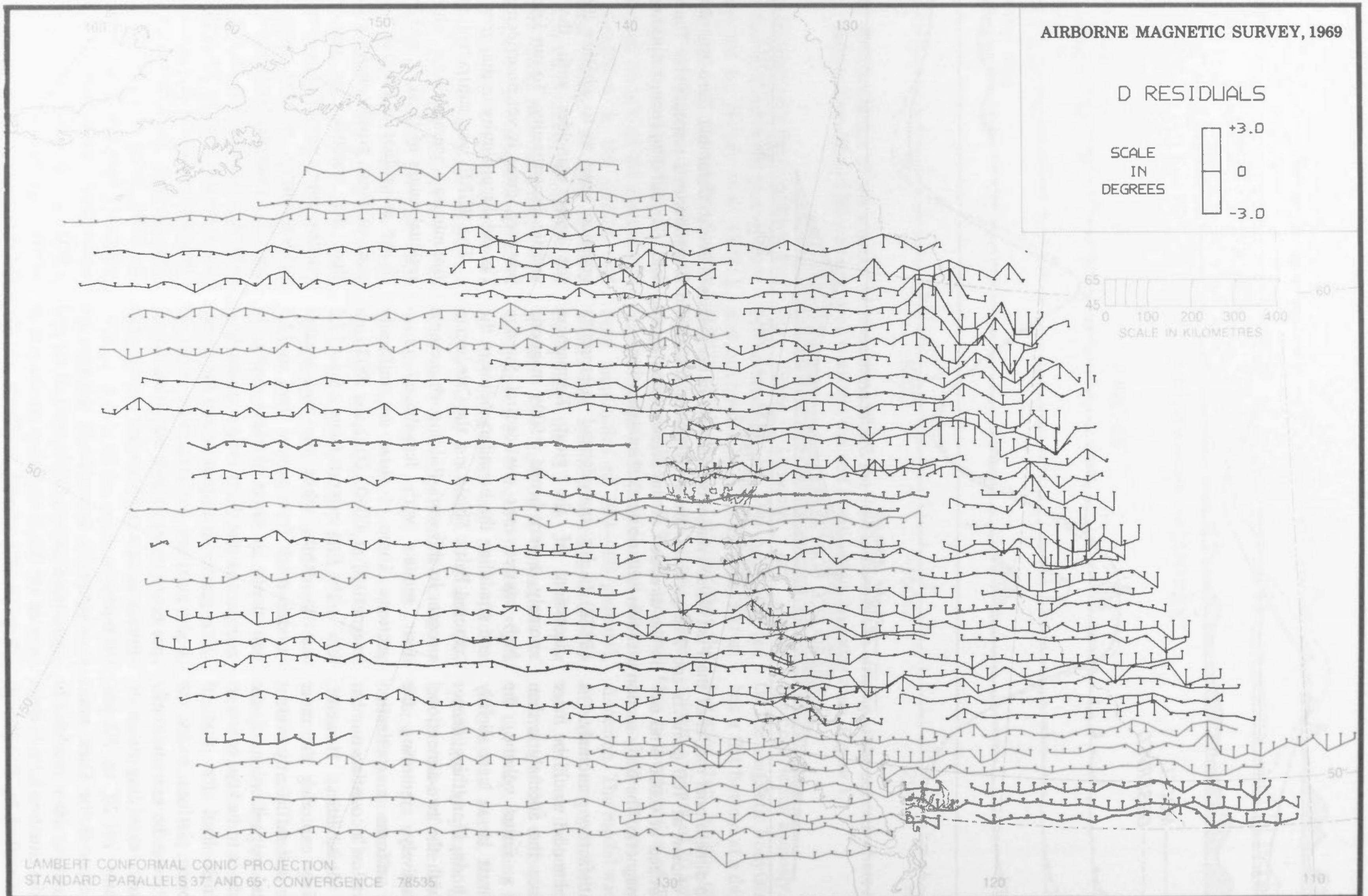

Figure 8. Profiles of the five-minute averaged Declination residuals (D minus IGRF). Positive residuals are shown above the flight line, negative residuals below.

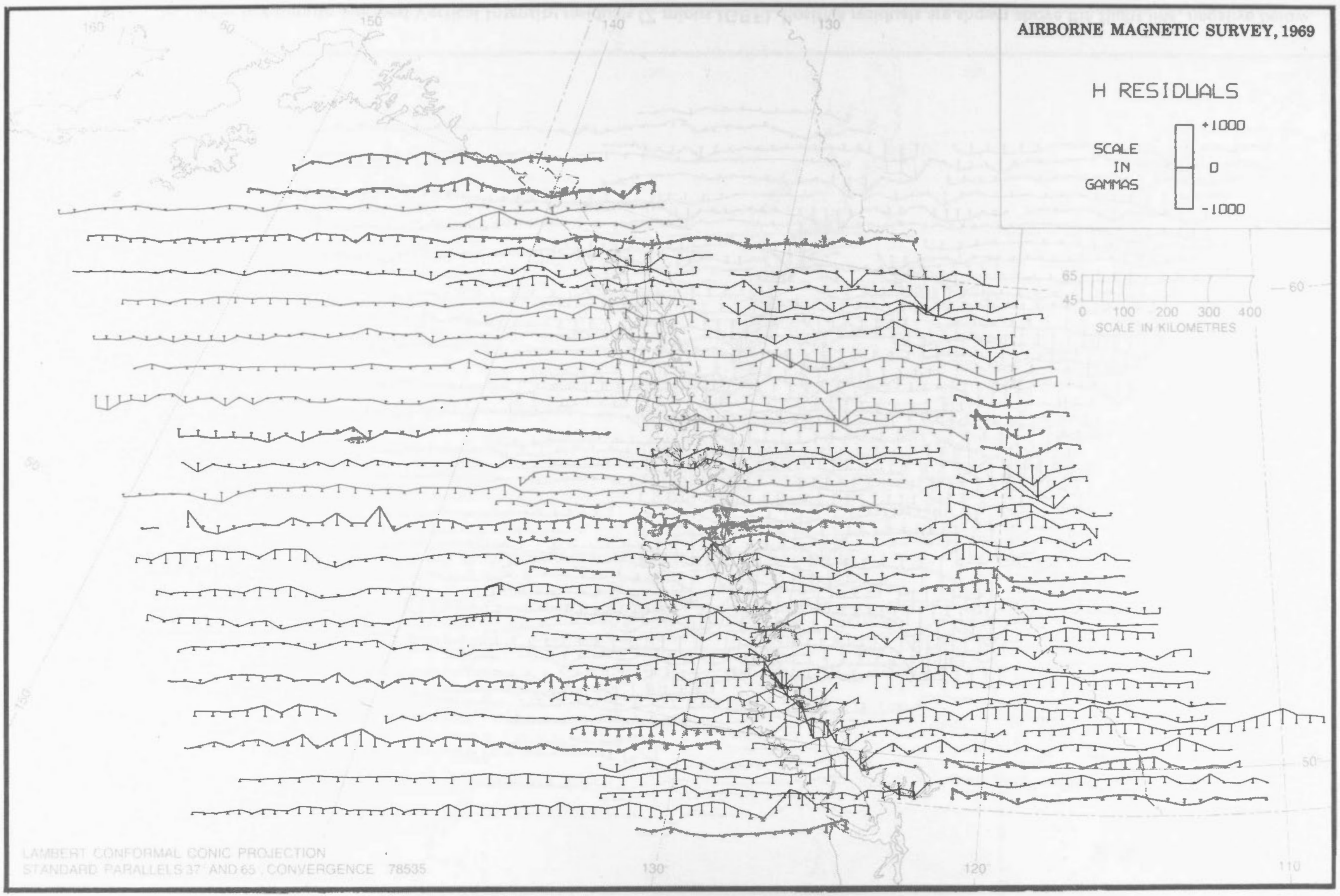

Figure 9. Profiles of the five-minute averaged Horizontal Intensity residuals (H minus IGRF). Positive residuals are shown above the flight line, negative below.

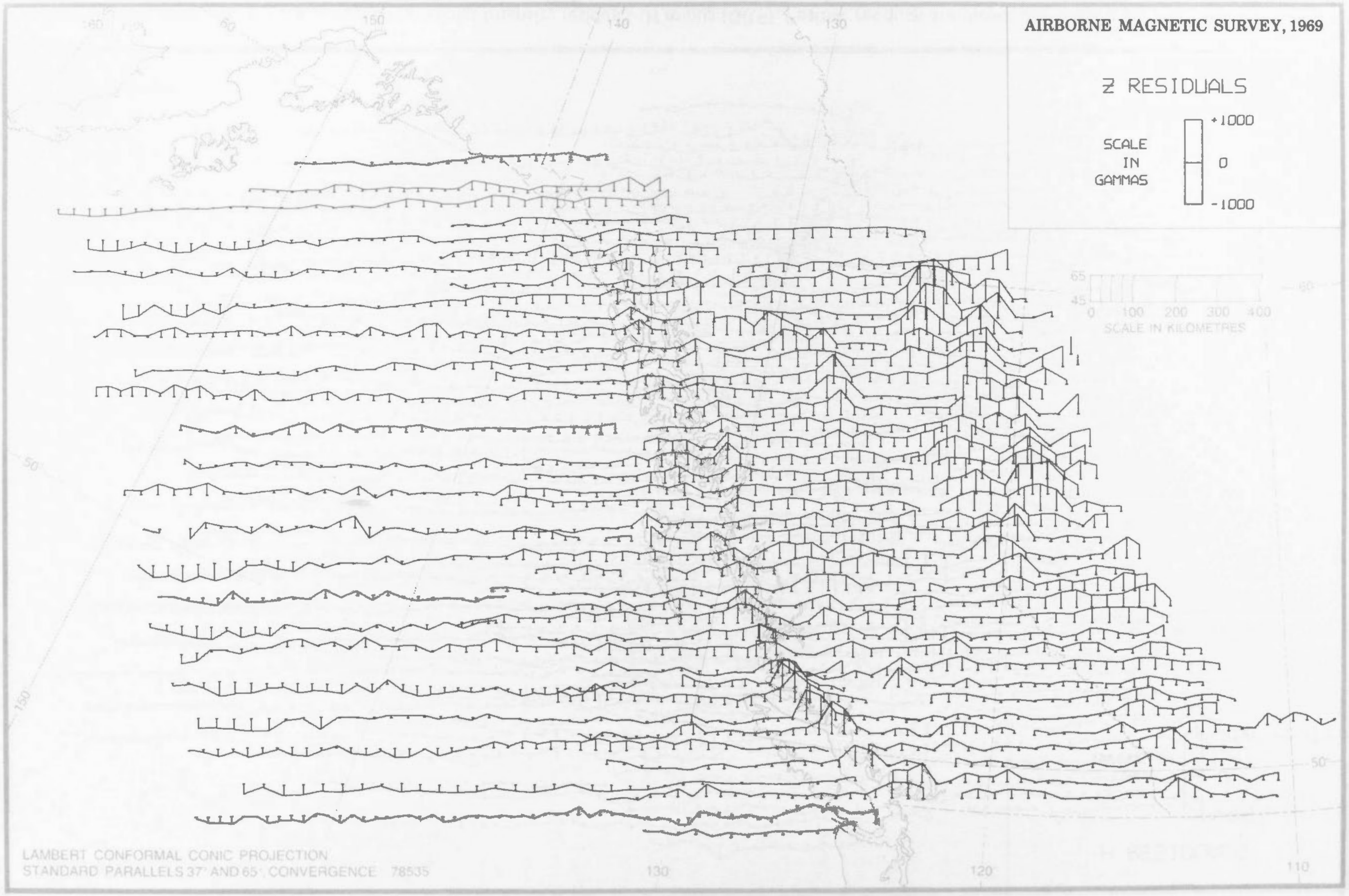

Figure 10. Profiles of the five-minute averaged Vertical Intensity residuals (Z minus IGRF). Positive residuals are shown above the flight line, negative below.

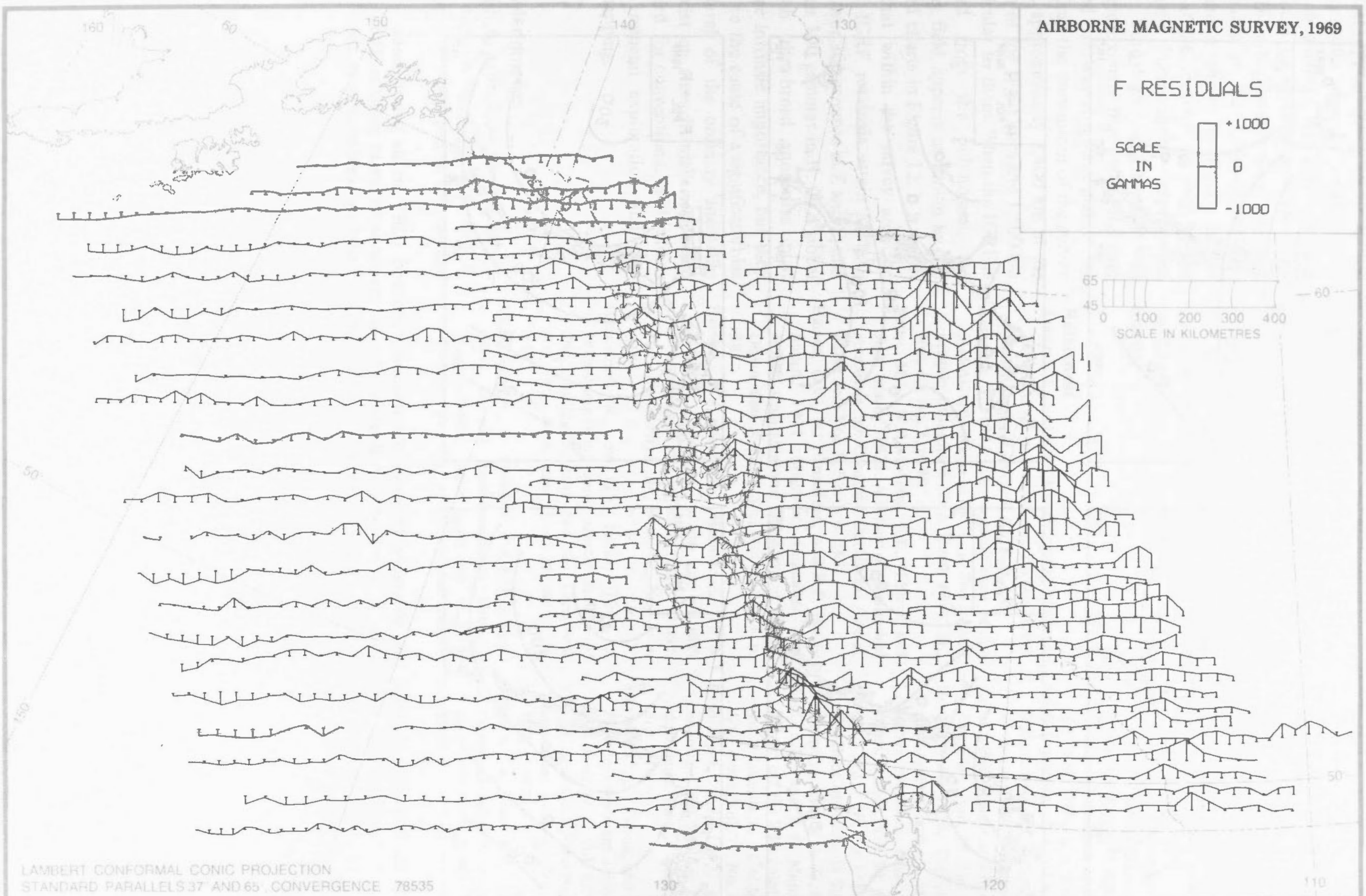

Figure 11. Profiles of the five-minute averaged Total Intensity residuals (F minus IGRF). Positive residuals are shown above the flight line, negative below.

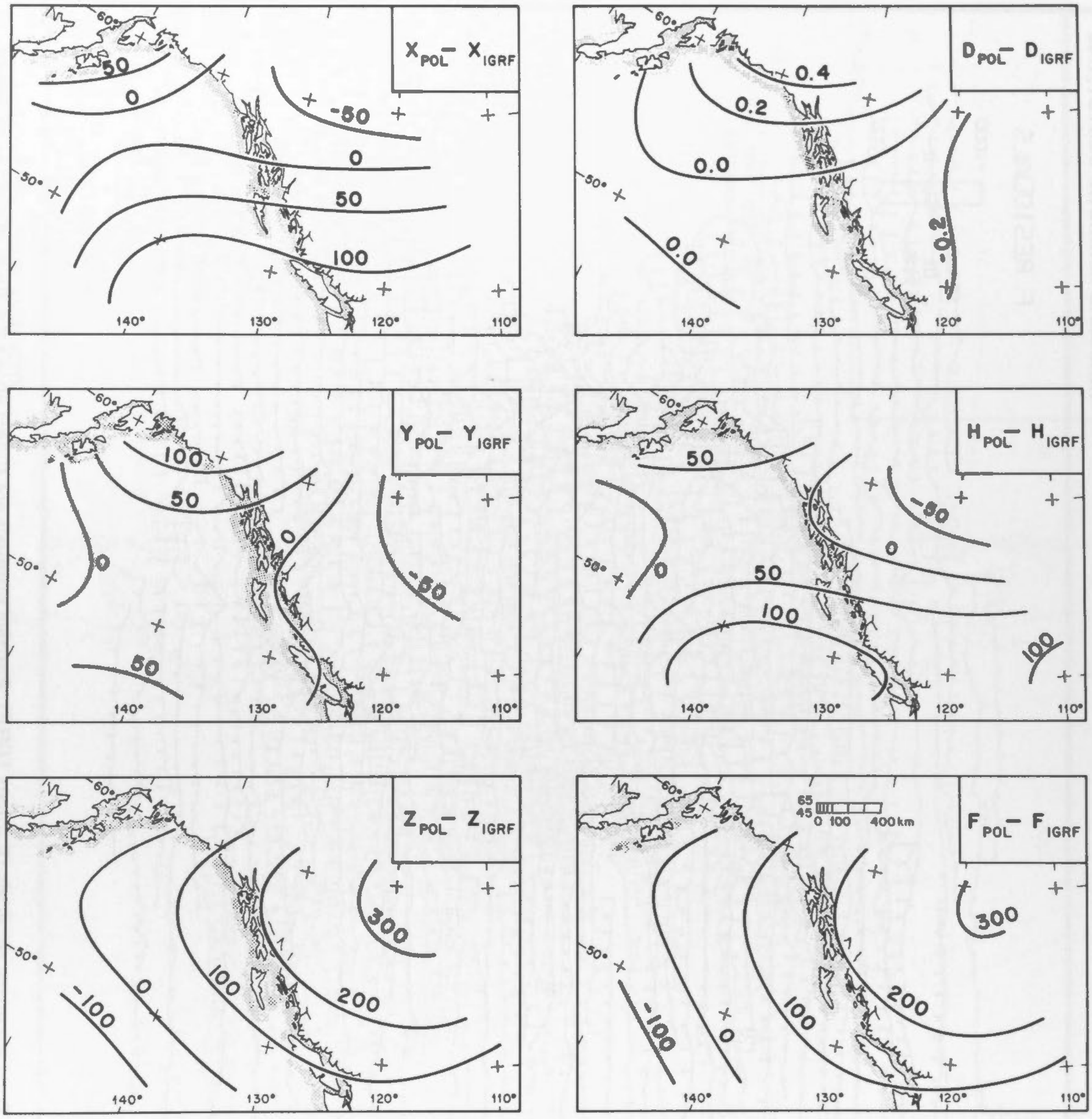

Figure 12. Contours showing the difference between the regional field and IGRF in six geomagnetic components. Declination D is indicated in degrees; all other components are in gammas. The regional field is assumed to be a 3rd-degree polynomial (POL) fitted by least-squares to the survey data.

tent offset appearing in some of the residual profiles must be considered as part of an anomaly that covers an area which could be as large as that of the survey. The effect within the survey area of anomalies in the 2,000–50,000 km wave band is shown in Figure 12. In arriving at the contours for each of the geomagnetic components represented here, a third-degree polynomial will closely approximate that part of the field comprised of wavelengths equal to or greater than the dimensions of the survey area, i.e. approximately 2,400 km in the direction of the flight lines and 1,500 km perpendicular to them. When the IGRF is subtracted from the polynomial, the remaining field appears as shown by the contoured charts in Figure 12. It is worth noting that within the survey area the broadest IGRF residuals attain a maximum of over 300 gammas in Z and F, and more than 100 gammas in H. On a global scale such ultra-broad anomalies must bear some intrinsic importance, but they can also be the cause of a significant bias in the level of the ordinary anomalies which exist on a much smaller scale and are studied for conventional applications such as mineral exploration and geological mapping.

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Appendix

Airborne Geomagnetic Survey Data
(All magnetic results apply to sea level)

Heading	Explanation
FL	Flight number as listed on index maps
LAT	Latitude in degrees and minutes (4558 N ≡ 45° 58′N)
LONG	Longitude in degrees and minutes (7757 W ≡ 77° 57′W)
ALT	Altitude in feet above sea level
GMT	Greenwich mean time in hours and minutes (1445 ≡ 14 h 45 m)
DA	Day
MO	Month
YR	Year
D	Magnetic Declination in degrees and minutes (2054 W ≡ 20° 54′W)
H	Horizontal Intensity in gammas ($1\ \gamma = 10^{-5}$ oersted)
Z	Vertical Intensity in gammas
F	Total Intensity in gammas
I	Magnetic Inclination in degrees and minutes (7319 N ≡ 73° 19′N) $I = \tan^{-1} Z/H$
X	Geographic North Component in gammas ($X = H \cos D$)
Y	Geographic East Component in gammas ($Y = H \sin D$)

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
2	4626N	8214W	9500	2100	27	1	69	558W	14693	57632N	59475	7541N	14613N	1530W
2	4625N	8239W	9500	2105	27	1	69	556W	14658					
2	4643N	8505W	9500	2135	27	1	69	326W	14777	57973N	59827	7541N	14751N	887W
2	4652N	8528W	9500	2140	27	1	69	244W	14475	57954N	59734	7558N	14458N	692W
2	4701N	8551W	9500	2145	27	1	69	222W	14542	57939N	59736	7554N	14530N	603W
2	4710N	8614W	9500	2150	27	1	69	205W	14624	57994N	59810	7550N	14615N	534W
2	4719N	8637W	9500	2155	27	1	69	125W	14289	58269N	59996	7613N	14284N	356W
2	4728N	8701W	9500	2200	27	1	69	113W	14109	58231N	59916	7622N	14106N	302W
2	4737N	8724W	9500	2205	27	1	69	114W	14128	58311N	59998	7622N	14124N	308W
2	4745N	8748W	9500	2210	27	1	69	32W	14158	58415N	60107	7622N	14158N	132W
2	4848N	9058W	9500	2250	27	1	69	232E	13642					
2	4855N	9122W	9500	2255	27	1	69	309E	13602					
2	4902N	9145W	9500	2300	27	1	69	310E	13794	58778N	60375	7647N	13773N	764E
2	4909N	9209W	9500	2305	27	1	69	350E	13729	58970N	60547	7653N	13698N	920E
2	4915N	9233W	9500	2310	27	1	69	507E	13360	58909N	60405	7713N	13307N	1191E
2	4955N	9527W	9500	2345	27	1	69	638E	13400	59207N	60705	7714N	13311N	1548E
2	5000N	9553W	9500	2350	27	1	69	810E	13285	59301N	60770	7722N	13150N	1890E
2	5003N	9619W	10000	2355	27	1	69	833E	13407	59350N	60845	7716N	13258N	1995E
2	5008N	9645W	13000	0	28	1	69	921E	13232	59308N	60766	7725N	13056N	2153E
2	5011N	9710W	16000	5	28	1	69	1005E	13205	59145N	60601	7724N	13000N	2315E
2	5015N	9737W	16000	10	28	1	69	924E	13357	59056N	60548	7715N	13177N	2184E
2	5019N	9803W	16000	15	28	1	69	938E	13425	59039N	60546	7711N	13235N	2249E
2	5022N	9829W	16000	20	28	1	69	1020E	13251	59158N	60624	7722N	13036N	2377E
2	5025N	9856W	16000	25	28	1	69	1102E	13341	59262N	60745	7718N	13093N	2555E
2	5027N	9923W	16000	30	28	1	69	1205E	13499	59050N	60574	7707N	13200N	2826E
2	5029N	9951W	16000	35	28	1	69	1213E	13594	59120N	60663	7703N	13285N	2879E
2	5030N	10019W	16000	40	28	1	69	1156E	13707	59226N	60791	7658N	13410N	2836E
2	5032N	10047W	16000	45	28	1	69	1357E	13764	59108N	60690	7653N	13357N	3321E
2	5033N	10115W	16000	50	28	1	69	1327E	13906	58826N	60447	7641N	13524N	3238E
2	5052N	10804W	16000	205	28	1	69	1807E	14810	58031N	59891	7540N	14074N	4609E
2	5053N	10832W	16000	210	28	1	69	1856E	14816	58079N	59939	7541N	14013N	4811E
2	5054N	10859W	16000	215	28	1	69	1854E	14913	57872N	59762	7532N	14108N	4831E
2	5055N	10927W	16000	220	28	1	69	1835E	15021	58038N	59950	7529N	14237N	4790E
2	5055N	10955W	16000	225	28	1	69	1949E	15251	58047N	60017	7516N	14347N	5172E
2	5054N	11022W	16000	230	28	1	69	1931E	15323	57818N	59814	7509N	14442N	5122E
2	5052N	11048W	16000	235	28	1	69	2005E	15368	57926N	59930	7508N	14432N	5281E
2	5050N	11114W	16000	240	28	1	69	2011E	15568	57553N	59621	7451N	14612N	5371E
2	5049N	11140W	16000	245	28	1	69	2003E	15504	57502N	59556	7454N	14564N	5316E
2	5048N	11207W	16000	250	28	1	69	2026E	15641	57492N	59582	7446N	14657N	5460E
2	5047N	11233W	16000	255	28	1	69	2022E	15596	57444N	59524	7448N	14621N	5428E
2	5047N	11300W	16000	300	28	1	69	2044E	15710	57458N	59567	7442N	14692N	5562E
2	5048N	11326W	16000	305	28	1	69	2139E	15733	57340N	59459	7439N	14622N	5807E
2	5049N	11353W	16000	310	28	1	69	2138E	15787	57082N	59225	7432N	14674N	5822E
2	5049N	11421W	16000	315	28	1	69	2154E	15939	56996N	59183	7422N	14788N	5947E
2	5049N	11448W	16000	320	28	1	69	2214E	16088	56871N	59103	7412N	14891N	6088E
2	5049N	11515W	16000	325	28	1	69	2204E	16191	56735N	59000	7404N	15004N	6085E
2	5049N	11543W	16000	330	28	1	69	2153E	16258	56830N	59110	7402N	15085N	6062E
2	5048N	11611W	16000	335	28	1	69	2241E	16353	56575N	58891	7352N	15086N	6310E
2	5047N	11639W	16000	340	28	1	69	2238E	16476	56353N	58713	7342N	15206N	6344E
2	5046N	11709W	16000	345	28	1	69	2245E	16501	56249N	58619	7339N	15216N	6384E
2	5045N	11739W	16000	350	28	1	69	2244E	16556	56147N	58537	7334N	15267N	6402E
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3	5125N	12653W	15100	1850	30	1	69	2457E	17285	54158N	56849	7217N	15670N	7294E
3	5127N	12621W	15100	1855	30	1	69	2519E	17199	54297N	56956	7225N	15546N	7358E
3	5128N	12549W	15100	1900	30	1	69	2508E	17248	54333N	57005	7223N	15614N	7328E
3	5130N	12517W	15100	1905	30	1	69	2516E	17388	54562N	57266	7219N	15724N	7424E
3	5133N	12445W	15100	1910	30	1	69	2508E	17157	54874N	57494	7238N	15532N	7287E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
3	5135N	12414W	15100	1915	30	1	69	2507E	17124	54926N	57533	7241N	15504N	7269E
3	5140N	12344W	15100	1920	30	1	69	2549E	16996	55245N	57800	7253N	15299N	7404E
3	5144N	12315W	15100	1925	30	1	69	2458E	16829	55612N	58103	7309N	15256N	7104E
3	5148N	12245W	15100	1930	30	1	69	2452E	16713	55489N	57952	7314N	15162N	7031E
3	5152N	12215W	15000	1935	30	1	69	2446E	16754	55667N	58134	7314N	15211N	7021E
3	5154N	12144W	15000	1940	30	1	69	2513E	16563	55945N	58346	7330N	14984N	7056E
3	5157N	12113W	15000	1945	30	1	69	2356E	16465	56166N	58530	7339N	15048N	6683E
3	5159N	12041W	15000	1950	30	1	69	2419E	16186	56145N	58432	7355N	14748N	6669E
3	5201N	12008W	15000	1955	30	1	69	2430E	16108	56250N	58511	7401N	14658N	6680E
3	5202N	11935W	15000	2000	30	1	69	2438E	15928	56448N	58653	7414N	14477N	6643E
3	5204N	11902W	15000	2005	30	1	69	2419E	15936	56527N	58730	7415N	14521N	6564E
3	5205N	11829W	15000	2010	30	1	69	2412E	15746	56707N	58852	7428N	14361N	6455E
3	5206N	11756W	15000	2015	30	1	69	2405E	15595	56844N	58945	7439N	14236N	6368E
3	5207N	11723W	15000	2020	30	1	69	2420E	15443	57049N	59102	7451N	14069N	6367E
3	5207N	11650W	15000	2025	30	1	69	2348E	15328	57173N	59192	7459N	14024N	6186E
3	5208N	11617W	15000	2030	30	1	69	2344E	15234	57286N	59278	7506N	13945N	6134E
3	5208N	11543W	15000	2035	30	1	69	2346E	15240	57396N	59385	7507N	13946N	6145E
3	5208N	11508W	15000	2040	30	1	69	2334E	15114	57610N	59560	7517N	13853N	6044E
3	5208N	11435W	15000	2045	30	1	69	2258E	15040	57730N	59658	7523N	13847N	5870E
3	5207N	11401W	15000	2050	30	1	69	2228E	14864	57798N	59679	7534N	13734N	5683E
3	5207N	11328W	15000	2055	30	1	69	2216E	14757	57866N	59718	7541N	13655N	5594E
3	5206N	11255W	15000	2100	30	1	69	2159E	14686	57986N	59817	7547N	13618N	5499E
3	5146N	11257W	16300	2125	30	1	69	2226E	15079	57713N	59651	7521N	13938N	5755E
3	5146N	11325W	16300	2130	30	1	69	2200E	15096	57597N	59542	7518N	13996N	5659E
3	5147N	11353W	16300	2135	30	1	69	2227E	15164	57567N	59531	7514N	14014N	5791E
3	5147N	11421W	16300	2140	30	1	69	2230E	15280	57508N	59504	7507N	14116N	5850E
3	5146N	11450W	16300	2145	30	1	69	2301E	15385	57468N	59491	7500N	14159N	6017E
3	5145N	11518W	16300	2150	30	1	69	2335E	15596	57325N	59408	7446N	14292N	6242E
3	5145N	11548W	16300	2155	30	1	69	2334E	15667	57105N	59215	7439N	14360N	6265E
3	5144N	11617W	16300	2200	30	1	69	2344E	15749	56997N	59133	7433N	14416N	6341E
3	5143N	11647W	16300	2205	30	1	69	2336E	15835	56912N	59074	7427N	14509N	6343E
3	5144N	11716W	16300	2210	30	1	69	2353E	16014	56789N	59004	7415N	14642N	6485E
3	5145N	11745W	16300	2215	30	1	69	2401E	16091	56686N	58926	7409N	14696N	6552E
3	5143N	11814W	16300	2220	30	1	69	2413E	16125	56502N	58758	7404N	14706N	6615E
3	5142N	11842W	16300	2225	30	1	69	2411E	16189	56406N	58684	7359N	14768N	6633E
3	5141N	11910W	16300	2230	30	1	69	2417E	16211	56311N	58598	7356N	14776N	6669E
3	5140N	11938W	16300	2235	30	1	69	2436E	16401	56167N	58513	7343N	14912N	6828E
3	5139N	12006W	16300	2240	30	1	69	2428E	16390	56018N	58367	7341N	14918N	6790E
3	5137N	12033W	16300	2245	30	1	69	2418E	16551	55939N	58337	7331N	15083N	6812E
3	5135N	12100W	16300	2250	30	1	69	2415E	16610	55960N	58373	7328N	15142N	6825E
3	5135N	12128W	16300	2255	30	1	69	2452E	16973	55672N	58202	7302N	15398N	7141E
3	5134N	12156W	16300	2300	30	1	69	2436E	16980	55520N	58058	7259N	15436N	7072E
3	5133N	12223W	16300	2305	30	1	69	2431E	16941	55418N	57950	7300N	15413N	7031E
3	5130N	12251W	16300	2310	30	1	69	2441E	17067	55418N	57986	7252N	15507N	7129E
3	5127N	12318W	16300	2315	30	1	69	2453E	17286	55532N	58161	7242N	15680N	7276E
3	5124N	12346W	16300	2320	30	1	69	2515E	17441	54983N	57683	7224N	15772N	7444E
3	5108N	12316W	15200	2340	30	1	69	2454E	17225	55044N	57676	7237N	15623N	7254E
3	5111N	12242W	15200	2345	30	1	69	2432E	17176	55211N	57821	7243N	15624N	7135E
3	5113N	12208W	15200	2350	30	1	69	2410E	16909	55392N	57915	7301N	15427N	6923E
3	5115N	12134W	15200	2355	30	1	69	2450E	16852	55594N	58092	7308N	15292N	7082E
3	5118N	12059W	15200	0	31	1	69	2402E	16601	55754N	58174	7325N	15161N	6764E
3	5119N	12023W	15200	5	31	1	69	2401E	16596	55842N	58256	7326N	15158N	6757E
3	5120N	11949W	15200	10	31	1	69	2414E	16570	55919N	58323	7329N	15109N	6802E
3	5122N	11915W	15200	15	31	1	69	2400E	16363	56098N	58436	7344N	14947N	6658E
3	5123N	11840W	15200	20	31	1	69	2351E	16334	56213N	58538	7347N	14939N	6605E
3	5124N	11805W	15200	25	31	1	69	2359E	16164	56396N	58667	7400N	14768N	6572E
3	5125N	11730W	15200	30	31	1	69	2350E	16046	56538N	58771	7409N	14676N	6485E
3	5126N	11655W	15200	35	31	1	69	2351E	15986	56728N	58937	7415N	14620N	6464E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
3	5127N	11622W	15200	40	31	1	69	2339E	15807	56912N	59067	7428N	14479N	6341E
3	5129N	11548W	15200	45	31	1	69	2341E	15595	57022N	59117	7442N	14281N	6266E
3	5130N	11515W	15200	50	31	1	69	2355E	15508	57249N	59312	7450N	14176N	6288E
3	5130N	11441W	15200	55	31	1	69	2242E	15424	57444N	59479	7458N	14229N	5952E
3	5129N	11408W	15200	100	31	1	69	2226E	15352	57355N	59374	7500N	14189N	5859E
3	5128N	11334W	15200	105	31	1	69	2227E	15271	57405N	59402	7506N	14113N	5833E
3	5127N	11301W	15200	110	31	1	69	2146E	15028	57606N	59534	7522N	13955N	5576E
3	5126N	11227W	15200	115	31	1	69	2138E	15012	57742N	59662	7525N	13954N	5536E
3	5110N	11231W	16400	145	31	1	69	2123E	15156	57714N	59671	7517N	14112N	5528E
3	5110N	11300W	16400	150	31	1	69	2154E	15209	57637N	59610	7513N	14110N	5674E
3	5110N	11329W	16400	155	31	1	69	2223E	15274	57471N	59466	7506N	14123N	5818E
3	5110N	11359W	16400	200	31	1	69	2228E	15505	57262N	59324	7450N	14327N	5928E
3	5110N	11429W	16400	205	31	1	69	2158E	15628	57201N	59298	7443N	14493N	5846E
3	5110N	11500W	16400	210	31	1	69	2224E	15809	57295N	59436	7434N	14614N	6028E
3	5110N	11530W	16400	215	31	1	69	2303E	16020	57113N	59317	7419N	14740N	6273E
3	5109N	11559W	16400	220	31	1	69	2329E	16084	56816N	59048	7411N	14751N	6410E
3	5108N	11627W	16400	225	31	1	69	2312E	16268	56651N	58941	7358N	14952N	6409E
3	5107N	11655W	16400	230	31	1	69	2308E	16249	56491N	58782	7357N	14942N	6384E
3	5105N	11723W	16400	235	31	1	69	2333E	16401	56363N	58701	7346N	15033N	6556E
3	5103N	11750W	16400	240	31	1	69	2318E	16521	56224N	58601	7337N	15172N	6536E
3	5101N	11818W	16400	245	31	1	69	2313E	16683	56119N	58546	7326N	15332N	6578E
3	5101N	11845W	16400	250	31	1	69	2329E	16826	55961N	58436	7315N	15432N	6706E
3	5101N	11911W	16400	255	31	1	69	2326E	16878	55940N	58431	7312N	15484N	6715E
3	5101N	11938W	16400	300	31	1	69	2355E	16899	55872N	58372	7310N	15447N	6853E
3	5100N	12003W	16400	305	31	1	69	2401E	16961	55636N	58164	7302N	15491N	6906E
3	5058N	12026W	16400	310	31	1	69	2343E	16975	55627N	58160	7301N	15541N	6827E
3	5056N	12049W	16400	315	31	1	69	2343E	16950	55484N	58016	7300N	15517N	6821E
3	5054N	12113W	16400	320	31	1	69	2440E	17165	55440N	58036	7247N	15597N	7166E
3	5052N	12139W	16400	325	31	1	69	2423E	17300	55216N	57863	7236N	15755N	7147E
3	5050N	12204W	16400	330	31	1	69	2409E	17576	55146N	57879	7219N	16036N	7194E
4	4844N	12356W	16300	1710	1	2	69	2252E	18893	53367N	56613	7030N	17407N	7344E
4	4843N	12422W	16300	1715	1	2	69	2244E	18896	53217N	56473	7027N	17428N	7302E
4	4842N	12449W	16300	1720	1	2	69	2243E	19053	53203N	56512	7017N	17574N	7359E
4	4841N	12514W	16300	1725	1	2	69	2253E	19054	53017N	56338	7013N	17553N	7412E
4	4845N	12540W	16200	1730	1	2	69	2257E	19209	52894N	56274	7002N	17687N	7492E
4	4843N	12604W	16200	1735	1	2	69	2235E	19363	52658N	56105	6948N	17878N	7436E
4	4830N	12626W	16200	1740	1	2	69	2310E	19354	52499N	55953	6945N	17793N	7614E
4	4818N	12649W	16100	1745	1	2	69	2321E	19432	52345N	55836	6938N	17838N	7705E
4	4817N	12713W	16100	1750	1	2	69	2305E	19526	52174N	55708	6928N	17960N	7660E
4	4817N	12739W	16100	1755	1	2	69	2256E	19627	52053N	55630	6920N	18075N	7649E
4	4817N	12804W	16100	1800	1	2	69	2313E	19774	51776N	55424	6905N	18172N	7797E
4	4817N	12828W	16100	1805	1	2	69	2236E	19807	51620N	55289	6900N	18285N	7614E
4	4812N	12847W	16100	1810	1	2	69	2217E	19903	51633N	55336	6855N	18415N	7550E
4	4808N	12905W	16100	1815	1	2	69	2304E	19969	51570N	55301	6849N	18371N	7827E
4	4802N	12923W	16100	1820	1	2	69	2312E	20112	51183N	54993	6832N	18484N	7925E
4	4757N	12941W	16100	1825	1	2	69	2250E	20109	51061N	54878	6830N	18532N	7804E
4	4757N	13001W	16100	1830	1	2	69	2241E	20122	51059N	54882	6829N	18565N	7760E
4	4755N	13020W	16100	1835	1	2	69	2254E	20220	50933N	54800	6820N	18625N	7872E
4	4754N	13039W	16200	1840	1	2	69	2241E	20295	50777N	54683	6812N	18724N	7830E
4	4753N	13102W	16200	1845	1	2	69	2301E	20356	50681N	54616	6806N	18736N	7960E
4	4750N	13123W	16200	1850	1	2	69	2227E	20359	50561N	54507	6803N	18815N	7777E
4	4746N	13146W	16200	1855	1	2	69	2247E	20368	50462N	54418	6801N	18778N	7890E
4	4742N	13207W	16200	1900	1	2	69	2241E	20473	50389N	54390	6753N	18889N	7897E
4	4739N	13227W	16200	1905	1	2	69	2224E	20548	50090N	54141	6741N	18997N	7831E
4	4736N	13247W	16200	1910	1	2	69	2225E	20587	50195N	54253	6741N	19030N	7855E
4	4733N	13307W	16200	1915	1	2	69	2247E	20777	49932N	54083	6724N	19153N	8051E
4	4730N	13326W	16200	1920	1	2	69	2248E	20708	49751N	53888	6724N	19089N	8026E
4	4726N	13347W	16200	1925	1	2	69	2232E	20839	49620N	53818	6713N	19247N	7988E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
4	4721N	13408W	16200	1930	1	2	69	2217E	20884	49342N	53579	6703N	19323N	7922E
4	4717N	13428W	16200	1935	1	2	69	2226E	20947	49267N	53535	6657N	19361N	7996E
4	4712N	13448W	16200	1940	1	2	69	2208E	20985	49115N	53411	6651N	19439N	7907E
4	4708N	13508W	16200	1945	1	2	69	2205E	21091	48994N	53341	6642N	19544N	7929E
4	4703N	13527W	16200	1950	1	2	69	2216E	21177	48811N	53207	6632N	19596N	8027E
4	4659N	13547W	16200	1955	1	2	69	2219E	21284	48705N	53152	6623N	19687N	8087E
4	4654N	13606W	16200	2000	1	2	69	2215E	21245	48543N	52988	6621N	19662N	8047E
4	4651N	13627W	16200	2005	1	2	69	2216E	21419	48297N	52834	6605N	19820N	8119E
4	4648N	13647W	16200	2010	1	2	69	2225E	21345	48082N	52607	6603N	19732N	8141E
4	4644N	13708W	16200	2015	1	2	69	2156E	21378	48104N	52641	6602N	19829N	7991E
4	4639N	13727W	16200	2020	1	2	69	2158E	21460	47815N	52410	6549N	19902N	8028E
4	4635N	13747W	16200	2025	1	2	69	2135E	21469	47785N	52386	6548N	19962N	7900E
4	4630N	13806W	16200	2030	1	2	69	2143E	21615	47624N	52300	6535N	20080N	8001E
4	4626N	13824W	16200	2035	1	2	69	2140E	21602	47420N	52109	6530N	20074N	7980E
4	4621N	13844W	16200	2040	1	2	69	2145E	21688	47261N	52000	6520N	20143N	8039E
4	4617N	13904W	16200	2045	1	2	69	2114E	21753	47007N	51796	6510N	20274N	7882E
4	4612N	13925W	16200	2050	1	2	69	2131E	21786	47004N	51808	6507N	20268N	7991E
4	4607N	13946W	16200	2055	1	2	69	2134E	21905	46648N	51535	6450N	20369N	8057E
4	4602N	14006W	16200	2100	1	2	69	2111E	21924	46626N	51523	6448N	20442N	7923E
4	4557N	14027W	16200	2105	1	2	69	2125E	22035	46520N	51475	6439N	20512N	8049E
4	4551N	14048W	16200	2110	1	2	69	2129E	22106	46143N	51166	6424N	20569N	8100E
4	4546N	14108W	16200	2115	1	2	69	2105E	22074	46011N	51033	6422N	20595N	7944E
4	4541N	14129W	16200	2120	1	2	69	2053E	22156	45832N	50907	6412N	20700N	7898E
4	4535N	14148W	16200	2125	1	2	69	2040E	22231	45610N	50740	6400N	20798N	7851E
4	4529N	14208W	16200	2130	1	2	69	2022E	22188	45605N	50717	6403N	20800N	7724E
4	4524N	14228W	16200	2135	1	2	69	2050E	22349	45444N	50642	6348N	20886N	7952E
4	4518N	14247W	16200	2140	1	2	69	2044E	22361	45078N	50319	6336N	20910N	7922E
4	4512N	14307W	16200	2145	1	2	69	2025E	22375	44929N	50193	6331N	20968N	7811E
4	4506N	14326W	16200	2150	1	2	69	2004E	22447	44769N	50081	6322N	21083N	7705E
4	4500N	14346W	16200	2155	1	2	69	2024E	22526	44685N	50042	6314N	21113N	7853E
4	4611N	14215W	17200	2225	1	2	69	2106E	21965	46022N	50995	6429N	20491N	7911E
4	4620N	14140W	17200	2230	1	2	69	2111E	21924	46114N	51061	6434N	20441N	7927E
4	4629N	14107W	17200	2235	1	2	69	2128E	21809	46401N	51271	6449N	20294N	7986E
4	4638N	14034W	17200	2240	1	2	69	2138E	21754	46771N	51583	6503N	20222N	8020E
4	4647N	14000W	17200	2245	1	2	69	2140E	21629	47016N	51753	6517N	20098N	7991E
4	4655N	13926W	17200	2250	1	2	69	2152E	21508	47344N	52001	6534N	19959N	8013E
4	4703N	13853W	17200	2255	1	2	69	2207E	21400	47707N	52287	6550N	19824N	8061E
4	4711N	13818W	17200	2300	1	2	69	2208E	21308	47815N	52348	6558N	19737N	8031E
4	4718N	13745W	17200	2305	1	2	69	2157E	21174	48125N	52577	6615N	19638N	7917E
4	4725N	13712W	17200	2310	1	2	69	2210E	21111	48356N	52763	6624N	19548N	7970E
4	4731N	13638W	17200	2315	1	2	69	2216E	21005	48601N	52946	6637N	19438N	7960E
4	4738N	13604W	17200	2320	1	2	69	2230E	20974	48870N	53181	6646N	19377N	8028E
4	4745N	13530W	17200	2325	1	2	69	2225E	20890	49214N	53465	6659N	19310N	7969E
4	4752N	13455W	17200	2330	1	2	69	2212E	20707	49400N	53564	6715N	19171N	7828E
4	4759N	13420W	17200	2335	1	2	69	2244E	20651	49616N	53742	6724N	19044N	7985E
4	4806N	13346W	17200	2340	1	2	69	2239E	20473	49934N	53969	6742N	18893N	7887E
4	4812N	13310W	17200	2345	1	2	69	2302E	20355	50293N	54256	6757N	18732N	7965E
4	4817N	13235W	17200	2350	1	2	69	2245E	20237	50389N	54301	6807N	18661N	7829E
4	4822N	13200W	17200	2355	1	2	69	2246E	20179	50611N	54486	6815N	18606N	7810E
4	4827N	13124W	17200	0	2	2	69	2256E	20023	50898N	54695	6831N	18438N	7807E
4	4832N	13052W	17200	5	2	2	69	2312E	19991	51121N	54891	6838N	18373N	7878E
4	4838N	13021W	17200	10	2	2	69	2308E	19911	51385N	55108	6849N	18308N	7827E
4	4843N	12946W	17200	15	2	2	69	2238E	19840	51692N	55369	6900N	18310N	7640E
4	4849N	12909W	17200	20	2	2	69	2325E	19562	51964N	55524	6922N	17950N	7775E
4	4854N	12833W	17200	25	2	2	69	2306E	19374	52138N	55621	6936N	17819N	7604E
4	4900N	12756W	17200	30	2	2	69	2324E	19250	52338N	55766	6948N	17665N	7647E
4	4903N	12720W	17200	35	2	2	69	2254E	19098	52580N	55942	7002N	17591N	7436E
4	4907N	12643W	17200	40	2	2	69	2324E	19141	52780N	56144	7003N	17565N	7606E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
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4	4914N	12531W	17200	50	2	2	69	2318E	18882	53248N	56497	7028N	17341N	7471E
4	4920N	12456W	17200	55	2	2	69	2305E	18836	53450N	56672	7035N	17328N	7385E
4	4925N	12421W	17200	100	2	2	69	2314E	18720	53730N	56898	7047N	17201N	7387E
5	5036N	13202W	18100	1945	3	2	69	2407E	18913	52126N	55451	7003N	17262N	7728E
5	5030N	13221W	18100	1950	3	2	69	2352E	18999	51894N	55263	6953N	17374N	7688E
5	5024N	13240W	18100	1955	3	2	69	2336E	19112	51934N	55339	6947N	17512N	7655E
5	5018N	13300W	18100	2000	3	2	69	2401E	19328	51766N	55257	6931N	17653N	7871E
5	5015N	13322W	18100	2005	3	2	69	2346E	19402	51497N	55031	6921N	17756N	7820E
5	5011N	13344W	18100	2010	3	2	69	2340E	19395	51341N	54882	6918N	17761N	7790E
5	5007N	13405W	18100	2015	3	2	69	2338E	19437	51306N	54864	6915N	17805N	7795E
5	5003N	13428W	18100	2020	3	2	69	2400E	19707	50993N	54668	6852N	18001N	8019E
5	4959N	13450W	18100	2025	3	2	69	2326E	19583	50816N	54459	6855N	17967N	7791E
5	4954N	13514W	18100	2030	3	2	69	2333E	19674	50714N	54397	6847N	18035N	7862E
5	4950N	13537W	18100	2035	3	2	69	2313E	19820	50480N	54232	6833N	18215N	7814E
5	4945N	13600W	18100	2040	3	2	69	2330E	19900	50407N	54193	6827N	18249N	7937E
5	4941N	13623W	18100	2045	3	2	69	2319E	19926	50356N	54156	6824N	18299N	7887E
5	4936N	13646W	18100	2050	3	2	69	2321E	20049	50107N	53970	6811N	18406N	7948E
5	4932N	13709W	18100	2055	3	2	69	2331E	19983	49885N	53739	6810N	18323N	7975E
5	4927N	13732W	18200	2100	3	2	69	2302E	20069	49765N	53659	6802N	18468N	7853E
5	4923N	13758W	18200	2105	3	2	69	2258E	20395	49508N	53545	6736N	18776N	7963E
5	4919N	13824W	18200	2110	3	2	69	2248E	20289	49275N	53288	6737N	18703N	7863E
5	4914N	13850W	18200	2115	3	2	69	2243E	20447	49035N	53128	6721N	18859N	7901E
5	4909N	13916W	18200	2120	3	2	69	2300E	20488	48935N	53051	6716N	18857N	8010E
5	4904N	13945W	18200	2125	3	2	69	2324E	20320	48990N	53037	6728N	18648N	8070E
5	4857N	14012W	18200	2130	3	2	69	2246E	20630	48470N	52678	6656N	19021N	7986E
5	4851N	14039W	18200	2135	3	2	69	2241E	20630	48452N	52661	6656N	19033N	7959E
5	4844N	14105W	18200	2140	3	2	69			48040N	52424			
5	4837N	14132W	18200	2145	3	2	69	2206E	20868	47875N	52225	6626N	19333N	7855E
5	4831N	14159W	18200	2150	3	2	69	2229E	20979	47684N	52095	6615N	19383N	8026E
5	4824N	14225W	18200	2155	3	2	69	2145E	21048	47417N	51879	6603N	19548N	7803E
5	4817N	14251W	18200	2200	3	2	69	2159E	21240	47325N	51873	6549N	19695N	7952E
5	4810N	14319W	18200	2205	3	2	69	2150E	21317	47092N	51692	6538N	19787N	7931E
5	4802N	14347W	18200	2210	3	2	69	2158E	21421	46741N	51416	6522N	19865N	8013E
5	4755N	14415W	18200	2215	3	2	69	2130E	21487	46488N	51213	6511N	19990N	7879E
5	4748N	14442W	18200	2220	3	2	69	2125E	21458	46182N	50924	6504N	19974N	7840E
5	4739N	14509W	18200	2225	3	2	69	2102E	21447	46157N	50897	6504N	20017N	7701E
5	4730N	14536W	18200	2230	3	2	69	2101E	21613	46021N	50844	6450N	20173N	7756E
5	4721N	14602W	18200	2235	3	2	69	2039E	21710	45776N	50663	6437N	20315N	7658E
5	4800N	14609W	19500	2305	3	2	69	2052E	21539	46040N	50829	6455N	20125N	7673E
5	4810N	14544W	19500	2310	3	2	69	2132E	21480	46295N	51036	6506N	19980N	7886E
5	4819N	14519W	19500	2315	3	2	69	2149E	21352	46770N	51414	6527N	19821N	7939E
5	4828N	14454W	19500	2320	3	2	69	2113E	21228	46951N	51527	6540N	19788N	7685E
5	4837N	14429W	19500	2325	3	2	69	2158E	21126	47082N	51605	6549N	19592N	7904E
5	4846N	14403W	19200	2330	3	2	69	2210E	21042	47380N	51842	6603N	19485N	7942E
5	4854N	14337W	19200	2335	3	2	69	2239E	20971	47614N	52028	6613N	19352N	8080E
5	4902N	14310W	19200	2340	3	2	69	2229E	20831	48001N	52326	6632N	19247N	7967E
5	4911N	14242W	19200	2345	3	2	69	2251E	20671	48268N	52508	6648N	19048N	8029E
5	4918N	14214W	19200	2350	3	2	69	2236E	20499	48337N	52504	6701N	18924N	7879E
5	4924N	14145W	19200	2355	3	2	69	2246E	20494	48649N	52789	6709N	18897N	7933E
5	4932N	14117W	19200	0	4	2	69	2318E	20514	48708N	52851	6709N	18840N	8116E
5	4937N	14047W	19200	5	4	2	69	2245E	20390	49229N	53285	6730N	18803N	7888E
5	4942N	14017W	19200	10	4	2	69	2253E	20393	49263N	53317	6730N	18786N	7933E
5	4948N	13945W	19200	15	4	2	69	2313E	20078	49501N	53418	6755N	18450N	7920E
5	4955N	13914W	19200	20	4	2	69	2311E	20093	49772N	53675	6800N	18468N	7915E
5	5001N	13842W	19200	25	4	2	69	2324E	20022	49823N	53696	6806N	18374N	7954E
5	5007N	13810W	19200	30	4	2	69	2345E	19741	50281N	54017	6833N	18069N	7952E
5	5013N	13739W	19200	35	4	2	69	2354E	19560	50424N	54085	6847N	17882N	7927E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
5	5020N	13711W	19200	40	4	2	69	2407E	19596	50663N	54321	6851N	17884N	8009E
5	5027N	13642W	19200	45	4	2	69	2354E	19451	51000N	54584	6907N	17782N	7883E
5	5033N	13604W	19200	50	4	2	69	2341E	19387	51112N	54666	6913N	17753N	7789E
5	5039N	13526W	19200	55	4	2	69	2400E	19230	51368N	54849	6928N	17567N	7822E
5	5045N	13448W	19200	100	4	2	69	2429E	18969	51620N	54995	6949N	17263N	7862E
5	5050N	13414W	19200	105	4	2	69	2427E	18974	51908N	55267	6955N	17270N	7857E
5	5055N	13340W	19200	110	4	2	69	2422E	18922	51969N	55307	6959N	17236N	7808E
5	5100N	13305W	19200	115	4	2	69	2459E	18703	52400N	55638	7021N	16952N	7902E
5	5106N	13230W	19200	120	4	2	69	2437E	18602	52469N	55669	7028N	16910N	7752E
5	5111N	13155W	19200	125	4	2	69	2459E	18475	52730N	55873	7041N	16746N	7803E
5	5117N	13120W	19200	130	4	2	69	2449E	18318	52936N	56016	7054N	16624N	7692E
5	5121N	13046W	19200	135	4	2	69	2527E	18087	53154N	56147	7112N	16331N	7775E
5	5126N	13011W	19200	140	4	2	69	2529E	18130	53341N	56338	7113N	16366N	7802E
5	5129N	12937W	19200	145	4	2	69	2519E	17993	53598N	56538	7126N	16284N	7653E
5	5132N	12903W	19200	150	4	2	69	2525E	17825	53797N	56674	7140N	16100N	7651E
5	5135N	12830W	19200	155	4	2	69	2530E	17813	53970N	56834	7144N	16077N	7672E
6	5042N	11918W	18200	1750	5	2	69	2247E	16873	55742N	58240	7309N	15556N	6536E
6	5041N	11943W	18200	1755	5	2	69	2312E	16758	55714N	58180	7315N	15403N	6602E
6	5040N	12008W	18200	1800	5	2	69	2329E	16880	55538N	58047	7305N	15481N	6728E
6	5039N	12033W	18200	1805	5	2	69	2301E	16977	55551N	58088	7300N	15625N	6638E
6	5037N	12056W	18200	1810	5	2	69	2249E	17067	55491N	58057	7254N	15731N	6620E
6	5035N	12119W	18200	1815	5	2	69	2342E	17216	55408N	58021	7244N	15763N	6922E
6	5034N	12142W	18200	1820	5	2	69	2340E	17394	55230N	57905	7231N	15931N	6983E
6	5032N	12204W	18200	1825	5	2	69	2331E	17488	54859N	57579	7219N	16034N	6982E
6	5030N	12226W	18100	1830	5	2	69	2318E	17476	54747N	57469	7217N	16049N	6917E
6	5028N	12249W	18100	1835	5	2	69	2301E	17498	54793N	57519	7217N	16103N	6845E
6	5027N	12313W	18100	1840	5	2	69	2322E	17727	54690N	57492	7202N	16271N	7035E
6	5025N	12339W	18100	1845	5	2	69	2318E	17741	54456N	57273	7157N	16294N	7019E
6	5024N	12404W	18100	1850	5	2	69	2314E	17678	54317N	57121	7158N	16244N	6976E
6	5022N	12430W	18100	1855	5	2	69	2259E	17539	54326N	57087	7206N	16146N	6849E
6	5020N	12454W	18100	1900	5	2	69	2328E	17715	54600N	57402	7201N	16248N	7058E
6	5017N	12518W	18100	1905	5	2	69	2308E	18302	54655N	57638	7129N	16829N	7194E
6	5015N	12543W	18100	1910	5	2	69	2345E	18483	54054N	57127	7107N	16918N	7444E
6	5012N	12608W	18100	1915	5	2	69	2346E	18456	53782N	56861	7103N	16890N	7440E
6	5009N	12633W	18100	1920	5	2	69	2352E	18631	53629N	56773	7050N	17036N	7542E
6	5005N	12658W	18100	1925	5	2	69	2400E	18452	53393N	56492	7056N	16855N	7508E
6	5003N	12722W	18100	1930	5	2	69	2355E	18651	53205N	56380	7040N	17049N	7562E
6	5001N	12746W	18100	1935	5	2	69	2350E	18751	53083N	56298	7032N	17151N	7579E
6	4958N	12810W	18100	1940	5	2	69	2334E	18724	52961N	56174	7031N	17162N	7487E
6	4955N	12834W	18100	1945	5	2	69	2350E	18800	52851N	56095	7025N	17196N	7597E
6	4953N	12859W	18100	1950	5	2	69	2344E	18939	52698N	55998	7013N	17336N	7627E
6	4949N	12923W	18000	1955	5	2	69	2301E	19025	52496N	55837	7004N	17508N	7442E
6	4946N	12947W	18000	2000	5	2	69	2333E	19086	52573N	55930	7002N	17494N	7629E
6	4943N	13010W	18000	2005	5	2	69	2408E	19206	52415N	55823	6952N	17526N	7855E
6	4940N	13033W	18000	2010	5	2	69	2429E	19431	52014N	55525	6930N	17682N	8057E
6	4936N	13054W	18000	2015	5	2	69	2343E	19389	51807N	55316	6928N	17750N	7800E
6	4933N	13114W	18000	2020	5	2	69	2339E	19481	51712N	55260	6921N	17843N	7818E
6	4929N	13134W	18000	2025	5	2	69	2333E	19515	51558N	55128	6916N	17887N	7802E
6	4926N	13155W	18000	2030	5	2	69	2325E	19602	51420N	55030	6907N	17987N	7791E
6	4923N	13217W	18000	2035	5	2	69	2322E	19648	51375N	55004	6904N	18035N	7798E
6	4920N	13239W	18000	2040	5	2	69	2329E	19747	51264N	54936	6855N	18111N	7870E
6	4917N	13301W	18000	2045	5	2	69	2334E	19820	50933N	54654	6844N	18166N	7928E
6	4914N	13323W	18000	2050	5	2	69	2324E	19808	50903N	54622	6844N	18177N	7872E
6	4850N	13145W	19300	2120	5	2	69	2341E	19489	51222N	54804	6910N	17846N	7831E
6	4854N	13111W	19300	2125	5	2	69	2350E	19601	51312N	54929	6905N	17928N	7925E
6	4857N	13038W	19300	2130	5	2	69	2348E	19600	51532N	55134	6910N	17933N	7911E
6	4900N	13006W	19300	2135	5	2	69	2251E	19445	51754N	55287	6924N	17918N	7553E
6	4903N	12935W	19200	2140	5	2	69	2318E	19549	51914N	55472	6921N	17954N	7734E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
6	4908N	12905W	19200	2145	5	2	69	2337E	19329	52214N	55677	6941N	17709N	7745E
6	4912N	12835W	19200	2150	5	2	69				55772			
6	4917N	12805W	19200	2155	5	2	69	2324E	19083	52497N	55858	7001N	17512N	7580E
6	4922N	12735W	19200	2200	5	2	69	2333E	19023	52712N	56040	7009N	17439N	7601E
6	4926N	12704W	19200	2205	5	2	69	2315E	18801	52942N	56182	7026N	17273N	7423E
6	4931N	12634W	19200	2210	5	2	69	2309E	18751	53159N	56369	7034N	17241N	7373E
6	4934N	12601W	19200	2215	5	2	69	2329E	18622	53381N	56537	7046N	17079N	7423E
6	4936N	12529W	19200	2220	5	2	69	2324E	18521	53500N	56615	7054N	16997N	7357E
6	4939N	12456W	19200	2225	5	2	69	2325E	18559	53780N	56892	7057N	17029N	7380E
6	4942N	12423W	19200	2230	5	2	69	2301E	18536	54306N	57382	7109N	17059N	7250E
6	4945N	12351W	19200	2235	5	2	69	2240E	17969	54292N	57188	7141N	16580N	6928E
6	4948N	12319W	19200	2240	5	2	69	2305E	17962	54146N	57048	7138N	16523N	7045E
6	4951N	12245W	19200	2245	5	2	69	2307E	17901	54468N	57334	7148N	16463N	7030E
6	4954N	12210W	19200	2250	5	2	69	2249E	17676	54525N	57319	7202N	16291N	6858E
6	4911N	12205W	19300	2320	5	2	69	2150E	18325	54377N	57382	7122N	17009N	6820E
6	4909N	12234W	19300	2325	5	2	69	2228E	18501	54359N	57421	7112N	17097N	7071E
6	4908N	12306W	19300	2330	5	2	69	2234E	18497	54201N	57270	7109N	17079N	7103E
6	4906N	12337W	19300	2335	5	2	69	2303E	18589	53859N	56976	7057N	17105N	7279E
6	4902N	12357W	19300	2340	5	2	69	2307E	18593	53641N	56772	7052N	17100N	7299E
6	4901N	12425W	19300	2345	5	2	69	2259E	18757	53533N	56724	7041N	17266N	7328E
6	4859N	12453W	19300	2350	5	2	69	2254E	18796	53294N	56511	7034N	17314N	7314E
6	4856N	12520W	19300	2355	5	2	69	2303E	18925	53195N	56462	7024N	17413N	7412E
6	4853N	12548W	19300	0	6	2	69	2302E	18994	52979N	56281	7016N	17480N	7432E
6	4850N	12615W	19300	5	6	2	69	2303E	19094	52828N	56173	7007N	17568N	7477E
6	4848N	12642W	19300	10	6	2	69	2256E	19138	52707N	56074	7002N	17624N	7461E
6	4846N	12709W	19300	15	6	2	69	2306E	19246	52549N	55962	6953N	17701N	7555E
6	4844N	12737W	19300	20	6	2	69	2301E	19346	52309N	55772	6942N	17806N	7564E
6	4841N	12804W	19300	25	6	2	69	2310E	19467	52214N	55726	6933N	17896N	7662E
6	4837N	12831W	19300	30	6	2	69	2235E	19511	52068N	55604	6927N	18014N	7495E
6	4834N	12858W	19300	35	6	2	69	2304E	19538	52083N	55628	6926N	17976N	7656E
6	4830N	12926W	19300	40	6	2	69	2302E	19823	51607N	55283	6859N	18241N	7758E
6	4827N	12951W	19300	45	6	2	69	2239E	19814	51634N	55305	6900N	18285N	7630E
6	4822N	13017W	19300	50	6	2	69	2302E	19904	51356N	55078	6848N	18317N	7788E
6	4818N	13042W	19300	55	6	2	69	2258E	19961	51194N	54949	6841N	18377N	7793E
6	4814N	13107W	19300	100	6	2	69	2247E	20037	50874N	54678	6830N	18472N	7763E
6	4809N	13134W	19300	105	6	2	69	2235E	20138	50774N	54622	6821N	18592N	7738E
6	4736N	13041W	19300	135	6	2	69	2239E	20238	50636N	54530	6812N	18676N	7794E
6	4739N	13008W	19300	140	6	2	69	2211E	20060	50829N	54644	6827N	18573N	7577E
6	4742N	12936W	19300	145	6	2	69	2244E	20140	50977N	54812	6826N	18574N	7788E
6	4744N	12903W	19300	150	6	2	69	2236E	19948	51351N	55090	6846N	18414N	7670E
6	4747N	12831W	19300	155	6	2	69	2145E	19857	51403N	55105	6852N	18442N	7360E
6	4749N	12759W	19300	200	6	2	69	2232E	19796	51716N	55375	6903N	18282N	7591E
6	4754N	12727W	19300	205	6	2	69	2232E	19713	51860N	55481	6911N	18208N	7555E
6	4759N	12655W	19300	210	6	2	69	2233E	19578	52089N	55647	6924N	18079N	7511E
6	4803N	12623W	19300	215	6	2	69	2231E	19484	52316N	55826	6934N	17997N	7463E
6	4808N	12550W	19300	220	6	2	69	2221E	19375	52473N	55936	6944N	17919N	7369E
6	4812N	12518W	19300	225	6	2	69	2228E	19286	52685N	56104	6953N	17821N	7373E
6	4815N	12446W	19300	230	6	2	69	2230E	19286	52897N	56303	6958N	17817N	7382E
6	4823N	12410W	19300	235	6	2	69	2239E	19154	53265N	56604	7013N	17675N	7379E
7	4916N	12052W	17400	1755	6	2	69	2246E	18156	54621N	57559	7136N	16739N	7030E
7	4918N	12020W	17400	1800	6	2	69	2205E	17842	54893N	57720	7159N	16533N	6708E
7	4919N	11948W	17400	1805	6	2	69	2223E	17868	54949N	57781	7159N	16520N	6808E
7	4920N	11916W	17400	1810	6	2	69				57946			
7	4922N	11843W	17400	1815	6	2	69	2210E	17387	55312N	57980	7232N	16101N	6562E
7	4923N	11810W	17400	1820	6	2	69	2143E	17410	55418N	58088	7233N	16173N	6444E
7	4923N	11737W	17400	1825	6	2	69	2158E	17265	55412N	58039	7241N	16010N	6462E
7	4924N	11704W	17400	1830	6	2	69	2132E	17234	55552N	58164	7245N	16030N	6328E
7	4925N	11631W	17400	1835	6	2	69	2143E	17145	55718N	58296	7253N	15928N	6344E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
7	4925N	11559W	17400	1840	6	2	69	2141E	17063	55841N	58390	7300N	15855N	6306E
7	4926N	11526W	17400	1845	6	2	69	2143E	17009	56065N	58588	7307N	15801N	6293E
7	4927N	11454W	17400	1850	6	2	69	2119E	16894	56200N	58684	7316N	15737N	6145F
7	4927N	11421W	17400	1855	6	2	69	2147E	16710	56348N	58774	7328N	15516N	6201E
7	4927N	11349W	17400	1900	6	2	69	2112E	16544	56828N	59187	7346N	15423N	5985E
7	4926N	11317W	17400	1905	6	2	69	1945E	16381	56756N	59073	7354N	15415N	5539E
7	4925N	11246W	17400	1910	6	2	69	2009E	16333	56670N	58977	7355N	15332N	5629F
7	4925N	11214W	17400	1915	6	2	69	1936E	16410	56759N	59084	7352N	15458N	5508F
7	4924N	11141W	17400	1920	6	2	69	1926E	16248	56966N	59238	7404N	15321N	5409E
7	4922N	11108W	17400	1925	6	2	69	1907E	16218	56898N	59164	7405N	15323N	5311E
7	4921N	11036W	17400	1930	6	2	69	1907E	16149	57065N	59307	7411N	15257N	5292E
7	4942N	11032W	17300	1950	6	2	69	1903E	15857	57370N	59521	7432N	14987N	5179E
7	4943N	11100W	17300	1955	6	2	69	1942E	16050	57207N	59416	7419N	15109N	5412E
7	4945N	11130W	17300	2000	6	2	69	1913E	15982	56953N	59153	7419N	15090N	5263F
7	4945N	11159W	17300	2005	6	2	69	1933E	16086	57030N	59256	7414N	15159N	5383E
7	4946N	11227W	17300	2010	6	2	69	1942E	16364	56898N	59204	7357N	15406N	5517E
7	4947N	11256W	17300	2015	6	2	69	1959E	16201	56788N	59054	7404N	15224N	5539E
7	4947N	11326W	17300	2020	6	2	69	2009E	16306	56821N	59114	7359N	15307N	5619F
7	4947N	11356W	17300	2025	6	2	69	2056E	16529	56625N	58988	7343N	15437N	5908E
7	4947N	11425W	17300	2030	6	2	69	2047E	16617	56393N	58790	7334N	15535N	5897E
7	4946N	11452W	17300	2035	6	2	69	2103E	16761	56364N	58803	7326N	15642N	6023E
7	4945N	11519W	17300	2040	6	2	69	2122E	16829	56260N	58724	7320N	15671N	6133E
7	4944N	11546W	17300	2045	6	2	69	2126E	16914	56033N	58531	7312N	15743N	6183E
7	4943N	11614W	17300	2050	6	2	69	2119E	17006	55893N	58422	7304N	15841N	6183E
7	4943N	11642W	17300	2055	6	2	69	2122E	17179	55813N	58397	7253N	15997N	6261E
7	4943N	11710W	17300	2100	6	2	69	2146E	17161	55704N	58288	7252N	15937N	6366E
7	4943N	11738W	17300	2105	6	2	69	2153E	17211	55620N	58222	7248N	15969N	6419E
7	4943N	11805W	17300	2110	6	2	69	2157E	17190	55527N	58127	7247N	15943N	6428E
7	4942N	11832W	17300	2115	6	2	69	2211E	17211	55355N	57969	7243N	15937N	6500E
7	4942N	11859W	17300	2120	6	2	69	2221E	17230	55322N	57943	7242N	15935N	6554E
7	4941N	11926W	17300	2125	6	2	69			55401N	58048			
7	4940N	11954W	17300	2130	6	2	69			55100N	57813			
7	4938N	12021W	17300	2135	6	2	69	2228E	17562	54991N	57727	7217N	16229N	6712E
7	4937N	12048W	17300	2140	6	2	69	2235E	17813	54935N	57751	7202N	16447N	6841E
7	4935N	12116W	17300	2145	6	2	69	2249E	17858	54633N	57478	7153N	16460N	6926F
7	4932N	12144W	17300	2150	6	2	69	2222E	17880	54403N	57266	7148N	16534N	6806F
7	4931N	12211W	17300	2155	6	2	69	2225E	17625	54761N	57528	7209N	16293N	6722E
7	4930N	12239W	17300	2200	6	2	69	2313E	17764	54444N	57269	7155N	16324N	7004E
7	5003N	12401W	17400	2240	6	2	69			54269N	57061			
7	5006N	12329W	17400	2245	6	2	69	2337E	17800	54302N	57145	7151N	16308N	7133E
7	5009N	12256W	17400	2250	6	2	69	2331E	17909	54626N	57487	7150N	16421N	7149F
7	5011N	12225W	17400	2255	6	2	69	2251E	17512	54697N	57432	7214N	16138N	6801E
7	5013N	12153W	17400	2300	6	2	69	2343E	17608	54779N	57540	7210N	16120N	7084E
7	5015N	12121W	17400	2305	6	2	69	2308E	17664	55228N	57984	7215N	16242N	6942E
7	5016N	12046W	17400	2310	6	2	69	2308E	17272	55204N	57843	7237N	15883N	6786F
7	5018N	12013W	17400	2315	6	2	69	2309E	17342	55250N	57908	7234N	15945N	6819F
7	5020N	11940W	17400	2320	6	2	69	2306E	17109	55508N	58085	7252N	15737N	6713E
7	5022N	11908W	17400	2325	6	2	69	2300E	16908	55639N	58151	7305N	15563N	6609F
7	5023N	11833W	17400	2330	6	2	69	2230E	16945	55741N	58260	7305N	15654N	6487E
7	5025N	11759W	17400	2335	6	2	69	2239E	16660	55965N	58392	7325N	15374N	6418F
7	5026N	11724W	17400	2340	6	2	69	2231E	16706	56052N	58489	7324N	15431N	6401E
7	5027N	11650W	17400	2345	6	2	69	2216E	16625	56176N	58584	7330N	15383N	6304F
7	5027N	11615W	17400	2350	6	2	69	2224E	16490	56410N	58771	7342N	15245N	6285E
7	5028N	11541W	17400	2355	6	2	69	2203E	16299	56569N	58871	7355N	15105N	6122E
7	5028N	11507W	17400	0	7	2	69	2220E	16173	56777N	59035	7405N	14959N	6148F
7	5028N	11433W	17300	5	7	2	69	2200E	16068	57010N	59231	7415N	14896N	6022E
7	5028N	11359W	17300	10	7	2	69	2105E	16085	57296N	59511	7419N	15007N	5788E
7	5027N	11325W	17300	15	7	2	69	2028E	16177	57054N	59303	7410N	15155N	5657E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
7	5027N	11252W	17300	20	7	2	69	2025E	15959	57094N	59283	7422N	14956N	5570E
7	5027N	11217W	17300	25	7	2	69	2044E	15681	57207N	59317	7440N	14665N	5553E
7	5004N	11126W	17300	55	7	2	69	2000E	15908	57106N	59280	7426N	14947N	5442E
7	5004N	11155W	17300	100	7	2	69	1918E	15873	57142N	59306	7428N	14981N	5247E
7	5005N	11223W	17300	105	7	2	69	2009E	15954	57117N	59303	7423N	14976N	5499E
7	5006N	11251W	17300	110	7	2	69	2021E	15973	57020N	59216	7421N	14976N	5555E
7	5007N	11318W	17300	115	7	2	69	2050E	16015	56931N	59141	7417N	14966N	5700E
7	5007N	11347W	17300	120	7	2	69	2107E	16200	56691N	58961	7403N	15110N	5840E
7	5007N	11416W	17300	125	7	2	69	2046E	16502	56685N	59038	7346N	15429N	5853E
7	5006N	11446W	17300	130	7	2	69	2135E	16568	56735N	59105	7343N	15406N	6095E
7	5005N	11515W	17300	135	7	2	69	2203E	16635	56464N	58864	7335N	15417N	6249E
7	5005N	11543W	17300	140	7	2	69	2155E	16595	56201N	58629	7327N	15488N	6232E
7	5005N	11612W	17300	145	7	2	69	2148E	16709	56108N	58543	7324N	15514N	6205E
7	5004N	11641W	17300	150	7	2	69	2214E	16704	56076N	58511	7324N	15461N	6323E
7	5004N	11709W	17300	155	7	2	69	2157E	16926	55869N	58377	7308N	15698N	6328E
7	5003N	11739W	17300	200	7	2	69	2208E	16926	55778N	58289	7307N	15678N	6378E
7	5002N	11808W	17300	205	7	2	69	2210E	16970	55804N	58328	7305N	15714N	6406E
7	5002N	11837W	17300	210	7	2	69	2229E	17042	55486N	58045	7255N	15745N	6521E
7	5002N	11906W	17300	215	7	2	69	2223E	17253	55375N	58001	7241N	15953N	6570E
7	5001N	11937W	17300	220	7	2	69	2219E	17231	55307N	57929	7241N	15940N	6546E
7	4959N	12007W	17300	225	7	2	69	2228E	17246	55210N	57841	7239N	15937N	6590E
7	4957N	12038W	17300	230	7	2	69	2228E	17473	55026N	57734	7223N	16145N	6680E
7	4956N	12108W	17300	235	7	2	69	2252E	17747	54974N	57768	7206N	16352N	6896E
8	5103N	12419W	18200	1805	9	2	69	2359E	17534	54618N	57363	7212N	16018N	7131E
8	5101N	12447W	18200	1810	9	2	69	2419E	17431	54542N	57260	7216N	15883N	7182E
8	5059N	12514W	18200	1815	9	2	69	2401E	17584	54445N	57214	7206N	16060N	7160E
8	5056N	12542W	18200	1820	9	2	69	2409E	17610	54363N	57144	7203N	16067N	7207E
8	5053N	12611W	18200	1825	9	2	69	2401E	17634	54402N	57189	7202N	16105N	7181E
8	5050N	12640W	18200	1830	9	2	69	2512E	18051	54520N	57431	7140N	16333N	7687E
8	5047N	12710W	18200	1835	9	2	69	2453E	18312	54000N	57021	7116N	16610N	7708E
8	5044N	12739W	18200	1840	9	2	69	2428E	18267	53666N	56690	7112N	16625N	7570E
8	5036N	12805W	18200	1845	9	2	69	2434E	18362	53547N	56608	7104N	16698N	7636E
8	5031N	12831W	18200	1850	9	2	69	2434E	18610	53278N	56435	7044N	16924N	7739E
8	5031N	12858W	18200	1855	9	2	69	2430E	18437	53159N	56265	7052N	16775N	7649E
8	5031N	12925W	18100	1900	9	2	69	2408E	18637	52971N	56154	7036N	17007N	7624E
8	5027N	12949W	18100	1905	9	2	69	2416E	18706	52852N	56065	7030N	17051N	7692E
8	5024N	13013W	18100	1910	9	2	69	2430E	18746	52748N	55980	7026N	17056N	7776E
8	5021N	13037W	18100	1915	9	2	69	2430E	18870	52615N	55896	7016N	17170N	7828E
8	5018N	13101W	18100	1920	9	2	69	2355E	18889	52370N	55672	7009N	17267N	7659E
8	5015N	13128W	18100	1925	9	2	69	2351E	19001	52234N	55583	7000N	17378N	7683E
8	5012N	13154W	18100	1930	9	2	69	2403E	19095	52081N	55471	6951N	17437N	7782E
8	5008N	13220W	18100	1935	9	2	69	2353E	19215	51963N	55402	6942N	17568N	7784E
8	5005N	13246W	18100	1940	9	2	69	2333E	19187	51813N	55252	6940N	17589N	7666E
8	5000N	13310W	18100	1945	9	2	69	2408E	19325	51864N	55347	6933N	17634N	7905E
8	4956N	13332W	18100	1950	9	2	69	2358E	19510	51480N	55053	6914N	17828N	7925E
8	4951N	13356W	18100	1955	9	2	69	2352E	19620	51279N	54905	6903N	17941N	7941E
8	5032N	13400W	19300	2020	9	2	69	2353E	19131	51635N	55065	6940N	17492N	7747E
8	5036N	13326W	19300	2025	9	2	69	2427E	19088	51737N	55146	6944N	17374N	7904E
8	5042N	13253W	19200	2030	9	2	69	2359E	18889	52176N	55490	7005N	17257N	7678E
8	5047N	13220W	19200	2035	9	2	69	2408E	18827	52207N	55499	7010N	17182N	7698E
8	5053N	13148W	19200	2040	9	2	69	2406E	18730	52399N	55646	7019N	17097N	7650E
8	5057N	13112W	19200	2045	9	2	69	2408E	18701	52575N	55802	7025N	17065N	7648E
8	5102N	13037W	19200	2050	9	2	69	2420E	18644	52909N	56098	7035N	16986N	7685E
8	5107N	13001W	19200	2055	9	2	69	2400E	18477	52950N	56082	7045N	16879N	7516E
8	5112N	12925W	19200	2100	9	2	69	2423E	18487	53148N	56271	7049N	16838N	7633E
8	5115N	12849W	19200	2105	9	2	69	2420E	18373	53448N	56518	7101N	16741N	7571E
8	5119N	12813W	19200	2110	9	2	69	2353E	18109	53656N	56630	7121N	16557N	7334E
8	5122N	12738W	19200	2115	9	2	69	2420E	17989	54126N	57037	7136N	16390N	7415E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
8	5126N	12702W	19200	2120	9	2	69	2458E	17214	54381N	57040	7226N	15603N	7270E
8	5130N	12626W	19200	2125	9	2	69	2355E	17491	54148N	56903	7205N	15988N	7094E
8	5133N	12549W	19200	2130	9	2	69	2425E	17416	54449N	57167	7215N	15857N	7202E
8	5117N	12507W	19200	2205	9	2	69	2434E	17542	54403N	57161	7207N	15952N	7296E
8	5114N	12532W	19200	2210	9	2	69	2425E	17298	54409N	57092	7221N	15750N	7151E
8	5112N	12556W	19300	2215	9	2	69	2422E	17281	54307N	56991	7220N	15740N	7133E
8	5110N	12621W	19300	2220	9	2	69	2428E	17454	54300N	57036	7210N	15886N	7230E
8	5109N	12646W	19300	2225	9	2	69	2445E	17517	54572N	57315	7212N	15908N	7335E
8	5107N	12710W	19300	2230	9	2	69	2500E	18050	54460N	57374	7139N	16358N	7628E
8	5105N	12735W	19300	2235	9	2	69	2500E	18303	53778N	56808	7112N	16587N	7739E
8	5144N	12734W	19300	2345	9	2	69	2436E	17326	54395N	57088	7219N	15753N	7213E
8	5149N	12654W	19300	2350	9	2	69	2442E	17354	54342N	57045	7217N	15765N	7253E
8	5153N	12614W	19300	2355	9	2	69	2436E	17410	54515N	57228	7217N	15829N	7248E
8	5155N	12536W	19300	0	10	2	69	2456E	17289	54892N	57550	7231N	15676N	7291E
8	5157N	12458W	19300	5	10	2	69	2323E	17101	55254N	57840	7248N	15695N	6789E
8	5201N	12420W	19300	10	10	2	69	2405E	16920	55270N	57802	7258N	15447N	6905E
8	5205N	12343W	19300	15	10	2	69	2448E	16719	55469N	57934	7313N	15177N	7013E
8	5209N	12306W	19300	20	10	2	69	2429E	16466	55649N	58034	7330N	14984N	6827E
8	5212N	12229W	19300	25	10	2	69	2436E	16299	55852N	58182	7343N	14820N	6785E
8	5215N	12159W	19300	30	10	2	69	2438E	16231	56005N	58310	7350N	14752N	6769E
8	5217N	12128W	19300	35	10	2	69	2426E	16203	56332N	58616	7357N	14752N	6702E
8	5219N	12057W	19300	40	10	2	69	2401E	16022	56190N	58429	7405N	14633N	6523E
8	5221N	12020W	19300	45	10	2	69	2447E	15869	56370N	58562	7416N	14406N	6654E
8	5222N	11941W	19300	50	10	2	69	2356E	15936	56512N	58717	7415N	14565N	6467E
8	5225N	11904W	19300	55	10	2	69	2403E	15741	56698N	58843	7429N	14374N	6416E
8	5227N	11826W	19300	100	10	2	69	2417E	15300	56946N	58966	7457N	13946N	6295E
8	5230N	11749W	19300	105	10	2	69	2423E	15480	56956N	59022	7447N	14098N	6392E
8	5231N	11712W	19300	110	10	2	69	2400E	15330	57223N	59241	7500N	14003N	6237E
8	5230N	11635W	19300	115	10	2	69	2241E	15087	57375N	59326	7515N	13920N	5820E
8	5230N	11559W	19300	120	10	2	69	2346E	15059	57329N	59274	7516N	13782N	6069E
8	5228N	11523W	19300	125	10	2	69	2324E	14916	57511N	59414	7527N	13688N	5926E
8	5227N	11446W	19300	130	10	2	69	2240E	14866	57832N	59713	7535N	13718N	5730E
8	5226N	11410W	19300	135	10	2	69	2152E	14609	57947N	59761	7550N	13558N	5442E
8	5226N	11335W	19300	140	10	2	69	2204E	14714	57912N	59752	7544N	13636N	5528E
10	5447N	11636W	20200	1850	12	2	69	2523E	13757	58156N	59761	7641N	12428N	5898E
10	5447N	11713W	20200	1855	12	2	69	2536E	13639	58009N	59591	7646N	12299N	5896E
10	5446N	11749W	20200	1900	12	2	69	2546E	13927	57927N	59578	7628N	12542N	6055E
10	5446N	11825W	20200	1905	12	2	69	2518E	14149	57707N	59417	7613N	12792N	6047E
10	5445N	11901W	20200	1910	12	2	69	2516E	14101	57612N	59313	7614N	12751N	6020E
10	5444N	11937W	20200	1915	12	2	69	2529E	14139	58024N	59722	7618N	12762N	6086E
10	5442N	12014W	20200	1920	12	2	69	2701E	14328	57701N	59454	7603N	12763N	6511E
10	5441N	12050W	20200	1925	12	2	69	2649E	14539	57547N	59355	7549N	12975N	6559E
10	5439N	12126W	20200	1930	12	2	69	2648E	14824	57196N	59086	7528N	13230N	6686E
10	5437N	12202W	20200	1935	12	2	69	2638E	14952	57038N	58965	7518N	13363N	6706E
10	5435N	12238W	20200	1940	12	2	69	2627E	14902	56920N	58839	7519N	13340N	6641E
10	5433N	12314W	20200	1945	12	2	69	2648E	15172	56764N	58757	7502N	13541N	6843E
10	5432N	12350W	20200	1950	12	2	69	2644E	15227	56678N	58688	7457N	13599N	6851E
10	5430N	12428W	20200	1955	12	2	69	2713E	15182	56439N	58446	7456N	13500N	6946E
10	5426N	12502W	20200	2000	12	2	69	2633E	15401	56234N	58305	7441N	13775N	6886E
10	5421N	12536W	20200	2005	12	2	69	2647E	15544	56131N	58244	7431N	13875N	7007E
10	5416N	12608W	20200	2010	12	2	69	2701E	15830	55900N	58098	7411N	14102N	7191E
10	5412N	12641W	20200	2015	12	2	69	2625E	15958	55782N	58020	7402N	14290N	7102E
10	5409N	12715W	20200	2020	12	2	69	2729E	16005	55740N	57993	7358N	14198N	7387E
10	5407N	12749W	20200	2025	12	2	69	2709E	16226	55483N	57807	7341N	14438N	7405E
10	5405N	12823W	20200	2030	12	2	69	2624E	16448	55268N	57663	7325N	14731N	7316E
10	5400N	12857W	20200	2035	12	2	69	2639E	16593	55133N	57576	7314N	14829N	7444E
10	5354N	12931W	20200	2040	12	2	69	2702E	16673	54799N	57280	7304N	14850N	7580E
10	5348N	13002W	20200	2045	12	2	69	2628E	16703	54612N	57109	7259N	14951N	7446E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
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10	5335N	13102W	20200	2055	12	2	69	2622E	17119	54303N	56937	7230N	15338N	7603E
10	5332N	13134W	20200	2100	12	2	69	2618E	17271	54114N	56803	7217N	15481N	7655E
10	5330N	13206W	20200	2105	12	2	69	2613E	17259	53971N	56663	7215N	15482N	7627E
10	5326N	13236W	20200	2110	12	2	69	2609E	17429	54068N	56808	7207N	15644N	7684E
10	5256N	13106W	20200	2140	12	2	69	2523E	17485	53891N	56657	7201N	15796N	7495E
10	5303N	13031W	20200	2145	12	2	69	2557E	17148	54250N	56896	7227N	15418N	7504E
10	5309N	12955W	20200	2150	12	2	69	2548E	17127	54364N	56998	7230N	15418N	7456E
10	5315N	12919W	20200	2155	12	2	69	2556E	16770	54727N	57239	7257N	15081N	7334E
10	5320N	12843W	20200	2200	12	2	69	2620E	16823	54639N	57171	7253N	15075N	7466E
10	5324N	12807W	20200	2205	12	2	69	2604E	16780	54958N	57463	7301N	15071N	7376E
10	5329N	12733W	20200	2210	12	2	69	2613E	16535	55282N	57702	7320N	14833N	7306E
10	5333N	12658W	20200	2215	12	2	69	2626E	16216	55542N	57861	7343N	14520N	7220E
10	5337N	12623W	20200	2220	12	2	69	2610E	16052	55642N	57912	7354N	14407N	7079E
10	5341N	12549W	20200	2225	12	2	69	2609E	15922	55746N	57975	7403N	14292N	7018E
10	5343N	12514W	20200	2230	12	2	69	2602E	15982	56023N	58258	7404N	14359N	7017E
10	5346N	12439W	20200	2235	12	2	69	2613E	15636	56299N	58430	7428N	14027N	6908E
10	5348N	12405W	20200	2240	12	2	69	2530E	15549	56370N	58476	7434N	14034N	6695E
10	5350N	12331W	20200	2245	12	2	69	2541E	15578	56344N	58458	7432N	14038N	6754E
10	5353N	12258W	20200	2250	12	2	69	2537E	15371	56482N	58537	7446N	13858N	6649E
10	5354N	12226W	20200	2255	12	2	69	2533E	15311	56571N	58607	7451N	13814N	6604E
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11	5244N	12406W	18200	1720	13	2	69	2547E	16355	55720N	58071	7338N	14727N	7115E
11	5242N	12437W	18200	1725	13	2	69	2557E	16409	55640N	58009	7334N	14753N	7183E
11	5239N	12507W	18200	1730	13	2	69	2542E	16569	55327N	57755	7319N	14928N	7188E
11	5236N	12538W	18200	1735	13	2	69	2537E	16817	55301N	57801	7305N	15163N	7272E
11	5233N	12608W	18200	1740	13	2	69	2606E	17112	55272N	57860	7247N	15365N	7532E
11	5230N	12638W	18200	1745	13	2	69	2557E	17152	54824N	57445	7237N	15421N	7509E
11	5227N	12708W	18200	1750	13	2	69	2537E	17097	54541N	57159	7235N	15415N	7395E
11	5224N	12736W	18200	1755	13	2	69	2526E	17001	54555N	57143	7241N	15353N	7303E
11	5221N	12805W	18200	1800	13	2	69	2557E	17089	54447N	57066	7234N	15364N	7481E
11	5218N	12834W	18200	1805	13	2	69	2538E	17221	54528N	57183	7228N	15525N	7451E
11	5215N	12903W	18200	1810	13	2	69	2529E	17474	54406N	57144	7211N	15774N	7519E
11	5212N	12933W	18200	1815	13	2	69	2531E	17842	54068N	56936	7144N	16102N	7686E
11	5208N	13001W	18200	1820	13	2	69	2525E	17826	53868N	56741	7141N	16100N	7652E
11	5204N	13030W	18200	1825	13	2	69	2528E	17955	53636N	56562	7129N	16209N	7723E
11	5200N	13057W	18200	1830	13	2	69	2517E	17955	53503N	56435	7126N	16233N	7672E
11	5157N	13126W	18200	1835	13	2	69	2522E	18128	53226N	56229	7111N	16380N	7767E
11	5154N	13154W	18200	1840	13	2	69	2504E	18142	53063N	56078	7107N	16431N	7690E
11	5150N	13223W	18200	1845	13	2	69	2501E	18222	52944N	55992	7100N	16511N	7709E
11	5147N	13250W	18200	1850	13	2	69	2451E	18348	52856N	55950	7051N	16649N	7711E
11	5142N	13320W	18200	1855	13	2	69	2506E	18498	52645N	55801	7038N	16749N	7851E
11	5136N	13350W	18200	1900	13	2	69	2444E	18534	52407N	55588	7031N	16833N	7755E
11	5131N	13420W	18200	1905	13	2	69	2431E	18675	52295N	55529	7020N	16990N	7752E
11	5126N	13450W	18000	1910	13	2	69	2431E	18896	52032N	55357	7002N	17191N	7843E
11	5120N	13519W	18000	1915	13	2	69	2418E	18902	51763N	55107	6956N	17225N	7783E
11	5115N	13548W	18000	1920	13	2	69	2413E	19015	51581N	54974	6945N	17340N	7802E
11	5109N	13617W	18000	1925	13	2	69	2344E	19195	51376N	54845	6930N	17570N	7729E
11	5103N	13647W	18000	1930	13	2	69	2342E	19316	51276N	54794	6921N	17686N	7766E
11	5056N	13715W	18000	1935	13	2	69	2356E	19455	50980N	54567	6906N	17781N	7896E
11	5049N	13744W	18000	1940	13	2	69	2357E	19539	50751N	54383	6856N	17855N	7935E
11	5042N	13813W	18000	1945	13	2	69	2344E	19599	50446N	54120	6846N	17940N	7891E
11	5137N	13728W	19300	2015	13	2	69	2417E	19038	51288N	54708	6938N	17353N	7830E
11	5142N	13658W	19300	2020	13	2	69	2428E	19043	51532N	54938	6943N	17332N	7889E
11	5147N	13629W	19300	2025	13	2	69	2402E	18827	51686N	55008	6959N	17194N	7668E
11	5151N	13559W	19300	2030	13	2	69	2407E	18835	51776N	55096	7000N	17191N	7697E
11	5157N	13527W	19300	2035	13	2	69	2421E	18733	51960N	55234	7010N	17066N	7724E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
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11	5207N	13423W	19300	2045	13	2	69	2432E	18463	52425N	55581	7035N	16795N	7669E
11	5212N	13350W	19300	2050	13	2	69	2434E	18409	52527N	55660	7041N	16741N	7657E
11	5217N	13318W	19300	2055	13	2	69	2512E	18261	52884N	55949	7056N	16521N	7779E
11	5221N	13244W	19300	2100	13	2	69	2447E	18042	53085N	56067	7113N	16379N	7565E
11	5225N	13211W	19300	2105	13	2	69	2518E	17941	53192N	56137	7121N	16219N	7668E
11	5229N	13138W	19300	2110	13	2	69	2532E	17826	53502N	56393	7134N	16084N	7685E
11	5234N	13103W	19300	2115	13	2	69	2545E	17469	53788N	56554	7200N	15733N	7592E
11	5240N	13029W	19200	2120	13	2	69	2528E	17480	53912N	56675	7202N	15780N	7519E
11	5245N	12953W	19200	2125	13	2	69	2533E	17403	54001N	56736	7208N	15701N	7507E
11	5250N	12916W	19200	2130	13	2	69	2625E	17217	54390N	57050	7226N	15419N	7661E
11	5256N	12839W	19200	2135	13	2	69	2524E	16991	54581N	57164	7242N	15347N	7290E
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11	5306N	12725W	19200	2145	13	2	69	2530E	16938	54947N	57498	7252N	15287N	7294E
11	5311N	12647W	19200	2150	13	2	69	2604E	16705	55404N	57867	7313N	15004N	7343E
11	5315N	12610W	19500	2155	13	2	69	2552E	16438	55610N	57989	7331N	14791N	7173E
11	5320N	12532W	19500	2200	13	2	69	2521E	16111	55770N	58051	7353N	14559N	6901E
11	5323N	12455W	19500	2205	13	2	69	2510E	16100	55688N	57968	7352N	14570N	6850E
11	5325N	12419W	19500	2210	13	2	69	2528E	16065	55945N	58206	7358N	14503N	6911E
11	5328N	12344W	19500	2215	13	2	69	2505E	15831	56142N	58331	7415N	14338N	6713E
12	5257N	12157W	19200	1835	14	2	69	2503E	15696	56241N	58390	7424N	14219N	6647E
12	5258N	12119W	19200	1840	14	2	69	2503E	15737	56373N	58529	7424N	14257N	6663E
12	5259N	12041W	19200	1845	14	2	69	2501E	15532	56574N	58668	7438N	14074N	6571E
12	5300N	12002W	19200	1850	14	2	69	2508E	15488	56716N	58792	7443N	14020N	6580E
12	5302N	11923W	19200	1855	14	2	69	2456E	15370	56924N	58962	7453N	13937N	6480E
12	5304N	11844W	18300	1900	14	2	69	2437E	15265	57124N	59128	7502N	13876N	6361E
12	5305N	11805W	18300	1905	14	2	69	2426E	15153	57300N	59269	7511N	13794N	6271E
12	5306N	11728W	18300	1910	14	2	69	2423E	15049	57432N	59371	7518N	13706N	6213E
12	5306N	11650W	18300	1915	14	2	69	2433E	14809	57700N	59571	7536N	13469N	6155E
12	5307N	11613W	18300	1920	14	2	69	2349E	14598	57853N	59666	7550N	13354N	5894E
12	5307N	11533W	18300	1925	14	2	69	2402E	14474	58005N	59784	7559N	13218N	5897E
12	5307N	11452W	18300	1930	14	2	69	2235E	14344	58122N	59866	7608N	13244N	5509E
12	5307N	11411W	18300	1935	14	2	69	2314E	14227	58077N	59795	7614N	13073N	5612E
12	5348N	11453W	18300	2005	14	2	69	2345E	13930	58409N	60047	7635N	12750N	5612E
12	5348N	11519W	18300	2010	14	2	69	2408E	13963	58303N	59952	7631N	12741N	5710E
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12	5347N	11612W	18300	2020	14	2	69	2451E	14234	57983N	59704	7612N	12915N	5983E
12	5347N	11641W	18300	2025	14	2	69	2442E	14353	57959N	59710	7605N	13038N	6000E
12	5346N	11709W	18300	2030	14	2	69	2521E	14444	57805N	59582	7558N	13051N	6187E
12	5346N	11735W	18300	2035	14	2	69	2514E	14392	57661N	59431	7559N	13019N	6136E
12	5346N	11801W	18300	2040	14	2	69	2518E	14469	57614N	59403	7554N	13081N	6183E
12	5345N	11827W	18300	2045	14	2	69	2529E	14637	57457N	59293	7542N	13213N	6298E
12	5345N	11853W	18300	2050	14	2	69	2448E	14770	57287N	59161	7532N	13406N	6198E
12	5343N	11919W	18300	2055	14	2	69			57321N	59235			
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12	5340N	12015W	18300	2105	14	2	69			57021N	59045			
12	5339N	12042W	18300	2110	14	2	69	2532E	15421	56856N	58911	7449N	13914N	6649E
12	5337N	12111W	18300	2115	14	2	69	2533E	15427	56684N	58746	7446N	13918N	6654E
12	5336N	12139W	18300	2120	14	2	69	2535E	15498	56571N	58656	7440N	13979N	6693E
12	5334N	12208W	18300	2125	14	2	69	2528E	15613	56417N	58538	7431N	14096N	6714E
12	5355N	12122W	18300	2150	14	2	69	2544E	15244	56758N	58769	7457N	13730N	6621E
12	5356N	12043W	18300	2155	14	2	69	2553E	15227	57014N	59013	7502N	13699N	6649E
12	5358N	12004W	18300	2200	14	2	69	2547E	15070	57410N	59355	7517N	13578N	6537E
12	5400N	11924W	18300	2205	14	2	69	2500E	14598	57711N	59528	7548N	13230N	6170E
12	5401N	11845W	18300	2210	14	2	69	2454E	14444	57420N	59209	7552N	13100N	6084E
12	5403N	11805W	18300	2215	14	2	69	2515E	14300	57500N	59251	7602N	12932N	6101E
12	5405N	11725W	18200	2220	14	2	69	2520E	14162	57736N	59447	7613N	12798N	6062E
12	5406N	11644W	18200	2225	14	2	69	2502E	14039	57997N	59672	7623N	12720N	5941E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
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12	5428N	11539W	18200	2300	14	2	69	2430E	13627	58608N	60171	7654N	12398N	5654E
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12	5426N	11658W	18200	2315	14	2	69	2502E	13931	57937N	59588	7628N	12621N	5897E
12	5425N	11724W	18200	2320	14	2	69	2506E	14081	57799N	59489	7618N	12751N	5975E
12	5425N	11752W	18200	2325	14	2	69	2506E	14226	57719N	59446	7609N	12881N	6037E
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12	5419N	12045W	18200	2355	14	2	69	2610E	15073	57516N	59459	7518N	13527N	6649E
12	5418N	12114W	18200	0	15	2	69	2619E	15193	57095N	59082	7505N	13617N	6737E
12	5416N	12144W	18200	5	15	2	69	2617E	15167	56818N	58808	7503N	13598N	6717E
12	5415N	12214W	18200	10	15	2	69	2609E	15109	56725N	58703	7505N	13562N	6660E
12	5412N	12242W	18200	15	15	2	69	2606E	15323	56651N	58687	7451N	13759N	6743E
12	5411N	12311W	18200	20	15	2	69	2608E	15351	56533N	58580	7448N	13781N	6763E
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13	5320N	12014W	17300	1855	16	2	69	2502E	15350	56832N	58868	7453N	13908N	6495E
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13	5321N	11904W	17300	1905	16	2	69	2422E	15094	57237N	59194	7513N	13749N	6227E
13	5322N	11829W	17200	1910	16	2	69	2455E	15019	57362N	59296	7519N	13620N	6330E
13	5323N	11756W	17200	1915	16	2	69	2417E	14780	57604N	59470	7536N	13473N	6078E
13	5325N	11724W	17200	1920	16	2	69	2418E	14674	57785N	59619	7545N	13373N	6040E
13	5326N	11652W	17200	1925	16	2	69	2420E	14605	57775N	59593	7548N	13306N	6021E
13	5327N	11618W	17200	1930	16	2	69	2346E	14475	57907N	59688	7557N	13246N	5837E
13	5327N	11545W	17200	1935	16	2	69	2341E	14353	58053N	59801	7606N	13143N	5766E
13	5327N	11510W	17200	1940	16	2	69	2338E	14144	58317N	60008	7621N	12957N	5671E
13	5328N	11437W	17200	1945	16	2	69	2224E	13949	58492N	60132	7635N	12895N	5319E
13	5328N	11404W	17200	1950	16	2	69	2225E	13858	58243N	59869	7636N	12811N	5285E
13	5249N	11418W	18200	2015	16	2	69	2244E	14589	58060N	59865	7553N	13455N	5639E
13	5248N	11451W	18200	2020	16	2	69	2259E	14735	57780N	59629	7541N	13564N	5756E
13	5247N	11522W	18200	2025	16	2	69	2252E	14901	57598N	59494	7529N	13730N	5790E
13	5247N	11554W	18200	2030	16	2	69	2300E	15037	57558N	59490	7521N	13840N	5879E
13	5246N	11624W	18300	2035	16	2	69	2308E	15139	57533N	59492	7515N	13920N	5950E
13	5245N	11653W	18300	2040	16	2	69	2329E	15289	57474N	59473	7506N	14021N	6096E
13	5243N	11723W	18300	2045	16	2	69	2358E	15443	57228N	53275	7453N	14111N	6274E
13	5243N	11754W	18300	2050	16	2	69	2344E	15437	57034N	59086	7451N	14130N	6215E
13	5243N	11826W	18300	2055	16	2	69	2403E	15425	56996N	59046	7451N	14086N	6286E
13	5242N	11857W	18300	2100	16	2	69	2415E	15564	56863N	58954	7441N	14189N	6395E
13	5241N	11929W	18300	2105	16	2	69	2424E	15766	56684N	58836	7427N	14357N	6515E
13	5239N	11959W	18300	2110	16	2	69	2420E	15776	56548N	58707	7424N	14372N	6504E
13	5237N	12030W	18300	2115	16	2	69	2443E	15886	56433N	58626	7416N	14431N	6643E
13	5235N	12100W	18300	2120	16	2	69	2447E	15899	56229N	58434	7412N	14434N	6666E
13	5232N	12130W	18300	2125	16	2	69	2412E	16126	56271N	58536	7400N	14708N	6611E
13	5232N	12202W	18300	2130	16	2	69	2440E	16274	56050N	58365	7348N	14787N	6795E
13	5231N	12234W	18300	2135	16	2	69	2453E	16478	55886N	58264	7334N	14947N	6934E
13	5230N	12305W	18300	2140	16	2	69	2504E	16521	55662N	58062	7328N	14963N	7003E
13	5227N	12337W	18300	2145	16	2	69	2529E	16299	55760N	58094	7342N	14713N	7014E
13	5225N	12409W	18300	2150	16	2	69	2515E	16720	55377N	57846	7311N	15122N	7134E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
13	5222N	12441W	18300	2155	16	2	69	2513E	16687	55253N	57718	7311N	15096N	7109E
13	5220N	12512W	18300	2200	16	2	69	2526E	16870	55272N	57789	7301N	15235N	7245E
13	5217N	12544W	18300	2205	16	2	69	2436E	17171	55012N	57630	7239N	15611N	7149E
13	5213N	12614W	18300	2210	16	2	69	2454E	17270	54831N	57487	7231N	15663N	7273E
13	5210N	12645W	18300	2215	16	2	69	2507E	17268	54589N	57255	7226N	15633N	7334E
13	5207N	12716W	18300	2220	16	2	69	2451E	17471	54446N	57180	7212N	15852N	7345E
13	5205N	12746W	18300	2225	16	2	69	2431E	17527	54367N	57123	7207N	15946N	7273E
15	4954N	12555W	7500	1725	20	2	69	2333E	18445	53514N	56603	7058N	16908N	7373E
15	4951N	12627W	8000	1730	20	2	69	2328E	18483	53306N	56419	7052N	16952N	7364E
15	4948N	12700W	10000	1735	20	2	69	2346E	18653	53157N	56335	7039N	17070N	7520E
15	4945N	12732W	12000	1740	20	2	69	2403E	18782	52901N	56137	7027N	17150N	7658E
15	4942N	12805W	15000	1745	20	2	69			52737N				
15	4937N	12839W	18200	1750	20	2	69			52613N				
15	4932N	12912W	18200	1755	20	2	69	2343E	19108	52463N	55835	6959N	17493N	7688E
15	4927N	12945W	18200	1800	20	2	69	2343E	19169	52344N	55744	6953N	17549N	7711E
15	4923N	13017W	18200	1805	20	2	69	2329E	19335	52021N	55498	6936N	17733N	7705E
15	4919N	13049W	18100	1810	20	2	69	2349E	19516	51876N	55426	6922N	17853N	7883E
15	4914N	13118W	18100	1815	20	2	69	2328E	19512	51671N	55233	6918N	17897N	7772E
15	4909N	13148W	18100	1820	20	2	69	2343E	19480	51568N	55125	6918N	17832N	7840E
15	4903N	13217W	18100	1825	20	2	69	2323E	19667	51329N	54968	6902N	18050N	7809E
15	4859N	13245W	18100	1830	20	2	69	2317E	19765	51210N	54892	6853N	18155N	7813E
15	4855N	13314W	18100	1835	20	2	69	2344E	19866	50946N	54683	6841N	18184N	7999E
15	4851N	13341W	18100	1840	20	2	69	2330E	19877	50773N	54525	6837N	18227N	7929E
15	4847N	13408W	18100	1845	20	2	69	2338E	20099	50599N	54445	6820N	18412N	8061E
15	4843N	13435W	18100	1850	20	2	69	2341E	20091	50306N	54170	6813N	18398N	8072E
15	4838N	13502W	18100	1855	20	2	69	2308E	20153	50205N	54099	6807N	18531N	7923E
15	4833N	13528W	18100	1900	20	2	69	2322E	20364	49862N	53860	6747N	18693N	8079E
15	4829N	13554W	18100	1905	20	2	69	2305E	20355	49811N	53810	6746N	18723N	7985E
15	4824N	13619W	18100	1910	20	2	69	2326E	20610	49512N	53630	6723N	18910N	8197E
15	4819N	13645W	18100	1915	20	2	69	2248E	20680	49274N	53438	6713N	19062N	8019E
15	4814N	13710W	18100	1920	20	2	69	2312E	20841	49007N	53255	6657N	19154N	8214E
15	4808N	13735W	18100	1925	20	2	69	2231E	20803	48732N	52986	6652N	19216N	7970E
15	4802N	13800W	18200	1930	20	2	69	2224E	21009	48703N	53041	6639N	19422N	8011E
15	4756N	13825W	18200	1935	20	2	69	2237E	21037	48341N	52720	6628N	19418N	8094E
15	4750N	13850W	18200	1940	20	2	69	2238E	21023	48111N	52504	6623N	19402N	8094E
15	4744N	13916W	18200	1945	20	2	69	2152E	21274	48080N	52577	6607N	19742N	7928E
15	4738N	13942W	18200	1950	20	2	69	2209E	21522	47759N	52385	6544N	19932N	8120E
15	4732N	14008W	18200	1955	20	2	69	2152E	21462	47590N	52206	6543N	19918N	7994E
15	4727N	14035W	18200	2000	20	2	69	2219E	21393	47572N	52161	6547N	19789N	8129E
15	4720N	14100W	18200	2005	20	2	69	2227E	21306	47253N	51834	6543N	19690N	8139E
15	4713N	14125W	18200	2010	20	2	69	2144E	21714	46906N	51689	6509N	20170N	8041E
15	4706N	14151W	18200	2015	20	2	69	2137E	21624	46714N	51477	6509N	20101N	7971E
15	4700N	14216W	18200	2020	20	2	69	2126E	21603	46653N	51412	6509N	20107N	7899E
15	4653N	14241W	18200	2025	20	2	69	2134E	21816	46339N	51218	6447N	20288N	8021E
15	4645N	14307W	18200	2030	20	2	69	2112E	21860	46051N	50976	6436N	20380N	7906E
15	4638N	14332W	18200	2035	20	2	69	2113E	21823	45978N	50894	6436N	20343N	7901E
15	4630N	14356W	18200	2040	20	2	69	2055E	22045	45637N	50683	6413N	20590N	7875E
15	4621N	14420W	18200	2045	20	2	69	2030E	22031	45531N	50581	6410N	20634N	7719E
15	4614N	14445W	18200	2050	20	2	69	2044E	22061	45386N	50463	6404N	20631N	7812E
15	4654N	14451W	18200	2115	20	2	69	2021E	21945	45609N	50614	6418N	20575N	7632E
15	4703N	14420W	18200	2120	20	2	69	2027E	21848	45892N	50828	6432N	20470N	7638E
15	4712N	14351W	18200	2125	20	2	69	2052E	21744	46115N	50985	6445N	20317N	7748E
15	4721N	14321W	18200	2130	20	2	69	2035E	21688	46312N	51139	6454N	20303N	7625E
15	4729N	14251W	18200	2135	20	2	69	2048E	21697	46576N	51382	6501N	20280N	7710E
15	4738N	14220W	18200	2140	20	2	69	2123E	21429	47055N	51705	6530N	19953N	7817E
15	4747N	14150W	18200	2145	20	2	69	2052E	21539	47340N	52010	6532N	20125N	7677E
15	4756N	14120W	18200	2150	20	2	69	2121E	21367	47329N	51929	6542N	19898N	7784E
15	4803N	14048W	18200	2155	20	2	69	2204E	21124	47892N	52344	6611N	19576N	7937E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
15	4811N	14017W	18200	2200	20	2	69	2209E	20824	48141N	52452	6636N	19286N	7855E
15	4818N	13946W	18200	2205	20	2	69	2234E	20932	48343N	52681	6635N	19329N	8034E
15	4825N	13916W	18200	2210	20	2	69	2230E	20547	48657N	52817	6706N	18983N	7863E
15	4832N	13846W	18200	2215	20	2	69	2248E	20612	48893N	53060	6708N	18999N	7992E
15	4839N	13816W	18200	2220	20	2	69	2234E	20392	49106N	53172	6726N	18830N	7828E
15	4846N	13747W	18200	2225	20	2	69	2246E	20464	49230N	53314	6725N	18868N	7923E
15	4853N	13718W	18200	2230	20	2	69	2310E	20381	49503N	53534	6737N	18737N	8019E
15	4858N	13649W	18200	2235	20	2	69	2251E	20227	49627N	53591	6749N	18638N	7857E
15	4903N	13620W	18800	2240	20	2	69	2314E	20166	50018N	53930	6802N	18530N	7958E
15	4908N	13553W	19500	2245	20	2	69	2244E	20056	50097N	53962	6810N	18496N	7754E
15	4913N	13522W	19500	2250	20	2	69	2314E	19953	50308N	54120	6821N	18332N	7876E
15	4918N	13451W	19500	2255	20	2	69	2309E	19832	50453N	54211	6832N	18234N	7799E
15	4923N	13420W	19500	2300	20	2	69	2325E	19757	50759N	54468	6843N	18129N	7854E
15	4928N	13349W	19500	2305	20	2	69	2326E	19636	50923N	54578	6854N	18015N	7814E
15	4933N	13318W	19500	2310	20	2	69	2337E	19570	51087N	54707	6902N	17930N	7842E
15	4938N	13248W	19500	2315	20	2	69	2315E	19428	51417N	54965	6918N	17848N	7673E
15	4942N	13220W	19500	2320	20	2	69	2324E	19392	51514N	55043	6922N	17796N	7704E
15	4946N	13150W	19500	2325	20	2	69	2324E	19260	51739N	55207	6934N	17675N	7650E
15	4950N	13121W	19200	2330	20	2	69	2321E	19186	51858N	55293	6941N	17613N	7608E
15	4954N	13052W	19200	2335	20	2	69	2335E	19056	52099N	55475	6954N	17464N	7626E
15	4957N	13023W	19200	2340	20	2	69	2350E	18932	52379N	55696	7007N	17316N	7654E
15	5001N	12955W	19200	2345	20	2	69	2319E	19055	52618N	55962	7005N	17498N	7544E
15	5005N	12926W	19200	2350	20	2	69	2257E	18864	52610N	55890	7016N	17370N	7358E
15	5008N	12859W	19200	2355	20	2	69	2323E	18730	52816N	56039	7028N	17191N	7437F
15	5012N	12831W	19200	0	21	2	69	2319E	18775	52881N	56116	7027N	17240N	7435E
15	5015N	12803W	19200	5	21	2	69	2337E	18637	53094N	56270	7039N	17074N	7470E
15	5020N	12735W	19200	10	21	2	69	2337E	18496	53335N	56451	7052N	16945N	7415E
15	5024N	12707W	19200	15	21	2	69	2355E	18436	53510N	56597	7059N	16852N	7476E
15	5028N	12639W	19200	20	21	2	69	2410E	18340	53657N	56705	7107N	16732N	7511E
15	5032N	12611W	19200	25	21	2	69	2355E	18419	54498N	57526	7119N	16835N	7472E
15	5034N	12543W	19200	30	21	2	69	2359E	17438	54491N	57213	7215N	15931N	7089E
15	5036N	12514W	19200	35	21	2	69	2344E	17407	54257N	56982	7212N	15935N	7007E
15	5038N	12446W	19200	40	21	2	69	2353E	17546	54321N	57085	7205N	16043N	7105E
15	5041N	12418W	19200	45	21	2	69	2341E	17509	54467N	57212	7210N	16032N	7037E
15	5043N	12351W	19200	50	21	2	69	2352E	17479	54557N	57289	7214N	15984N	7072E
15	5045N	12323W	19100	55	21	2	69	2354E	17395	54772N	57468	7222N	15903N	7050E
15	5047N	12256W	19100	100	21	2	69	2334E	17339	54857N	57532	7227N	15891N	6936E
16	5509N	12353W	18200	1930	22	2	69	2818E	14773	56754N	58645	7524N	13007N	7005E
16	5507N	12428W	18200	1935	22	2	69	2738E	14967	56646N	58590	7511N	13259N	6943E
16	5503N	12504W	18200	1940	22	2	69	2747E	15170	56392N	58397	7456N	13419N	7075E
16	5500N	12539W	18200	1945	22	2	69	2709E	15254	56229N	58262	7449N	13573N	6961E
16	5456N	12615W	18200	1950	22	2	69	2730E	15529	56144N	58252	7432N	13773N	7171E
16	5453N	12652W	18200	1955	22	2	69	2745E	15465	55936N	58035	7432N	13686N	7201E
16	5450N	12728W	18200	2000	22	2	69	2731E	15632	55854N	58000	7421N	13862N	7225E
16	5447N	12804W	18200	2005	22	2	69	2730E	15807	55714N	57913	7409N	14020N	7301E
16	5443N	12840W	18200	2010	22	2	69	2723E	15998	55487N	57748	7354N	14205N	7360E
16	5438N	12915W	18200	2015	22	2	69	2702E	16062	55273N	57559	7347N	14306N	7301E
16	5433N	12950W	18200	2020	22	2	69	2718E	16281	55217N	57568	7334N	14466N	7470E
16	5427N	13026W	18200	2025	22	2	69	2649E	16548	54814N	57257	7312N	14768N	7465E
16	5424N	13102W	18200	2030	22	2	69	2647E	16510	54638N	57078	7311N	14737N	7444E
16	5421N	13138W	18200	2035	22	2	69	2639E	16691	54562N	57058	7259N	14917N	7488E
16	5417N	13213W	18200	2040	22	2	69	2640E	16870	54338N	56897	7245N	15075N	7572E
16	5414N	13250W	18200	2045	22	2	69	2631E	16948	54134N	56725	7236N	15163N	7570E
16	5410N	13326W	18200	2050	22	2	69	2641E	17108	53929N	56577	7223N	15285N	7685E
16	5405N	13401W	18200	2055	22	2	69	2622E	17239	53690N	56390	7211N	15445N	7657E
16	5359N	13436W	18200	2100	22	2	69	2639E	17268	53501N	56219	7206N	15433N	7746E
16	5353N	13510W	18200	2105	22	2	69	2558E	17471	53277N	56068	7150N	15707N	7651E
16	5347N	13544W	18200	2110	22	2	69	2534E	17680	53077N	55944	7134N	15947N	7634E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
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16	5334N	13652W	18200	2120	22	2	69	2506E	17931	52725N	55690	7113N	16237N	7607E
16	5329N	13728W	18200	2125	22	2	69	2531E	18129	52541N	55581	7057N	16360N	7810E
16	5247N	13717W	18000	2150	22	2	69	2503E	18314	52164N	55286	7039N	16591N	7754E
16	5253N	13653W	18000	2155	22	2	69	2456E	18113	52423N	55464	7056N	16424N	7637E
16	5258N	13628W	18000	2200	22	2	69	2502E	18087	52520N	55548	7059N	16387N	7657E
16	5302N	13601W	18000	2205	22	2	69	2509E	17948	52646N	55622	7110N	16245N	7632E
16	5305N	13533W	18000	2210	22	2	69	2517E	17945	52726N	55696	7112N	16224N	7669E
16	5309N	13506W	18000	2215	22	2	69	2519E	17821	52850N	55774	7121N	16109N	7621E
16	5322N	13345W	18000	2230	22	2	69	2541E	17507	53372N	56170	7150N	15776N	7591E
16	5326N	13318W	18000	2235	22	2	69	2553E	17432	53557N	56323	7158N	15681N	7613E
16	5239N	13323W	18200	2310	22	2	69	2533E	17964	53141N	56096	7119N	16206N	7751E
16	5235N	13356W	18200	2315	22	2	69	2503E	18054	52910N	55906	7109N	16354N	7648E
16	5231N	13430W	18200	2320	22	2	69	2455E	18152	52802N	55835	7101N	16461N	7650E
16	5227N	13504W	18200	2325	22	2	69	2458E	18312	52494N	55596	7046N	16600N	7730E
16	5222N	13538W	18200	2330	22	2	69	2450E	18402	52326N	55467	7037N	16700N	7729E
16	5215N	13611W	18200	2335	22	2	69	2443E	18637	52054N	55290	7018N	16927N	7797E
16	5403N	13733W	18200	15	23	2	69	2547E	17527	52739N	55576	7136N	15781N	7625E
16	5409N	13704W	18200	20	23	2	69	2541E	17666	52900N	55772	7131N	15919N	7660E
16	5416N	13636W	18200	25	23	2	69	2536E	17601	53002N	55848	7137N	15871N	7609E
16	5421N	13608W	18200	30	23	2	69	2557E	17408	53148N	55926	7151N	15651N	7621E
16	5425N	13539W	18200	35	23	2	69	2556E	17347	53349N	56099	7159N	15599N	7589E
16	5429N	13509W	18200	40	23	2	69	2547E	17205	53576N	56271	7211N	15490N	7488E
16	5432N	13439W	18200	45	23	2	69	2549E	17135	53683N	56351	7217N	15424N	7464E
16	5436N	13409W	18200	50	23	2	69	2611E	16999	53896N	56513	7229N	15253N	7503E
16	5439N	13339W	18200	55	23	2	69	2630E	16884	54085N	56659	7239N	15108N	7537E
16	5443N	13309W	18200	100	23	2	69	2639E	16718	54375N	56887	7254N	14941N	7501E
16	5447N	13239W	18200	105	23	2	69	2643E	16592	54545N	57013	7304N	14821N	7459E
16	5451N	13209W	18200	110	23	2	69	2634E	16463	54841N	57259	7317N	14724N	7363E
16	5456N	13139W	18200	115	23	2	69	2644E	16067	54801N	57108	7339N	14348N	7230E
16	5501N	13109W	18200	120	23	2	69	2703E	16076	54878N	57184	7340N	14316N	7312E
16	5505N	13038W	18200	125	23	2	69	2718E	16135	55133N	57446	7341N	14338N	7401E
16	5509N	13007W	18200	130	23	2	69	2720E	15856	55493N	57715	7403N	14086N	7281E
16	5513N	12936W	18200	135	23	2	69	2716E	15739	55552N	57739	7410N	13989N	7212E
16	5517N	12905W	18200	140	23	2	69	2727E	15568	55630N	57768	7421N	13815N	7178E
16	5521N	12833W	18200	145	23	2	69	2731E	15479	55778N	57886	7429N	13728N	7152E
16	5524N	12800W	18200	150	23	2	69	2737E	15289	55939N	57991	7442N	13545N	7091E
16	5527N	12728W	18200	155	23	2	69	2737E	15177	56053N	58071	7450N	13446N	7038E
16	5531N	12656W	18200	200	23	2	69	2744E	15115	56176N	58174	7456N	13378N	7034E
16	5534N	12624W	18200	205	23	2	69	2746E	14935	56425N	58368	7510N	13215N	6958E
16	5537N	12553W	18200	210	23	2	69	2744E	14811	56491N	58401	7518N	13108N	6895E
16	5541N	12520W	18200	215	23	2	69	2723E	14733	56622N	58508	7524N	13081N	6778E
16	5545N	12448W	18200	220	23	2	69	2725E	14584	56768N	58611	7535N	12945N	6717E
16	5547N	12415W	18200	225	23	2	69	2740E	14436	56984N	58784	7547N	12785N	6704E
16	5548N	12343W	18200	230	23	2	69	2730E	14311	57104N	58870	7555N	12692N	6611E
17	5202N	12739W	16200	2040	23	2	69	2456E	17360	54476N	57175	7219N	15741N	7320E
17	5159N	12812W	16200	2045	23	2	69	2523E	17357	54422N	57123	7218N	15680N	7443E
17	5156N	12846W	16200	2050	23	2	69	2536E	17683	54105N	56922	7154N	15945N	7644E
17	5153N	12920W	16200	2055	23	2	69	2522E	17864	53847N	56733	7138N	16141N	7655E
17	5150N	12954W	16200	2100	23	2	69	2524E	17778	53690N	56557	7140N	16059N	7628E
17	5144N	13028W	16200	2105	23	2	69	2447E	18184	53362N	56376	7110N	16508N	7627E
17	5139N	13101W	16200	2110	23	2	69	2455E	18206	53075N	56111	7103N	16509N	7674E
17	5133N	13135W	16000	2115	23	2	69	2503E	18357	52905N	56000	7051N	16629N	7774E
17	5127N	13208W	16000	2120	23	2	69	2455E	18449	52759N	55892	7043N	16730N	7777E
17	5122N	13242W	16000	2125	23	2	69	2434E	18577	52478N	55669	7030N	16894N	7726E
17	5117N	13316W	16000	2130	23	2	69	2448E	18720	52405N	55648	7020N	16993N	7852E
17	5112N	13350W	16000	2135	23	2	69	2428E	18794	52043N	55333	7008N	17105N	7787E
17	5108N	13424W	16000	2140	23	2	69	2434E	18915	51905N	55244	6958N	17200N	7868E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
17	5103N	13457W	16000	2145	23	2	69	2437E	19052	51543N	54952	6942N	17321N	7936E
17	5101N	13700W	16000	2205	23	2	69	2407E	19428	51048N	54620	6909N	17730N	7942E
17	5054N	13733W	16000	2210	23	2	69	2352E	19518	50761N	54384	6858N	17847N	7901E
17	5047N	13806W	16000	2215	23	2	69	2333E	19602	50393N	54071	6844N	17969N	7833E
17	5041N	13838W	16000	2220	23	2	69	2339E	19697	50302N	54021	6836N	18042N	7902E
17	5031N	13909W	16200	2225	23	2	69	2318E	19844	49908N	53708	6818N	18225N	7851E
17	5022N	13941W	16200	2230	23	2	69	2307E	20007	49840N	53706	6807N	18399N	7859E
17	5013N	14011W	16200	2235	23	2	69	2247E	20022	49473N	53372	6757N	18460N	7754E
17	5005N	14041W	16200	2240	23	2	69	2252E	20107	49391N	53327	6750N	18526N	7814E
17	4957N	14110W	16200	2245	23	2	69	2314E	20354	49038N	53094	6727N	18702N	8031E
17	4950N	14139W	16200	2250	23	2	69	2227E	20392	48892N	52975	6721N	18846N	7787E
17	4943N	14207W	16200	2255	23	2	69	2238E	20587	48578N	52760	6701N	19001N	7924E
17	4936N	14234W	16200	2300	23	2	69	2208E	20600	48444N	52642	6657N	19080N	7764E
17	4930N	14301W	16200	2305	23	2	69	2244E	20614	48221N	52443	6651N	19012N	7968E
17	4923N	14328W	16200	2310	23	2	69	2234E	20630	48054N	52296	6645N	19050N	7920E
17	4916N	14354W	16200	2315	23	2	69	2158E	20914	47595N	51987	6616N	19395N	7825E
17	4909N	14420W	16200	2320	23	2	69	2211E	20921	47474N	51879	6613N	19371N	7904E
17	4901N	14446W	16200	2325	23	2	69	2131E	20936	47166N	51604	6603N	19476N	7681E
17	4854N	14511W	16200	2330	23	2	69	2146E	21180	47120N	51661	6547N	19670N	7854E
17	4847N	14538W	16200	2335	23	2	69	2119E	21279	46677N	51299	6529N	19821N	7740E
17	4840N	14605W	16200	2340	23	2	69	2053E	21360	46463N	51138	6518N	19957N	7615E
17	4833N	14631W	16200	2345	23	2	69	2034E	21437	46325N	51045	6510N	20070N	7533E
17	4826N	14658W	16200	2350	23	2	69	2029E	21433	46183N	50915	6506N	20097N	7449E
17	4818N	14727W	16200	2355	23	2	69	2020E	21650	45989N	50831	6447N	20301N	7524E
17	4853N	14733W	16200	25	24	2	69	2049E	21357	46510N	51179	6520N	19963N	7590E
17	4900N	14707W	16200	30	24	2	69	2036E	21184	46738N	51315	6537N	19829N	7455E
17	4908N	14641W	16200	35	24	2	69	2101E	21170	46864N	51425	6541N	19761N	7595E
17	4916N	14615W	16200	40	24	2	69	2103E	21074	47028N	51535	6551N	19666N	7574E
17	4923N	14549W	16200	45	24	2	69	2127E	21052	47187N	51670	6557N	19593N	7698E
17	4931N	14523W	16200	50	24	2	69	2134E	20934	47738N	52126	6619N	19467N	7697E
17	4939N	14456W	16200	55	24	2	69	2111E	20802	47697N	52036	6626N	19395N	7519E
17	4946N	14429W	16200	100	24	2	69	2127E	20843	47919N	52256	6629N	19399N	7624E
17	4954N	14400W	16200	105	24	2	69	2155E	20676	48189N	52438	6646N	19181N	7720E
17	5002N	14332W	16200	110	24	2	69	2225E	20671	48501N	52722	6654N	19109N	7884E
17	5009N	14303W	16200	115	24	2	69	2232E	20415	48666N	52775	6714N	18855N	7826E
17	5017N	14235W	16200	120	24	2	69	2246E	20145	49097N	53069	6741N	18574N	7799E
17	5026N	14206W	16200	125	24	2	69	2239E	20047	49120N	53053	6747N	18500N	7724E
17	5035N	14138W	16200	130	24	2	69	2251E	19948	49480N	53350	6802N	18381N	7749E
17	5043N	14109W	16200	135	24	2	69	2324E	19967	49475N	53353	6801N	18325N	7930E
17	5049N	14041W	16200	140	24	2	69	2318E	19884	49894N	53710	6816N	18260N	7869E
17	5054N	14013W	16200	145	24	2	69	2311E	19760	49968N	53733	6825N	18163N	7782E
17	5100N	13945W	16200	150	24	2	69	2324E	19703	50096N	53832	6831N	18081N	7828E
17	5105N	13916W	16200	155	24	2	69	2351E	19610	50336N	54021	6842N	17934N	7932E
17	5111N	13849W	16200	200	24	2	69	2407E	19470	50575N	54193	6856N	17769N	7958E
17	5117N	13821W	16200	205	24	2	69	2354E	19368	50748N	54319	6906N	17707N	7848E
17	5123N	13753W	16200	210	24	2	69	2423E	19323	50872N	54418	6912N	17598N	7981E
17	5129N	13727W	16200	215	24	2	69	2412E	19213	51163N	54652	6925N	17522N	7880E
17	5135N	13701W	16200	220	24	2	69	2448E	19172	51316N	54781	6930N	17403N	8043E
17	5132N	13553W	16000	235	24	2	69	2435E	18995	51605N	54990	6947N	17271N	7907E
17	5137N	13525W	16000	240	24	2	69	2439E	18843	51856N	55174	7001N	17124N	7864E
17	5142N	13457W	16000	245	24	2	69	2444E	18828	51999N	55303	7005N	17098N	7882E
17	5146N	13429W	16000	250	24	2	69	2450E	18711	52272N	55520	7018N	16978N	7862E
17	5150N	13401W	16000	255	24	2	69	2447E	18424	52453N	55594	7038N	16725N	7726E
17	5154N	13333W	16000	300	24	2	69	2519E	18370	52576N	55693	7044N	16603N	7860E
17	5159N	13305W	16000	305	24	2	69	2459E	18401	52917N	56026	7049N	16679N	7772E
17	5203N	13236W	16000	310	24	2	69	2419E	18370	52930N	56028	7051N	16738N	7569E
17	5208N	13208W	16000	315	24	2	69	2515E	18064	53178N	56162	7114N	16336N	7709E
17	5212N	13138W	16000	320	24	2	69	2518E	18073	53352N	56330	7117N	16339N	7726E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
17	5218N	13107W	16000	325	24	2	69	2509E	17952	53665N	56588	7130N	16249N	7630E
17	5223N	13036W	16000	330	24	2	69	2511E	17684	53749N	56584	7147N	16002N	7528E
17	5227N	13004W	16000	335	24	2	69	2543E	17545	53823N	56611	7156N	15806N	7616E
17	5232N	12929W	16000	340	24	2	69	2612E	17262	54112N	56799	7218N	15487N	7623E
17	5237N	12854W	16000	345	24	2	69	2517E	17138	54582N	57209	7234N	15495N	7324E
17	5241N	12819W	16000	350	24	2	69	2511E	17014	54436N	57034	7238N	15396N	7242E
17	5245N	12745W	16000	355	24	2	69	2527E	16925	54587N	57151	7246N	15282N	7274E
17	5247N	12710W	16000	400	24	2	69	2546E	16960	54789N	57355	7247N	15273N	7374E
17	5250N	12635W	16000	405	24	2	69	2606E	16882	55153N	57679	7258N	15160N	7427E
17	5253N	12600W	16000	410	24	2	69	2528E	16624	55425N	57865	7318N	15008N	7149E
17	5255N	12524W	16000	415	24	2	69	2458E	16568	55337N	57764	7319N	15018N	6996E
17	5257N	12449W	16000	420	24	2	69	2517E	16472	55532N	57924	7328N	14894N	7036E
17	5301N	12414W	16000	425	24	2	69	2516E	16315	55727N	58066	7340N	14752N	6967E
17	5304N	12338W	16000	430	24	2	69	2518E	16159	55869N	58159	7352N	14608N	6908E
17	5307N	12304W	16000	435	24	2	69	2507E	15966	56129N	58356	7407N	14456N	6777E
18	5409N	12401W	16000	1705	24	2	69	2646E	15393	56341N	58406	7443N	13743N	6935E
18	5407N	12436W	16000	1710	24	2	69	2646E	15445	56121N	58208	7436N	13788N	6959E
18	5404N	12511W	16300	1715	24	2	69	2637E	15517	56118N	58224	7432N	13872N	6953E
18	5400N	12547W	16300	1720	24	2	69	2705E	15856	55904N	58109	7409N	14117N	7219E
18	5356N	12622W	16300	1725	24	2	69	2640E	15875	55589N	57811	7403N	14186N	7125E
18	5353N	12656W	16300	1730	24	2	69	2639E	16067	55678N	57950	7354N	14359N	7208E
18	5349N	12730W	16300	1735	24	2	69	2636E	16197	55467N	57783	7343N	14483N	7252E
18	5345N	12802W	16300	1740	24	2	69	2644E	16399	55356N	57734	7329N	14645N	7381E
18	5341N	12835W	16300	1745	24	2	69	2657E	16697	55027N	57505	7307N	14883N	7568E
18	5336N	12906W	16300	1750	24	2	69	2625E	16752	54657N	57167	7257N	15001N	7456E
18	5332N	12938W	16300	1755	24	2	69	2539E	16857	54753N	57289	7253N	15195N	7299E
18	5328N	13009W	16200	1800	24	2	69	2555E	17299	54467N	57149	7222N	15559N	7561E
18	5324N	13041W	16200	1805	24	2	69	2612E	16983	54246N	56843	7236N	15237N	7500E
18	5320N	13114W	16200	1810	24	2	69	2557E	17264	54049N	56739	7217N	15522N	7557E
18	5315N	13147W	16200	1815	24	2	69	2551E	17364	53819N	56551	7207N	15625N	7573E
18	5311N	13221W	16200	1820	24	2	69	2548E	17517	53766N	56548	7157N	15769N	7628E
18	5306N	13254W	16200	1825	24	2	69	2543E	17698	53501N	56352	7141N	15944N	7681E
18	5300N	13327W	16200	1830	24	2	69	2545E	17797	53370N	56260	7133N	16029N	7733E
18	5253N	13359W	16200	1835	24	2	69	2531E	17831	53155N	56066	7127N	16091N	7681E
18	5248N	13432W	16200	1840	24	2	69	2526E	17972	52994N	55959	7115N	16228N	7721E
18	5243N	13505W	16200	1845	24	2	69	2518E	18110	52690N	55716	7101N	16373N	7740E
18	5239N	13538W	16100	1850	24	2	69	2524E	18290	52523N	55617	7047N	16521N	7848E
18	5233N	13612W	16100	1855	24	2	69	2521E	18335	52254N	55378	7039N	16570N	7850E
18	5227N	13646W	16100	1900	24	2	69	2456E	18347	52158N	55291	7037N	16637N	7735E
18	5221N	13719W	16100	1905	24	2	69	2501E	18703	51777N	55052	7008N	16946N	7913E
18	5214N	13753W	16100	1910	24	2	69	2459E	18834	51525N	54860	6955N	17069N	7959E
18	5207N	13828W	16100	1915	24	2	69	2425E	18923	51361N	54736	6946N	17230N	7823E
18	5159N	13901W	16100	1920	24	2	69	2431E	19129	51126N	54587	6929N	17403N	7941E
18	5151N	13935W	16100	1925	24	2	69	2441E	19202	50790N	54299	6917N	17447N	8020E
18	5142N	14008W	16100	1930	24	2	69	2404E	19284	50573N	54125	6907N	17606N	7867E
18	5135N	14039W	16200	1935	24	2	69	2334E	19425	50253N	53877	6851N	17804N	7769E
18	5126N	14109W	16200	1940	24	2	69	2346E	19623	50224N	53922	6839N	17959N	7909E
18	5118N	14139W	16200	1945	24	2	69	2335E	19712	49811N	53570	6824N	18065N	7889E
18	5111N	14208W	16200	1950	24	2	69	2345E	19807	49634N	53440	6814N	18129N	7977E
18	5103N	14237W	16200	1955	24	2	69	2239E	19764	49443N	53247	6812N	18238N	7616E
18	5055N	14305W	16200	2000	24	2	69	2259E	20002	49095N	53013	6749N	18412N	7814E
18	5049N	14334W	16200	2005	24	2	69	2318E	20354	49008N	53067	6726N	18692N	8056E
18	5044N	14402W	16200	2010	24	2	69	2245E	20438	48549N	52675	6710N	18846N	7907E
18	5038N	14430W	16000	2015	24	2	69	2217E	20487	48369N	52529	6702N	18956N	7770E
18	5029N	14459W	16000	2020	24	2	69	2156E	20414	48265N	52405	6704N	18936N	7626E
18	5020N	14528W	16000	2025	24	2	69	2230E	20667	47997N	52258	6642N	19093N	7910E
18	5012N	14556W	16300	2030	24	2	69	2149E	20658	47822N	52094	6638N	19178N	7678E
18	5002N	14624W	16300	2035	24	2	69	2143E	20803	47550N	51902	6622N	19326N	7700E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
18	4952N	14651W	16300	2040	24	2	69	2110E	20945	47210N	51648	6604N	19530N	7566E
18	4942N	14718W	16300	2045	24	2	69	2102E	20965	47102N	51557	6600N	19567N	7527E
18	4933N	14744W	16300	2050	24	2	69	2103E	21167	46741N	51311	6538N	19754N	7604E
18	4926N	14810W	16300	2055	24	2	69	2054E	21238	46679N	51284	6532N	19840N	7578E
18	5000N	14857W	16300	2120	24	2	69	2049E	20879	46943N	51377	6601N	19515N	7423E
18	5009N	14830W	16300	2125	24	2	69	2127E	20820	47061N	51461	6608N	19376N	7618E
18	5036N	14708W	16300	2140	24	2	69	2209E	20398	47968N	52125	6657N	18892N	7691E
18	5045N	14641W	16300	2145	24	2	69	2214E	20203	48106N	52176	6713N	18700N	7647E
18	5054N	14613W	16300	2150	24	2	69	2221E	20214	48306N	52365	6717N	18693N	7691E
18	5102N	14545W	16300	2155	24	2	69	2237E	20194	48355N	52403	6719N	18640N	7769E
18	5111N	14517W	16300	2200	24	2	69	2312E	20099	48795N	52773	6736N	18473N	7920E
18	5118N	14450W	16300	2205	24	2	69	2237E	19966	48787N	52715	6744N	18430N	7679E
18	5125N	14423W	16300	2210	24	2	69	2308E	20046	49097N	53032	6747N	18433N	7877E
18	5132N	14355W	16300	2215	24	2	69	2307E	19823	49385N	53215	6807N	18231N	7785E
18	5139N	14327W	16300	2220	24	2	69	2314E	19734	49522N	53309	6816N	18132N	7787E
18	5146N	14300W	16300	2225	24	2	69	2301E	19859	49908N	53714	6818N	18275N	7770E
18	5153N	14233W	16300	2230	24	2	69	2300E	19524	50219N	53881	6845N	17972N	7629E
18	5200N	14205W	16300	2235	24	2	69	2353E	19432	49894N	53545	6843N	17766N	7872E
18	5206N	14138W	16300	2240	24	2	69	2336E	19711	50306N	54030	6836N	18060N	7896E
18	5212N	14109W	16300	2245	24	2	69	2353E	19031	50557N	54021	6922N	17400N	7707E
18	5218N	14041W	16300	2250	24	2	69	2403E	19091	50694N	54170	6921N	17432N	7782E
18	5224N	14012W	16300	2255	24	2	69	2353E	19054	50793N	54249	6926N	17421N	7717E
18	5230N	13944W	16300	2300	24	2	69	2410E	18996	51058N	54477	6935N	17329N	7781E
18	5236N	13915W	16300	2305	24	2	69	2430E	18876	51250N	54616	6946N	17175N	7831E
18	5241N	13845W	16300	2310	24	2	69	2418E	18636	51543N	54809	7007N	16983N	7672E
18	5247N	13816W	16300	2315	24	2	69	2449E	18603	51608N	54858	7010N	16884N	7808E
18	5251N	13747W	16300	2320	24	2	69	2433E	18508	51880N	55082	7021N	16834N	7692E
18	5257N	13718W	16300	2325	24	2	69	2452E	18461	52070N	55246	7028N	16749N	7764E
18	5304N	13649W	16300	2330	24	2	69	2451E	18385	52236N	55377	7036N	16682N	7728E
18	5310N	13620W	16300	2335	24	2	69	2458E	18201	52395N	55467	7050N	16499N	7684E
18	5315N	13551W	16300	2340	24	2	69	2509E	18077	52608N	55627	7102N	16361N	7685E
18	5321N	13523W	16300	2345	24	2	69	2521E	17976	52722N	55702	7110N	16243N	7701E
18	5326N	13453W	16300	2350	24	2	69	2529E	17950	52989N	55947	7117N	16203N	7725E
18	5332N	13424W	16300	2355	24	2	69	2534E	17766	53194N	56082	7131N	16025N	7669E
18	5336N	13354W	16300	0	25	2	69	2602E	17602	53367N	56195	7144N	15815N	7727E
18	5342N	13324W	16300	5	25	2	69	2607E	17457	53580N	56353	7157N	15673N	7687E
18	5347N	13253W	16300	10	25	2	69	2608E	17425	54055N	56794	7207N	15643N	7676E
18	5351N	13223W	16300	15	25	2	69	2543E	17099	53985N	56629	7225N	15404N	7420E
18	5356N	13151W	16300	20	25	2	69	2644E	16979	54157N	56756	7235N	15163N	7639E
18	5400N	13119W	16300	25	25	2	69	2643E	16998	54398N	56992	7238N	15181N	7645E
18	5404N	13047W	16300	30	25	2	69	2637E	16634	54564N	57043	7302N	14870N	7454E
18	5409N	13014W	16300	35	25	2	69	2636E	16525	54669N	57112	7310N	14773N	7403E
18	5412N	12941W	16300	40	25	2	69	2649E	16541	54926N	57363	7314N	14762N	7463E
18	5417N	12908W	16300	45	25	2	69	2656E	16277	55181N	57532	7333N	14511N	7375E
18	5420N	12835W	16300	50	25	2	69	2654E	16194	55344N	57665	7341N	14441N	7329E
18	5424N	12802W	16200	55	25	2	69	2653E	16048	55459N	57735	7351N	14313N	7258E
18	5428N	12729W	16200	100	25	2	69	2716E	15930	55664N	57899	7401N	14158N	7300E
18	5432N	12656W	16200	105	25	2	69	2643E	15670	55938N	58091	7420N	13996N	7047E
18	5435N	12621W	16200	110	25	2	69	2659E	15765	55935N	58115	7415N	14047N	7157E
18	5439N	12545W	16200	115	25	2	69	2641E	15530	56207N	58313	7433N	13875N	6975E
18	5442N	12510W	16200	120	25	2	69	2638E	15425	56299N	58374	7440N	13787N	6916E
18	5445N	12434W	16200	125	25	2	69	2640E	15262	56441N	58468	7452N	13638N	6850E
18	5447N	12359W	16200	130	25	2	69	2733E	15052	56649N	58615	7507N	13344N	6964E
19	5527N	12405W	18300	1700	25	2	69	2807E	14568	56910N	58745	7538N	12848N	6866E
19	5524N	12445W	18300	1705	25	2	69	2726E	14579	56713N	58557	7534N	12939N	6719E
19	5520N	12523W	18300	1710	25	2	69	2727E	14891	56520N	58449	7514N	13213N	6866E
19	5517N	12603W	18300	1715	25	2	69	2741E	15069	56494N	58469	7503N	13343N	7003E
19	5514N	12643W	18300	1720	25	2	69	2808E	15270	56237N	58273	7448N	13464N	7202E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
19	5510N	12722W	18300	1725	25	2	69	2743E	15378	56022N	58094	7438N	13612N	7155E
19	5506N	12801W	18300	1730	25	2	69	2743E	15488	55755N	57866	7428N	13711N	7204E
19	5501N	12840W	18300	1735	25	2	69	2723E	15605	55569N	57719	7418N	13854N	7181E
19	5456N	12919W	18300	1740	25	2	69	2708E	15758	55453N	57648	7408N	14024N	7187E
19	5451N	12958W	18300	1745	25	2	69	2724E	16143	55242N	57553	7342N	14332N	7430E
19	5446N	13035W	18300	1750	25	2	69	2722E	16321	54923N	57297	7327N	14494N	7502E
19	5441N	13113W	18300	1755	25	2	69	2650E	16467	54710N	57135	7314N	14693N	7434E
19	5437N	13151W	18300	1800	25	2	69	2638E	16692	54715N	57205	7302N	14920N	7484E
19	5434N	13229W	18300	1805	25	2	69	2631E	16754	54354N	56878	7252N	14991N	7481E
19	5430N	13307W	18300	1810	25	2	69	2625E	16920	54203N	56782	7239N	15151N	7531E
19	5423N	13343W	18300	1815	25	2	69	2650E	17063	53924N	56559	7226N	15225N	7704E
19	5415N	13418W	18300	1820	25	2	69	2626E	17257	53669N	56376	7210N	15451N	7686E
19	5408N	13454W	18300	1825	25	2	69	2611E	17369	53487N	56237	7200N	15585N	7668E
19	5402N	13530W	18300	1830	25	2	69	2603E	17545	53241N	56058	7145N	15762N	7708E
19	5357N	13607W	18300	1835	25	2	69	2554E	17628	53039N	55892	7136N	15857N	7701E
19	5350N	13643W	18300	1840	25	2	69	2550E	17786	52897N	55808	7124N	16006N	7755E
19	5342N	13719W	18300	1845	25	2	69	2551E	17945	52680N	55652	7111N	16148N	7826E
19	5337N	13753W	18300	1850	25	2	69	2543E	18255	52548N	55629	7050N	16446N	7922E
19	5331N	13826W	18300	1855	25	2	69	2522E	18273	52082N	55195	7039N	16509N	7833E
19	5325N	13900W	18300	1900	25	2	69	2512E	18365	51949N	55100	7031N	16617N	7821E
19	5318N	13934W	18300	1905	25	2	69	2500E	18534	51683N	54906	7016N	16797N	7834E
19	5311N	14009W	18300	1910	25	2	69	2444E	18668	51384N	54670	7001N	16954N	7814E
19	5303N	14044W	18300	1915	25	2	69	2431E	18796	51240N	54579	6951N	17100N	7803E
19	5255N	14115W	18300	1920	25	2	69	2416E	18855	50971N	54347	6941N	17187N	7753E
19	5247N	14147W	18300	1925	25	2	69	2421E	19036	50870N	54315	6928N	17341N	7852E
19	5239N	14218W	18300	1930	25	2	69	2355E	19150	50455N	53967	6912N	17504N	7766E
19	5232N	14251W	18300	1935	25	2	69	2347E	19312	50497N	54064	6904N	17672N	7788E
19	5225N	14324W	18300	1940	25	2	69	2356E	19484	50051N	53710	6843N	17807N	7909E
19	5218N	14357W	18300	1945	25	2	69	2323E	19501	49930N	53604	6839N	17897N	7745E
19	5211N	14430W	18300	1950	25	2	69	2309E	19641	49553N	53303	6822N	18058N	7726E
19	5202N	14501W	18300	1955	25	2	69	2256E	19730	49480N	53269	6815N	18170N	7688E
19	5153N	14532W	18300	2000	25	2	69	2254E	19848	49184N	53038	6801N	18283N	7726E
19	5144N	14603W	18300	2005	25	2	69	2253E	19958	48907N	52822	6748N	18386N	7762E
19	5134N	14635W	18300	2010	25	2	69	2220E	19992	48624N	52574	6738N	18491N	7600E
19	5124N	14704W	18300	2015	25	2	69	2222E	19936	48459N	52400	6738N	18436N	7587E
19	5114N	14733W	18300	2020	25	2	69	2153E	20130	48440N	52456	6726N	18678N	7506E
19	5105N	14803W	18300	2025	25	2	69	2144E	20343	48080N	52207	6703N	18896N	7534E
19	5055N	14833W	18300	2030	25	2	69	2117E	20508	47811N	52024	6646N	19109N	7444E
19	5046N	14903W	18300	2035	25	2	69	2116E	20579	47680N	51932	6639N	19177N	7464E
19	5037N	14932W	18300	2040	25	2	69	2101E	20659	47276N	51593	6623N	19283N	7413E
19	5137N	14842W	18000	2120	25	2	69	2147E	20209	48222N	52286	6715N	18766N	7500E
19	5145N	14813W	18000	2125	25	2	69	2215E	19598	48222N	52166	6734N	18415N	7538E
19	5153N	14744W	18000	2130	25	2	69	2250E	19999	48519N	52479	6735N	18430N	7766E
19	5201N	14715W	18000	2135	25	2	69	2242E	19825	48812N	52684	6753N	18289N	7651E
19	5209N	14647W	18000	2140	25	2	69	2308E	19669	49078N	52873	6809N	18086N	7730E
19	5217N	14619W	18000	2145	25	2	69	2310E	19599	49174N	52936	6816N	18017N	7714E
19	5226N	14550W	18000	2150	25	2	69	2342E	19556	49515N	53237	6826N	17906N	7863E
19	5233N	14521W	18000	2155	25	2	69	2329E	19392	49705N	53354	6841N	17784N	7731E
19	5241N	14453W	18000	2200	25	2	69	2313E	19251	49916N	53500	6854N	17692N	7590E
19	5247N	14424W	18000	2205	25	2	69	2341E	19294	50010N	53603	6854N	17668N	7751E
19	5254N	14356W	18000	2210	25	2	69	2333E	19093	50243N	53748	6911N	17501N	7633E
19	5301N	14327W	18000	2215	25	2	69	2400E	19161	50507N	54020	6913N	17503N	7797E
19	5309N	14258W	18000	2220	25	2	69	2338E	18878	50664N	54067	6933N	17295N	7569E
19	5316N	14229W	18000	2225	25	2	69	2426E	18888	50786N	54185	6935N	17195N	7815E
19	5323N	14200W	18000	2230	25	2	69	2422E	18698	51132N	54443	6954N	17031N	7717E
19	5330N	14130W	18000	2235	25	2	69	2439E	18553	51237N	54493	7005N	16860N	7742E
19	5336N	14100W	18000	2240	25	2	69	2447E	18479	51498N	54713	7015N	16775N	7749E
19	5342N	14030W	18000	2245	25	2	69	2443E	18374	51568N	54744	7023N	16690N	7685E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
19	5348N	14000W	18000	2250	25	2	69	2521E	18256	51862N	54981	7036N	16497N	7818E
19	5354N	13929W	18000	2255	25	2	69	2517E	18267	52122N	55231	7041N	16515N	7806E
19	5402N	13900W	18000	2300	25	2	69	2529E	18008	52433N	55439	7102N	16254N	7751E
19	5409N	13830W	18000	2305	25	2	69	2558E	17717	52482N	55392	7120N	15928N	7758E
19	5417N	13802W	18000	2310	25	2	69	2556E	17768	52613N	55533	7120N	15978N	7774E
19	5421N	13733W	18000	2315	25	2	69	2622E	17583	52801N	55652	7134N	15752N	7812E
19	5427N	13706W	18000	2320	25	2	69	2554E	17500	53095N	55905	7145N	15741N	7647E
19	5432N	13637W	18000	2325	25	2	69	2602E	17408	53248N	56022	7153N	15641N	7641E
19	5436N	13609W	18000	2330	25	2	69	2617E	17297	53336N	56071	7201N	15509N	7660E
19	5441N	13541W	18000	2335	25	2	69	2631E	17195	53521N	56215	7211N	15385N	7678E
19	5445N	13512W	18000	2340	25	2	69	2612E	17148	53661N	56335	7216N	15384N	7574E
19	5450N	13445W	18000	2345	25	2	69	2643E	17006	53825N	56448	7227N	15188N	7648E
19	5453N	13418W	18000	2350	25	2	69	2652E	16941	54047N	56640	7235N	15112N	7657E
19	5457N	13350W	18000	2355	25	2	69	2703E	16757	54319N	56845	7251N	14922N	7624E
19	5501N	13323W	18000	0	26	2	69	2659E	16684	54369N	56871	7256N	14866N	7574E
19	5505N	13255W	18000	5	26	2	69	2737E	16458	54653N	57078	7314N	14581N	7633E
19	5510N	13227W	18000	10	26	2	69	2713E	16322	54847N	57225	7325N	14514N	7466E
19	5515N	13200W	18000	15	26	2	69	2655E	16121	54957N	57273	7339N	14372N	7302E
19	5520N	13131W	18000	20	26	2	69	2746E	15938	54941N	57207	7349N	14102N	7426E
19	5524N	13103W	18000	25	26	2	69	2733E	16070	55107N	57402	7344N	14246N	7435E
19	5527N	13035W	18000	30	26	2	69	2737E	15871	55633N	57853	7404N	14060N	7361E
19	5530N	13006W	18000	35	26	2	69	2751E	15656	55523N	57689	7415N	13842N	7316E
19	5533N	12938W	18000	40	26	2	69	2734E	15454	55655N	57761	7428N	13700N	7152E
19	5537N	12910W	18000	45	26	2	69	2740E	15485	55677N	57791	7427N	13713N	7193E
19	5540N	12842W	18000	50	26	2	69	2825E	15435	55859N	57952	7433N	13575N	7346E
19	5543N	12814W	18000	55	26	2	69	2802E	15204	56052N	58077	7449N	13419N	7146E
19	5547N	12744W	18000	100	26	2	69	2806E	15260	56071N	58110	7446N	13459N	7191E
19	5550N	12714W	18000	105	26	2	69	2756E	15132	56257N	58257	7456N	13369N	7089E
19	5553N	12644W	18000	110	26	2	69	2822E	15008	56486N	58446	7507N	13206N	7130E
19	5557N	12614W	18000	115	26	2	69	2807E	14676	56654N	58524	7528N	12943N	6918E
19	5600N	12544W	18000	120	26	2	69	2915E	14726	56803N	58681	7527N	12847N	7197E
19	5602N	12511W	18000	125	26	2	69	2806E	14408	56873N	58670	7546N	12709N	6788E
19	5606N	12439W	18000	130	26	2	69	2838E	14471	56863N	58676	7543N	12700N	6936E
19	5609N	12406W	18000	135	26	2	69	2837E	14348	57072N	58848	7553N	12594N	6874E
19	5612N	12332W	18000	140	26	2	69	2852E	14088	57275N	58983	7610N	12336N	6803E
20	5654N	12209W	18200	1735	26	2	69	2952E	13425	57955N	59490	7657N	11640N	6688E
20	5652N	12248W	18200	1740	26	2	69	3019E	13613	57690N	59274	7643N	11750N	6873E
20	5649N	12326W	18200	1745	26	2	69	3017E	13835	57471N	59113	7627N	11945N	6980E
20	5646N	12405W	18200	1750	26	2	69	2928E	13993	57238N	58924	7615N	12182N	6885E
20	5643N	12443W	18200	1755	26	2	69	2925E	14146	57157N	58882	7605N	12320N	6951E
20	5640N	12521W	18200	1800	26	2	69	2919E	14247	56958N	58713	7557N	12422N	6976E
20	5638N	12600W	18200	1805	26	2	69	2854E	14295	56842N	58612	7552N	12513N	6911E
20	5635N	12638W	18200	1810	26	2	69	2853E	14673	56813N	58677	7531N	12847N	7088E
20	5632N	12716W	18200	1815	26	2	69	2902E	14805	56531N	58438	7519N	12943N	7187E
20	5628N	12753W	18200	1820	26	2	69	2846E	14935	56495N	58436	7511N	13092N	7188E
20	5625N	12831W	18200	1825	26	2	69	2854E	14959	56283N	58237	7506N	13095N	7231E
20	5621N	12908W	18200	1830	26	2	69	2908E	15115	56021N	58025	7454N	13201N	7362E
20	5617N	12947W	18200	1835	26	2	69	2841E	15359	55776N	57853	7436N	13473N	7374E
20	5611N	13025W	18200	1840	26	2	69	2818E	15378	55626N	57713	7432N	13539N	7292E
20	5606N	13103W	18100	1845	26	2	69	2825E	15681	55601N	57770	7414N	13791N	7463E
20	5600N	13144W	18100	1850	26	2	69	2812E	15942	55179N	57436	7353N	14049N	7535E
20	5555N	13223W	18100	1855	26	2	69	2818E	15969	54971N	57243	7348N	14058N	7574E
20	5550N	13303W	18100	1900	26	2	69	2824E	16198	54788N	57133	7331N	14248N	7705E
20	5544N	13341W	18100	1905	26	2	69	2814E	16391	54550N	56959	7316N	14440N	7756E
20	5521N	13341W	12000	1940	26	2	69	2704E	16295	54463N	56849	7320N	14509N	7417E
20	5525N	13311W	12000	1945	26	2	69	2718E	16115	54724N	57047	7335N	14319N	7393E
20	5528N	13241W	12000	1950	26	2	69	2649E	16173	54842N	57177	7334N	14432N	7298E
20	5532N	13210W	12100	1955	26	2	69	2656E	15823	55023N	57253	7357N	14105N	7171E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
20	5537N	13140W	12100	2000	26	2	69	2709E	15816	55000N	57229	7357N	14073N	7217E
20	5541N	13110W	12100	2005	26	2	69	2716E	15843	55129N	57360	7357N	14081N	7261E
20	5546N	13040W	12100	2010	26	2	69	2741E	15643	55642N	57799	7417N	13850N	7271E
20	5551N	13011W	12100	2015	26	2	69	2708E	15418	55661N	57757	7431N	13719N	7035E
20	5555N	12941W	12100	2020	26	2	69	2723E	15258	55698N	57750	7440N	13547N	7020E
20	5600N	12911W	12100	2025	26	2	69	2753E	15096	55889N	57892	7453N	13343N	7061E
20	5603N	12840W	12100	2030	26	2	69	2741E	15034	56078N	58058	7459N	13311N	6987E
20	5606N	12809W	12100	2035	26	2	69	2737E	14927	56218N	58166	7507N	13226N	6920E
20	5609N	12738W	12100	2040	26	2	69	2741E	14808	56285N	58200	7515N	13112N	6881E
20	5612N	12707W	12100	2045	26	2	69	2835E	14634	56524N	58388	7529N	12849N	7004E
20	5615N	12635W	12000	2050	26	2	69	2730E	14405	56809N	58607	7546N	12777N	6652E
20	5618N	12604W	12000	2055	26	2	69	2745E	14433	56780N	58586	7544N	12772N	6722E
20	5620N	12533W	12000	2100	26	2	69	2733E	14119	57059N	58780	7606N	12517N	6531E
20	5623N	12503W	12000	2105	26	2	69	2746E	14036	57046N	58747	7610N	12419N	6541E
20	5626N	12433W	12000	2110	26	2	69	2807E	14021	57136N	58831	7612N	12365N	6609E
20	5628N	12403W	12000	2115	26	2	69	2757E	13880	57261N	58919	7622N	12259N	6509E
20	5630N	12332W	12000	2120	26	2	69	2814E	13765	57477N	59102	7631N	12126N	6515E
20	5632N	12302W	12000	2125	26	2	69	2817E	13713	57689N	59297	7637N	12076N	6498E
21	5732N	12308W	18300	1640	27	2	69	2954E	12962	57624N	59064	7719N	11236N	6463E
21	5729N	12351W	18300	1645	27	2	69	2948E	13140	57407N	58891	7706N	11402N	6530E
21	5727N	12434W	18300	1650	27	2	69	2954E	13239	57291N	58801	7659N	11475N	6602E
21	5724N	12518W	18300	1655	27	2	69	2939E	13492	57143N	58714	7642N	11725N	6676E
21	5720N	12558W	18300	1700	27	2	69	2937E	13632	56962N	58570	7632N	11850N	6736E
21	5717N	12638W	18300	1705	27	2	69	2859E	13452	57208N	58768	7646N	11766N	6521E
21	5713N	12722W	18300	1710	27	2	69	2941E	14140	57118N	58843	7605N	12284N	7002E
21	5709N	12806W	18300	1715	27	2	69	2938E	14271	56529N	58303	7549N	12403N	7059E
21	5705N	12848W	18300	1720	27	2	69	2928E	14321	56299N	58092	7543N	12468N	7046E
21	5700N	12929W	18300	1725	27	2	69	2856E	14526	56180N	58028	7530N	12712N	7030E
21	5656N	13010W	18300	1730	27	2	69	2848E	14755	56005N	57916	7514N	12930N	7108E
21	5651N	13052W	18300	1735	27	2	69	2825E	14862	55844N	57788	7505N	13070N	7076E
21	5646N	13133W	18300	1740	27	2	69	2815E	14982	55681N	57662	7456N	13197N	7092E
21	5641N	13215W	18300	1745	27	2	69	2816E	15276	55578N	57639	7437N	13454N	7236E
21	5635N	13254W	18200	1750	27	2	69	2811E	15407	55248N	57356	7425N	13580N	7277E
21	5629N	13331W	18200	1755	27	2	69	2754E	15599	55109N	57274	7411N	13785N	7301E
21	5623N	13408W	18200	1800	27	2	69	2744E	15899	54767N	57028	7348N	14070N	7402E
21	5617N	13446W	18200	1805	27	2	69	2730E	16058	54527N	56843	7335N	14243N	7416E
21	5611N	13523W	18200	1810	27	2	69	2735E	16185	54385N	56742	7325N	14343N	7498E
21	5605N	13600W	18200	1815	27	2	69	2733E	16336	54148N	56559	7312N	14483N	7556E
21	5559N	13640W	18200	1820	27	2	69	2730E	16459	53909N	56366	7301N	14598N	7603E
21	5551N	13719W	18200	1825	27	2	69	2706E	16600	53765N	56270	7250N	14777N	7563E
21	5544N	13754W	18200	1830	27	2	69	2637E	16826	53616N	56194	7234N	15041N	7542E
21	5537N	13830W	18200	1835	27	2	69	2618E	17052	53418N	56074	7217N	15287N	7556E
21	5530N	13904W	18200	1840	27	2	69	2603E	17205	53068N	55788	7202N	15456N	7559E
21	5521N	13940W	18200	1845	27	2	69	2605E	17364	52928N	55704	7150N	15594N	7637E
21	5514N	14015W	18200	1850	27	2	69	2602E	17499	52649N	55481	7136N	15723N	7681E
21	5505N	14049W	18200	1855	27	2	69	2559E	17600	52379N	55258	7125N	15820N	7712E
21	5457N	14123W	18200	1900	27	2	69	2546E	17792	52213N	55161	7110N	16021N	7738E
21	5450N	14157W	18200	1905	27	2	69	2505E	17830	52004N	54976	7104N	16147N	7562E
21	5442N	14231W	18200	1910	27	2	69	2519E	17974	51750N	54783	7050N	16246N	7689E
21	5435N	14304W	18200	1915	27	2	69	2445E	18115	51672N	54755	7040N	16451N	7584E
21	5428N	14336W	18200	1920	27	2	69	2517E	18304	51379N	54542	7023N	16549N	7820E
21	5421N	14408W	18200	1925	27	2	69	2428E	18411	51222N	54430	7013N	16758N	7626E
21	5414N	14439W	18200	1930	27	2	69	2406E	18520	50841N	54109	6959N	16905N	7564E
21	5407N	14509W	18200	1935	27	2	69	2417E	18582	50851N	54140	6955N	16937N	7642E
21	5359N	14538W	18200	1940	27	2	69	2357E	18721	50591N	53944	6941N	17108N	7601E
21	5351N	14606W	18200	1945	27	2	69	2403E	18948	50261N	53714	6920N	17302N	7724E
21	5343N	14634W	18200	1950	27	2	69	2255E	19055	50024N	53530	6908N	17549N	7423E
21	5335N	14702W	18200	1955	27	2	69	2258E	19162	49823N	53381	6857N	17641N	7481E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
21	5327N	14730W	18200	2000	27	2	69	2238E	19109	49911N	53444	6902N	17637N	7354E
21	5321N	14756W	18200	2005	27	2	69	2259E	19372	49476N	53134	6837N	17834N	7566E
21	5314N	14823W	18200	2010	27	2	69	2211E	19261	49380N	53004	6841N	17834N	7277E
21	5306N	14849W	18200	2015	27	2	69	2208E	19533	49136N	52876	6819N	18092N	7362E
21	5259N	14916W	18200	2020	27	2	69	2154E	19597	49175N	52936	6816N	18182N	7311E
21	5252N	14940W	18200	2025	27	2	69	2204E	19592	48870N	52651	6809N	18156N	7362E
21	5244N	15005W	18200	2030	27	2	69	2139E	19894	48792N	52692	6749N	18489N	7342E
21	5236N	15030W	18200	2035	27	2	69	2126E	19952	48389N	52341	6735N	18571N	7295E
21	5228N	15056W	18200	2040	27	2	69	2121E	19902	48319N	52257	6736N	18534N	7249E
21	5220N	15121W	18200	2045	27	2	69	2155E	20033	48152N	52153	6724N	18583N	7481E
21	5212N	15144W	18200	2050	27	2	69	2119E	20039	47877N	51901	6717N	18667N	7286E
21	5205N	15205W	18200	2055	27	2	69	2026E	19975	47806N	51811	6719N	18718N	6974E
21	5212N	14920W	18000	2135	27	2	69	2146E	19832	48460N	52362	6744N	18417N	7358E
21	5221N	14844W	18000	2140	27	2	69	2137E	19737	48658N	52509	6755N	18347N	7276E
21	5231N	14810W	18000	2145	27	2	69	2235E	19585	48832N	52613	6808N	18081N	7524E
21	5240N	14735W	18000	2150	27	2	69	2250E	19516	49283N	53007	6823N	17986N	7576E
21	5249N	14701W	18000	2155	27	2	69	2249E	19385	49288N	52963	6831N	17868N	7518E
21	5257N	14626W	18200	2200	27	2	69	2328E	19169	49632N	53206	6852N	17582N	7637E
21	5308N	14554W	18200	2205	27	2	69	2308E	19175	49997N	53548	6901N	17633N	7534E
21	5317N	14522W	18200	2210	27	2	69	2356E	18869	50330N	53751	6926N	17246N	7655E
21	5327N	14449W	18200	2215	27	2	69	2352E	18868	50324N	53745	6926N	17253N	7638E
21	5336N	14417W	18300	2220	27	2	69	2407E	18736	50746N	54095	6944N	17099N	7660E
21	5344N	14344W	18300	2225	27	2	69	2420E	18769	50842N	54195	6944N	17101N	7734E
21	5352N	14311W	18300	2230	27	2	69	2428E	18336	51158N	54345	7016N	16690N	7594E
21	5400N	14238W	18300	2235	27	2	69	2432E	18392	51386N	54579	7018N	16730N	7640E
21	5407N	14206W	18300	2240	27	2	69	2450E	18228	51586N	54712	7032N	16542N	7656E
21	5415N	14135W	18300	2245	27	2	69	2515E	18010	51825N	54865	7050N	16287N	7686E
21	5423N	14105W	18300	2250	27	2	69	2535E	17974	51926N	54950	7054N	16211N	7764E
21	5430N	14034W	18300	2255	27	2	69	2519E	17863	52073N	55052	7103N	16147N	7639E
21	5436N	14003W	18300	2300	27	2	69	2540E	17766	52310N	55245	7114N	16013N	7695E
21	5443N	13932W	18300	2305	27	2	69	2550E	17648	52529N	55415	7125N	15883N	7693E
21	5450N	13900W	18300	2310	27	2	69	2542E	17482	52730N	55553	7139N	15752N	7582E
21	5455N	13827W	18300	2315	27	2	69	2614E	17433	52926N	55723	7146N	15636N	7708E
21	5500N	13756W	18300	2320	27	2	69	2619E	17244	53107N	55836	7200N	15456N	7645E
21	5506N	13725W	18300	2325	27	2	69	2638E	17197	53357N	56060	7208N	15371N	7712E
21	5511N	13654W	18300	2330	27	2	69	2628E	17020	53525N	56166	7221N	15235N	7587E
21	5515N	13623W	18300	2335	27	2	69	2639E	16857	53718N	56301	7234N	15064N	7564E
21	5521N	13554W	18300	2340	27	2	69	2654E	16740	53885N	56425	7244N	14928N	7575E
21	5526N	13524W	18300	2345	27	2	69	2703E	16619	54052N	56549	7254N	14800N	7560E
21	5530N	13454W	18300	2350	27	2	69	2712E	16470	54290N	56733	7307N	14647N	7532E
21	5610N	13254W	18300	15	28	2	69	2825E	15751	55175N	57380	7404N	13852N	7497E
21	5615N	13222W	18300	20	28	2	69	2801E	15579	55220N	57375	7414N	13752N	7319E
21	5619N	13150W	18300	25	28	2	69	2824E	15594	55409N	57562	7416N	13716N	7419E
21	5623N	13117W	18300	30	28	2	69	2838E	15260	55735N	57787	7441N	13393N	7315E
21	5627N	13045W	18300	35	28	2	69	2808E	15151	55768N	57790	7448N	13360N	7147E
21	5631N	13015W	18300	40	28	2	69	2814E	15047	55763N	57758	7453N	13255N	7121E
21	5634N	12945W	18300	45	28	2	69	2831E	15024	55922N	57905	7457N	13200N	7174E
21	5637N	12916W	18300	50	28	2	69	2840E	14869	56115N	58051	7509N	13045N	7136E
21	5640N	12846W	18300	55	28	2	69	2852E	14746	56273N	58174	7518N	12913N	7121E
21	5644N	12816W	18300	100	28	2	69	2856E	14663	56539N	58410	7527N	12832N	7096E
21	5648N	12745W	18300	105	28	2	69	2857E	14481	56601N	58424	7538N	12670N	7011E
21	5652N	12714W	18300	110	28	2	69	2909E	14391	56825N	58619	7547N	12568N	7010E
21	5655N	12643W	18300	115	28	2	69	2851E	14165	57213N	58941	7605N	12405N	6836E
21	5658N	12613W	18300	120	28	2	69	2757E	13922	56941N	58618	7615N	12297N	6528E
21	5700N	12542W	18300	125	28	2	69	2844E	13948	56978N	58660	7614N	12229N	6709E
21	5703N	12511W	18300	130	28	2	69	2858E	13764	57209N	58842	7628N	12042N	6666E
21	5706N	12439W	18300	135	28	2	69	2848E	13606	57271N	58865	7638N	11923N	6556E
21	5709N	12408W	18300	140	28	2	69	2921E	13667	57386N	58991	7636N	11912N	6701E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
21	5711N	12336W	18300	145	28	2	69	2934E	13483	57539N	59098	7648N	11727N	6653E
21	5713N	12305W	18300	150	28	2	69	2933E	13305	57654N	59169	7700N	11574N	6563E
21	5715N	12235W	18300	155	28	2	69	2956E	13291	57752N	59262	7702N	11517N	6632E
21	5716N	12205W	18300	200	28	2	69	2939E	13208	58138N	59620	7712N	11478N	6535E
24	5506N	11623W	16100	1755	4	3	69	2431E	13144	58512N	59970	7720N	11957N	5457E
24	5505N	11651W	16100	1800	4	3	69	2512E	13601	58390N	59953	7653N	12306N	5793E
24	5506N	11718W	16100	1805	4	3	69	2523E	13651	58018N	59603	7645N	12333N	5852E
24	5506N	11746W	16100	1810	4	3	69	2434E	13663	58023N	59610	7644N	12426N	5681E
24	5505N	11817W	16100	1815	4	3	69	2431E	13967	58080N	59736	7628N	12707N	5797E
24	5504N	11848W	16100	1820	4	3	69	2436E	14205	57976N	59691	7613N	12916N	5914E
24	5504N	11916W	16100	1825	4	3	69	2444E	14183	57830N	59543	7613N	12881N	5934E
24	5503N	11945W	16100	1830	4	3	69	2618E	14245	57993N	59717	7611N	12770N	6312E
24	5501N	12015W	16100	1835	4	3	69	2646E	14248	57498N	59237	7604N	12720N	6419E
24	5500N	12045W	16100	1840	4	3	69	2554E	14335	57547N	59306	7600N	12894N	6262E
24	5458N	12117W	16100	1845	4	3	69	2636E	14779	57287N	59162	7532N	13213N	6621E
24	5456N	12150W	16100	1850	4	3	69	2641E	14743	57297N	59164	7534N	13173N	6621E
24	5454N	12222W	16100	1855	4	3	69	2610E	14837	57014N	58914	7524N	13317N	6543E
24	5450N	12255W	16100	1900	4	3	69	2640E	14768	56862N	58749	7526N	13197N	6628E
25	5939N	13250W	19200	1845	5	3	69	3037E	13738	56392N	58041	7618N	11821N	6999E
25	5934N	13329W	19200	1850	5	3	69	3019E	13893	56237N	57928	7607N	11993N	7013E
25	5929N	13407W	19200	1855	5	3	69	3014E	13961	56100N	57812	7601N	12061N	7031E
25	5923N	13445W	19200	1900	5	3	69	3003E	14195	55946N	57719	7545N	12287N	7108E
25	5917N	13523W	19100	1905	5	3	69	3010E	14081	55789N	57538	7550N	12174N	7077E
25	5911N	13602W	19100	1910	5	3	69	3032E	14319	55646N	57459	7534N	12334N	7275E
25	5905N	13640W	19100	1915	5	3	69	2912E	14707	55500N	57416	7509N	12836N	7177E
25	5859N	13718W	19200	1920	5	3	69	2914E	15078	55142N	57167	7442N	13156N	7366E
25	5852N	13754W	19200	1925	5	3	69	2916E	15129	54997N	57040	7437N	13196N	7398E
25	5845N	13831W	19200	1930	5	3	69	2851E	15183	54756N	56822	7430N	13297N	7328E
25	5839N	13907W	19200	1935	5	3	69	2811E	15337	54791N	56898	7421N	13518N	7246E
25	5833N	13941W	19200	1940	5	3	69	2818E	15557	54548N	56724	7404N	13697N	7377E
25	5827N	14014W	19200	1945	5	3	69	2735E	15831	54252N	56515	7343N	14031N	7331E
25	5821N	14047W	19200	1950	5	3	69	2738E	15964	54069N	56377	7333N	14143N	7405E
25	5815N	14120W	19200	1955	5	3	69	2739E	15996	53916N	56239	7328N	14169N	7423E
25	5808N	14151W	19200	2000	5	3	69	2738E	16073	53757N	56109	7321N	14239N	7455E
25	5800N	14223W	19200	2005	5	3	69	2716E	16214	53616N	56014	7310N	14411N	7432E
25	5753N	14254W	19200	2010	5	3	69	2701E	16484	53410N	55896	7250N	14685N	7488E
25	5746N	14323W	19100	2015	5	3	69	2556E	16628	53090N	55633	7236N	14953N	7273E
25	5828N	14324W	19100	2050	5	3	69	2706E	16148	53491N	55875	7312N	14374N	7359E
25	5835N	14249W	19100	2055	5	3	69	2733E	16014	53706N	56043	7323N	14197N	7409E
25	5844N	14210W	19200	2100	5	3	69	2655E	15999	53851N	56177	7327N	14265N	7243E
25	5853N	14131W	19200	2105	5	3	69	2705E	15944	54127N	56427	7335N	14195N	7259E
25	5900N	14053W	19200	2110	5	3	69	2756E	15545	54437N	56613	7403N	13732N	7284E
25	5909N	14016W	19200	2115	5	3	69	2825E	15276	54617N	56713	7422N	13434N	7271E
25	5916N	13938W	19200	2120	5	3	69	2809E	15217	54789N	56863	7428N	13415N	7182E
25	5923N	13900W	19200	2125	5	3	69	2836E	14983	54893N	56901	7443N	13154N	7175E
25	5929N	13820W	19200	2130	5	3	69	2924E	14793	55132N	57083	7458N	12887N	7262E
25	5935N	13741W	19200	2135	5	3	69	2922E	14661	55319N	57229	7509N	12776N	7191E
25	5941N	13659W	19200	2140	5	3	69	2953E	14483	55509N	57367	7522N	12556N	7218E
25	5947N	13617W	19200	2145	5	3	69	3013E	14188	55711N	57489	7542N	12259N	7142E
25	5954N	13539W	19200	2150	5	3	69	3046E	14147	55866N	57630	7547N	12155N	7239E
25	6001N	13501W	19200	2155	5	3	69	3033E	13959	56113N	57824	7601N	12020N	7098E
25	6008N	13423W	19200	2200	5	3	69	3037E	13757	56195N	57855	7614N	11838N	7007E
25	6036N	13551W	22200	2230	5	3	69	3047E	13915	56270N	57965	7606N	11953N	7124E
25	6030N	13630W	22200	2235	5	3	69	3033E	14032	55881N	57616	7554N	12082N	7135E
25	6024N	13707W	22200	2240	5	3	69	3011E	13878	55957N	57653	7604N	11994N	6981E
25	6018N	13743W	22200	2245	5	3	69	2947E	14254	55692N	57488	7538N	12371N	7081E
25	6013N	13816W	22200	2250	5	3	69	2950E	14355	55436N	57265	7528N	12450N	7145E
25	6008N	13849W	22200	2255	5	3	69	2948E	14454	55287N	57145	7520N	12542N	7185E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
25	6001N	13923W	22200	2300	5	3	69	2938E	14538	55136N	57020	7513N	12635N	7190E
25	5954N	13957W	22200	2305	5	3	69	2912E	14660	54985N	56906	7504N	12796N	7153E
25	5947N	14031W	22200	2310	5	3	69	2822E	14961	54851N	56855	7444N	13164N	7109E
25	5940N	14104W	22200	2315	5	3	69	2756E	15170	54588N	56657	7428N	13401N	7109E
25	5935N	14137W	22200	2320	5	3	69	2739E	15257	54475N	56571	7421N	13516N	7078E
25	5930N	14209W	22200	2325	5	3	69	2737E	15418	54361N	56505	7409N	13659N	7150E
25	5924N	14241W	22200	2330	5	3	69	2656E	15623	54250N	56455	7356N	13928N	7078E
25	5918N	14314W	22200	2335	5	3	69	2649E	15901	54128N	56416	7337N	14189N	7177E
25	5911N	14343W	22200	2340	5	3	69	2639E	15950	53805N	56119	7329N	14274N	7117E
25	5904N	14412W	22200	2345	5	3	69	2607E	16014	53635N	55974	7322N	14378N	7050E
25	5857N	14443W	22200	2350	5	3	69	2604E	16169	53501N	55891	7311N	14523N	7107E
25	5850N	14513W	22200	2355	5	3	69	2600E	16185	53362N	55762	7307N	14545N	7099E
25	5842N	14542W	22200	0	6	3	69	2532E	16298	53178N	55620	7257N	14705N	7028E
25	5836N	14613W	22200	5	6	3	69	2537E	16510	53039N	55549	7242N	14885N	7141E
25	5829N	14644W	22200	10	6	3	69	2526E	16637	52825N	55383	7231N	15023N	7148E
25	5821N	14714W	22200	15	6	3	69	2502E	16724	52628N	55221	7222N	15151N	7080E
25	5813N	14743W	22200	20	6	3	69	2445E	16743	52566N	55168	7219N	15203N	7013E
25	5805N	14812W	22200	25	6	3	69	2444E	16985	52400N	55084	7202N	15426N	7106E
25	5757N	14841W	22200	30	6	3	69	2424E	17171	52115N	54871	7145N	15635N	7097E
25	5749N	14911W	22200	35	6	3	69	2407E	17224	51928N	54711	7138N	15720N	7040E
25	5741N	14941W	22200	40	6	3	69	2349E	17399	51717N	54565	7124N	15916N	7028E
25	5732N	15011W	22200	45	6	3	69	2335E	17467	51543N	54422	7116N	16008N	6989E
25	5724N	15040W	22200	50	6	3	69	2304E	17663	51390N	54341	7101N	16249N	6924E
25	5717N	15109W	22200	55	6	3	69	2242E	17807	51200N	54209	7049N	16428N	6872E
25	5814N	15005W	22200	125	6	3	69	2419E	16965	51959N	54659	7155N	15458N	6989E
25	5827N	14926W	22200	130	6	3	69	2413E	16964	52143N	54833	7158N	15470N	6961E
25	5837N	14845W	22200	135	6	3	69	2455E	16731	52411N	55017	7217N	15172N	7052E
25	5849N	14805W	22200	140	6	3	69	2506E	16660	52670N	55242	7226N	15085N	7070E
25	5859N	14723W	22200	145	6	3	69	2511E	16562	52817N	55353	7235N	14987N	7050E
25	5909N	14641W	22200	150	6	3	69	2606E	16361	53076N	55540	7252N	14692N	7199E
25	5919N	14558W	22200	155	6	3	69	2610E	16080	53335N	55706	7313N	14431N	7093E
25	5928N	14516W	22200	200	6	3	69	2552E	16087	53518N	55884	7316N	14474N	7020E
25	5936N	14433W	22200	205	6	3	69	2727E	15734	53827N	56080	7342N	13962N	7254E
25	5946N	14354W	22200	210	6	3	69	2737E	15669	54066N	56291	7350N	13882N	7267E
25	5955N	14313W	22200	215	6	3	69	2757E	15308	54341N	56456	7415N	13522N	7175E
25	6005N	14233W	22200	220	6	3	69	2850E	15074	54520N	56566	7432N	13204N	7272E
25	6013N	14153W	22200	225	6	3	69	2842E	14897	54719N	56710	7446N	13065N	7156E
25	6021N	14112W	22200	230	6	3	69	2850E	14827	54934N	56900	7453N	12988N	7153E
25	6029N	14032W	22200	235	6	3	69	2824E	14588	55106N	57004	7510N	12832N	6939E
25	6037N	13950W	22200	240	6	3	69	2940E	14354	55322N	57154	7527N	12471N	7107E
25	6045N	13909W	22200	245	6	3	69	2954E	14160	55404N	57185	7539N	12275N	7059E
25	6051N	13826W	22200	250	6	3	69	3007E	14008	55657N	57393	7552N	12116N	7029E
26	5923N	13150W	20300	1745	8	3	69	3044E	13695	56496N	58132	7622N	11770N	7001E
26	5929N	13114W	20300	1750	8	3	69	3047E	13487	56664N	58247	7636N	11585N	6906E
26	5933N	13037W	20300	1755	8	3	69	3055E	13385	56847N	58402	7645N	11481N	6879E
26	5938N	13001W	20300	1800	8	3	69	3043E	13180	57009N	58513	7658N	11330N	6734E
26	5942N	12925W	20300	1805	8	3	69	3114E	13151	57062N	58558	7701N	11243N	6822E
26	5946N	12849W	20300	1810	8	3	69	3145E	12870	57304N	58731	7720N	10943N	6775E
26	5950N	12812W	20300	1815	8	3	69	3107E	12780	57426N	58831	7727N	10941N	6605E
26	5954N	12735W	20300	1820	8	3	69	3145E	12561	57532N	58887	7740N	10681N	6611E
26	5958N	12659W	20300	1825	8	3	69	3257E	12047	57759N	59002	7813N	10108N	6553E
26	6004N	12546W	20300	1835	8	3	69	3240E	12062	57853N	59098	7813N	10154N	6511E
26	6007N	12508W	20300	1840	8	3	69	3218E	11970	58034N	59256	7820N	10117N	6397E
26	6009N	12431W	20300	1845	8	3	69	3244E	11655	58170N	59326	7840N	9802N	6304E
26	6011N	12354W	20300	1850	8	3	69	3308E	11506	58316N	59440	7850N	9634N	6290E
26	6013N	12317W	20300	1855	8	3	69	3238E	11369	58449N	59545	7859N	9572N	6133E
26	6016N	12240W	20300	1900	8	3	69	3219E	11369	58609N	59701	7901N	9607N	6080E
26	6018N	12203W	20300	1905	8	3	69	3149E	11144	58724N	59772	7915N	9469N	5876E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
26	6020N	12126W	20300	1910	8	3	69	3252E	10777	58883N	59861	7937N	9050N	5851E
26	6021N	12049W	20300	1915	8	3	69	3124E	10587	59128N	60068	7950N	9036N	5517E
26	5957N	12220W	20100	1945	8	3	69	3104E	11388	58575N	59672	7859N	9754N	5878E
26	5955N	12304W	20100	1950	8	3	69	3112E	11362	58520N	59613	7900N	9718N	5887E
26	5953N	12347W	20100	1955	8	3	69	3321E	11229	58503N	59571	7908N	9379N	6175E
26	5950N	12430W	20100	2000	8	3	69	3245E	11871	58370N	59564	7830N	9983N	6422E
26	5947N	12512W	20100	2005	8	3	69	3250E	12108	57985N	59235	7812N	10173N	6565E
26	5943N	12554W	20100	2010	8	3	69	3132E	12276	57820N	59109	7800N	10462N	6421E
26	5939N	12636W	20100	2015	8	3	69	3144E	12497	57717N	59055	7746N	10628N	6573E
26	5935N	12718W	20100	2020	8	3	69	3115E	12643	57529N	58902	7736N	10808N	6559E
26	5932N	12759W	20100	2025	8	3	69	3121E	12793	57528N	58934	7727N	10924N	6657E
26	5927N	12840W	20100	2030	8	3	69	3057E	13097	57230N	58710	7706N	11230N	6738E
26	5923N	12920W	20100	2035	8	3	69	3112E	13149	57088N	58583	7701N	11246N	6814E
26	5919N	12958W	20100	2040	8	3	69	3056E	13332	56911N	58452	7648N	11435N	6853E
26	5915N	13036W	20100	2045	8	3	69	3051E	13402	56845N	58403	7644N	11504N	6875E
26	5910N	13114W	20100	2050	8	3	69	3038E	13885	56635N	58313	7613N	11945N	7078E
26	5905N	13152W	20100	2055	8	3	69	3010E	13872	56322N	58006	7609N	11992N	6973E
26	5900N	13230W	20100	2100	8	3	69	2954E	14066	56351N	58080	7559N	12193N	7012E
26	5856N	13305W	20100	2105	8	3	69	2955E	14282	56012N	57804	7541N	12378N	7123E
26	5851N	13341W	20100	2110	8	3	69	2946E	14373	55986N	57802	7536N	12475N	7139E
26	5847N	13417W	20100	2115	8	3	69	3026E	14578	55847N	57718	7522N	12568N	7385E
26	5841N	13452W	20200	2120	8	3	69	2918E	14828	55478N	57425	7502N	12930N	7258E
26	5836N	13526W	20200	2125	8	3	69	2909E	14863	55341N	57302	7457N	12979N	7243E
26	5830N	13601W	20200	2130	8	3	69	2851E	14994	55319N	57315	7450N	13131N	7237E
26	5824N	13634W	20200	2135	8	3	69	2910E	15267	55060N	57138	7430N	13330N	7442E
26	5820N	13710W	19200	2140	8	3	69	2840E	15360	54847N	56958	7421N	13475N	7372E
26	5815N	13745W	19200	2145	8	3	69	2825E	15353	54694N	56808	7419N	13502N	7307E
26	5809N	13819W	19200	2150	8	3	69	2835E	15485	54751N	56899	7412N	13597N	7408E
26	5803N	13852W	19200	2155	8	3	69	2741E	15901	54409N	56685	7342N	14080N	7389E
26	5757N	13924W	19200	2200	8	3	69	2739E	16047	54143N	56471	7329N	14214N	7448E
26	5751N	13956W	19200	2205	8	3	69	2721E	16122	53974N	56331	7322N	14320N	7407E
26	5744N	14028W	19200	2210	8	3	69	2717E	16180	53863N	56241	7316N	14380N	7417E
26	5738N	14100W	19200	2215	8	3	69	2706E	16263	53707N	56115	7309N	14477N	7410E
26	5732N	14132W	19200	2220	8	3	69	2711E	16490	53451N	55936	7251N	14668N	7533E
26	5726N	14203W	19200	2225	8	3	69	2642E	16603	53184N	55716	7239N	14833N	7461E
26	5720N	14235W	19200	2230	8	3	69	2629E	16660	53123N	55674	7235N	14911N	7431E
26	5700N	14045W	19200	2300	8	3	69	2720E	16447	53538N	56008	7255N	14609N	7555E
26	5707N	14007W	19200	2305	8	3	69	2638E	16410	53723N	56173	7300N	14668N	7356E
26	5715N	13929W	19200	2310	8	3	69	2720E	16237	53915N	56307	7314N	14422N	7459E
26	5722N	13850W	19200	2315	8	3	69	2708E	16163	54060N	56425	7321N	14383N	7372E
26	5729N	13810W	19300	2320	8	3	69	2733E	16082	54209N	56544	7328N	14257N	7440E
26	5735N	13730W	19300	2325	8	3	69	2756E	15810	54438N	56688	7348N	13967N	7408E
26	5741N	13650W	19300	2330	8	3	69	2752E	15851	54628N	56881	7349N	14011N	7412E
26	5747N	13610W	19300	2335	8	3	69	2800E	15628	54804N	56989	7404N	13798N	7339E
26	5753N	13530W	19300	2340	8	3	69	2830E	15489	55289N	57418	7421N	13611N	7392E
26	5757N	13451W	19300	2345	8	3	69	2835E	15139	55275N	57311	7440N	13293N	7245E
26	5801N	13412W	19300	2350	8	3	69	2929E	15029	55388N	57391	7449N	13082N	7397E
26	5805N	13333W	19300	2355	8	3	69	2922E	14996	55635N	57620	7454N	13068N	7355E
26	5811N	13256W	19300	0	9	3	69	2900E	14887	55959N	57906	7506N	13020N	7219E
26	5817N	13219W	19300	5	9	3	69	2920E	14520	56110N	57958	7529N	12657N	7115E
27	5918N	13320W	20200	1820	11	3	69	3043E	13906	56150N	57847	7605N	11954N	7104E
27	5912N	13355W	20200	1825	11	3	69	3001E	14049	56089N	57822	7556N	12163N	7031E
27	5905N	13430W	20200	1830	11	3	69	2958E	14261	55900N	57690	7541N	12354N	7124E
27	5859N	13504W	20200	1835	11	3	69	2932E	14588	55647N	57528	7518N	12693N	7191E
27	5854N	13540W	20200	1840	11	3	69	2849E	14697	55631N	57540	7512N	12875N	7086E
27	5850N	13616W	20200	1845	11	3	69	2901E	14893	55496N	57460	7458N	13023N	7225E
27	5844N	13650W	20200	1850	11	3	69	2936E	15016	55223N	57228	7447N	13056N	7418E
27	5838N	13725W	20200	1855	11	3	69	2859E	15200	55025N	57086	7433N	13295N	7366E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
27	5832N	13801W	20200	1900	11	3	69	2811E	15192	54808N	56874	7430N	13388N	7179E
27	5825N	13837W	20200	1905	11	3	69	2756E	15294	54777N	56872	7423N	13512N	7166E
27	5819N	13913W	20200	1910	11	3	69	2805E	15649	54625N	56823	7400N	13805N	7369E
27	5812N	13948W	20200	1915	11	3	69	2804E	15861	54265N	56536	7342N	13995N	7463E
27	5806N	14023W	20200	1920	11	3	69	2754E	15789	54122N	56378	7344N	13953N	7389E
27	5759N	14057W	20100	1925	11	3	69	2720E	16015	53892N	56222	7326N	14226N	7356E
27	5752N	14132W	20100	1930	11	3	69	2703E	16194	53669N	56059	7312N	14422N	7366E
27	5744N	14205W	20100	1935	11	3	69	2627E	16323	53426N	55864	7300N	14614N	7271E
27	5735N	14243W	20100	1940	11	3	69	2624E	16548	53233N	55746	7243N	14821N	7360E
27	5727N	14320W	20100	1945	11	3	69	2604E	16482	53029N	55531	7244N	14804N	7245E
27	5720N	14357W	20100	1950	11	3	69	2600E	16715	52869N	55449	7227N	15023N	7329E
27	5714N	14433W	20100	1955	11	3	69	2530E	16827	52666N	55289	7216N	15187N	7245E
27	5705N	14505W	20100	2000	11	3	69	2522E	17041	52445N	55144	7159N	15397N	7303E
27	5655N	14536W	20100	2005	11	3	69	2508E	17213	52281N	55041	7146N	15583N	7311E
27	5646N	14609W	20100	2010	11	3	69	2426E	17421	52074N	54910	7130N	15860N	7206E
27	5638N	14642W	20100	2015	11	3	69	2445E	17597	51787N	54695	7113N	15980N	7368E
27	5629N	14715W	20100	2020	11	3	69	2414E	17665	51604N	54544	7106N	16107N	7253E
27	5620N	14747W	20100	2025	11	3	69	2416E	17820	51436N	54436	7053N	16245N	7326E
27	5612N	14819W	20100	2030	11	3	69	2321E	18046	51058N	54154	7032N	16567N	7155E
27	5603N	14851W	20100	2035	11	3	69	2415E	18157	50788N	53936	7019N	16554N	7460E
27	5554N	14921W	20100	2040	11	3	69	2350E	18279	50611N	53811	7008N	16720N	7386E
27	5546N	14950W	20100	2045	11	3	69	2243E	18292	50403N	53620	7003N	16873N	7064E
27	5538N	15020W	20100	2050	11	3	69	2308E	18481	50432N	53712	6952N	16994N	7261E
27	5528N	15049W	20100	2055	11	3	69	2251E	18698	50039N	53419	6930N	17230N	7262E
27	5519N	15118W	20100	2100	11	3	69	2202E	18729	49826N	53230	6923N	17361N	7028E
27	5510N	15147W	20100	2105	11	3	69	2123E	18844	49681N	53135	6913N	17546N	6871E
27	5500N	15216W	20100	2110	11	3	69	2141E	19055	49576N	53112	6858N	17705N	7044E
27	5451N	15245W	20100	2115	11	3	69	2133E	19088	49259N	52829	6849N	17752N	7015E
27	5442N	15314W	20100	2120	11	3	69	2057E	19253	48941N	52592	6831N	17980N	6884E
27	5432N	15345W	20100	2125	11	3	69	2035E	19339	48767N	52462	6822N	18102N	6804E
27	5421N	15417W	20100	2130	11	3	69	2027E	19479	48600N	52359	6809N	18250N	6809E
27	5410N	15448W	20100	2135	11	3	69	2017E	19603	48344N	52167	6755N	18385N	6800E
27	5355N	15312W	20100	2210	11	3	69	2104E	19710	48197N	52071	6745N	18391N	7087E
27	5405N	15242W	20100	2215	11	3	69	2139E	19565	48505N	52303	6801N	18183N	7223E
27	5415N	15213W	20100	2220	11	3	69	2150E	19463	49019N	52742	6820N	18066N	7242E
27	5425N	15143W	20100	2225	11	3	69	2133E	19259	49015N	52663	6832N	17911N	7076E
27	5434N	15112W	20500	2230	11	3	69	2231E	19225	49165N	52790	6838N	17759N	7362E
27	5445N	15041W	20500	2235	11	3	69	2253E	19060	49613N	53148	6859N	17558N	7415E
27	5456N	15009W	20500	2240	11	3	69	2229E	18982	49697N	53199	6905N	17538N	7263E
27	5506N	14936W	20500	2245	11	3	69	2316E	18796	50124N	53532	6926N	17266N	7427E
27	5515N	14902W	20500	2250	11	3	69	2323E	18649	50319N	53664	6939N	17115N	7405E
27	5524N	14826W	20500	2255	11	3	69	2314E	18544	50603N	53894	6952N	17038N	7318E
27	5533N	14752W	20500	2300	11	3	69	2346E	18401	50906N	54130	7007N	16840N	7417E
27	5543N	14716W	20500	2305	11	3	69	2346E	18239	51072N	54231	7020N	16691N	7354E
27	5553N	14639W	20500	2310	11	3	69	2407E	18061	51315N	54401	7036N	16482N	7383E
27	5602N	14603W	20500	2315	11	3	69	2427E	17766	51616N	54588	7100N	16172N	7356E
27	5611N	14526W	20500	2320	11	3	69	2429E	17680	51828N	54761	7109N	16090N	7328E
27	5620N	14449W	20500	2325	11	3	69	2527E	17550	51993N	54875	7120N	15847N	7542E
27	5629N	14411W	20500	2330	11	3	69	2507E	17402	52274N	55094	7135N	15756N	7387E
27	5637N	14335W	20500	2335	11	3	69	2553E	17190	52533N	55274	7152N	15465N	7506E
27	5646N	14259W	20500	2340	11	3	69	2623E	17068	52812N	55502	7205N	15289N	7586E
27	5654N	14222W	20500	2345	11	3	69	2635E	16787	53069N	55661	7226N	15012N	7514E
27	5703N	14146W	20500	2350	11	3	69	2647E	16688	53254N	55808	7236N	14896N	7522E
27	5711N	14110W	20500	2355	11	3	69	2654E	16527	53563N	56055	7251N	14738N	7480E
27	5719N	14034W	20500	0	12	3	69	2746E	16351	53735N	56168	7304N	14468N	7618E
27	5727N	13958W	20500	5	12	3	69	2726E	16116	53915N	56272	7321N	14304N	7425E
27	5735N	13922W	20500	10	12	3	69	2740E	15880	54170N	56450	7339N	14064N	7374E
27	5741N	13845W	20500	15	12	3	69	2756E	15870	54363N	56632	7343N	14019N	7436E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
27	5748N	13808W	20500	20	12	3	69	2814E	15749	54549N	56777	7353N	13874N	7452E
27	5754N	13730W	20500	25	12	3	69	2749E	15633	54736N	56925	7403N	13824N	7299E
27	5800N	13651W	20500	30	12	3	69	2822E	15554	54925N	57085	7411N	13684N	7393E
27	5806N	13613W	20500	35	12	3	69	2916E	15212	55284N	57339	7436N	13269N	7439E
27	5812N	13534W	20500	40	12	3	69	2852E	15138	55382N	57414	7442N	13256N	7309E
27	5817N	13455W	20500	45	12	3	69	2921E	15054	55560N	57563	7450N	13121N	7379E
27	5823N	13417W	20500	50	12	3	69	2953E	14909	55773N	57732	7502N	12925N	7431E
27	5829N	13338W	20500	55	12	3	69	2945E	14727	56015N	57918	7516N	12785N	7308E
27	5833N	13300W	20500	100	12	3	69	2936E	14509	56341N	58179	7533N	12614N	7169E
28	5747N	13403W	20300	1745	12	3	69	2850E	14936	55372N	57351	7454N	13083N	7205E
28	5742N	13435W	20300	1750	12	3	69	2908E	15086	55241N	57264	7443N	13176N	7347E
28	5738N	13504W	20300	1755	12	3	69	2836E	15234	55322N	57382	7436N	13374N	7295E
28	5733N	13534W	20300	1800	12	3	69	2825E	15608	55004N	57176	7409N	13727N	7427E
28	5727N	13603W	20300	1805	12	3	69	2759E	15552	54790N	56955	7409N	13733N	7299E
28	5723N	13632W	20300	1810	12	3	69	2813E	15613	54723N	56907	7404N	13756N	7383E
28	5717N	13703W	20300	1815	12	3	69	2814E	15698	54559N	56772	7356N	13829N	7428E
28	5711N	13734W	20300	1820	12	3	69	2745E	15861	54349N	56616	7343N	14034N	7388E
28	5705N	13805W	20200	1825	12	3	69	2752E	16156	54150N	56509	7323N	14281N	7554E
28	5659N	13835W	20200	1830	12	3	69	2705E	16269	53980N	56378	7313N	14484N	7410E
28	5654N	13904W	20200	1835	12	3	69	2718E	16387	53886N	56322	7305N	14561N	7517E
28	5648N	13933W	20200	1840	12	3	69	2732E	16557	53599N	56099	7250N	14681N	7654E
28	5642N	14002W	20200	1845	12	3	69	2653E	16573	53493N	56002	7247N	14782N	7494E
28	5636N	14030W	20200	1850	12	3	69	2640E	16710	53404N	55957	7237N	14932N	7499E
28	5630N	14057W	20200	1855	12	3	69	2640E	16869	53128N	55742	7223N	15073N	7574E
28	5624N	14126W	20200	1900	12	3	69	2629E	16976	53035N	55686	7215N	15193N	7574E
28	5618N	14154W	20200	1905	12	3	69	2622E	17059	52757N	55447	7204N	15284N	7577E
28	5612N	14221W	20200	1910	12	3	69	2538E	17076	52894N	55582	7206N	15395N	7387E
28	5606N	14250W	20200	1915	12	3	69	2557E	17404	52699N	55499	7143N	15648N	7620E
28	5600N	14317W	20200	1920	12	3	69	2553E	17489	52342N	55187	7131N	15732N	7638E
28	5554N	14345W	20200	1925	12	3	69	2516E	17589	52065N	54956	7119N	15905N	7511E
28	5548N	14413W	20200	1930	12	3	69	2436E	17731	51971N	54913	7109N	16121N	7381E
28	5542N	14441W	20200	1935	12	3	69	2505E	17904	51913N	54914	7058N	16215N	7591E
28	5536N	14508W	20100	1940	12	3	69	2443E	17910	51488N	54514	7049N	16267N	7492E
28	5529N	14535W	20100	1945	12	3	69	2428E	17973	51442N	54491	7044N	16358N	7444E
28	5522N	14601W	20100	1950	12	3	69	2404E	18067	51267N	54358	7035N	16496N	7369E
28	5515N	14626W	20100	1955	12	3	69	2350E	18235	51127N	54282	7022N	16679N	7369E
28	5508N	14653W	20100	2000	12	3	69	2327E	18395	50861N	54085	7006N	16876N	7321E
28	5500N	14719W	20100	2005	12	3	69	2330E	18420	50884N	54116	7005N	16892N	7345E
28	5454N	14746W	20100	2010	12	3	69	2344E	18539	50539N	53832	6951N	16971N	7462E
28	5446N	14811W	20100	2015	12	3	69	2249E	18566	50348N	53662	6945N	17112N	7201E
28	5438N	14835W	20100	2020	12	3	69	2252E	18710	50256N	53626	6934N	17239N	7272E
28	5430N	14901W	20100	2025	12	3	69	2234E	18888	50073N	53517	6919N	17441N	7250E
28	5423N	14925W	20100	2030	12	3	69	2234E	18877	49873N	53326	6916N	17430N	7248E
28	5415N	14950W	20100	2035	12	3	69	2201E	18999	49685N	53194	6904N	17612N	7125E
28	5408N	15015W	20100	2040	12	3	69	2158E	19100	49483N	53042	6853N	17712N	7147E
28	5359N	15039W	20100	2045	12	3	69	2133E	19248	49288N	52913	6840N	17902N	7070E
28	5351N	15103W	20100	2050	12	3	69	2130E	19294	49252N	52897	6836N	17951N	7073E
28	5343N	15128W	20100	2055	12	3	69	2141E	19489	49009N	52742	6818N	18110N	7201E
28	5335N	15153W	20100	2100	12	3	69	2108E	19531	48677N	52449	6808N	18217N	7044E
28	5327N	15218W	20100	2105	12	3	69	2041E	19703	48477N	52329	6752N	18433N	6960E
28	5318N	15243W	20100	2110	12	3	69	2011E	19725	48432N	52295	6750N	18512N	6809E
28	5310N	15308W	20100	2115	12	3	69	2037E	19860	48242N	52170	6737N	18587N	6995E
28	5301N	15332W	20100	2120	12	3	69	2029E	19940	47847N	51836	6722N	18678N	6983E
28	5251N	15142W	20100	2150	12	3	69	2133E	19949	48026N	52005	6726N	18555N	7328E
28	5302N	15109W	20100	2155	12	3	69	2137E	19925	48444N	52382	6738N	18522N	7345E
28	5312N	15036W	20300	2200	12	3	69	2148E	19679	48685N	52512	6759N	18271N	7309E
28	5324N	15004W	20300	2205	12	3	69	2155E	19585	48954N	52727	6811N	18169N	7311E
28	5334N	14930W	20300	2210	12	3	69	2215E	19470	49179N	52893	6824N	18020N	7373E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
28	5343N	14856W	20300	2215	12	3	69	2212E	19370	49380N	53043	6834N	17932N	7323E
28	5353N	14820W	20300	2220	12	3	69	2223E	19214	49689N	53275	6851N	17766N	7318E
28	5402N	14745W	20300	2225	12	3	69	2316E	19081	49878N	53404	6903N	17529N	7537E
28	5412N	14710W	20300	2230	12	3	69	2300E	18946	50168N	53626	6918N	17438N	7406E
28	5423N	14632W	20300	2235	12	3	69	2334E	18791	50372N	53763	6932N	17222N	7515E
28	5434N	14554W	20400	2240	12	3	69	2417E	18575	50792N	54082	6954N	16930N	7642E
28	5445N	14517W	20400	2245	12	3	69	2417E	18427	51116N	54336	7010N	16795N	7581E
28	5455N	14439W	20400	2250	12	3	69	2431E	18234	51255N	54402	7025N	16588N	7569E
28	5505N	14400W	20400	2255	12	3	69	2437E	18152	51534N	54638	7035N	16500N	7565E
28	5515N	14320W	20300	2300	12	3	69	2509E	17924	51967N	54972	7058N	16224N	7618E
28	5524N	14240W	20300	2305	12	3	69	2521E	17742	52173N	55107	7113N	16032N	7599E
28	5533N	14159W	20300	2310	12	3	69	2542E	17606	52310N	55193	7123N	15862N	7639E
28	5542N	14118W	20300	2315	12	3	69	2550E	17411	52723N	55524	7143N	15669N	7591E
28	5551N	14039W	20300	2320	12	3	69	2555E	17393	52939N	55724	7148N	15643N	7602E
28	5600N	14000W	20300	2325	12	3	69	2616E	17040	53213N	55875	7214N	15279N	7544E
28	5608N	13920W	20300	2330	12	3	69	2634E	16858	53329N	55930	7227N	15077N	7542E
28	5615N	13839W	20300	2335	12	3	69	2652E	16739	53629N	56181	7239N	14930N	7568E
28	5622N	13759W	20300	2340	12	3	69	2707E	16643	53775N	56291	7248N	14811N	7590E
28	5629N	13718W	20400	2345	12	3	69	2654E	16429	54034N	56476	7305N	14650N	7435E
28	5636N	13638W	20400	2350	12	3	69	2716E	16322	54273N	56675	7315N	14507N	7481E
28	5643N	13557W	20400	2355	12	3	69	2742E	16054	54518N	56833	7335N	14213N	7465E
28	5650N	13517W	20400	0	13	3	69	2713E	16039	54656N	56961	7338N	14261N	7339E
28	5657N	13436W	20400	5	13	3	69	2811E	15745	54970N	57180	7400N	13877N	7438E
28	5705N	13356W	20400	10	13	3	69	2755E	15491	55218N	57349	7419N	13688N	7252E
28	5711N	13315W	20400	15	13	3	69	2833E	15379	55370N	57466	7428N	13507N	7353E
29	6023N	13522W	18200	1820	13	3	69	3040E	13777	56320N	57980	7615N	11849N	7028E
29	6017N	13558W	18200	1825	13	3	69	3052E	13909	55959N	57661	7602N	11937N	7139E
29	6010N	13635W	18200	1830	13	3	69	3017E	14037	55749N	57489	7552N	12120N	7080E
29	6004N	13713W	18200	1835	13	3	69	3001E	14245	55641N	57435	7538N	12332N	7129E
29	5957N	13750W	18200	1840	13	3	69	2929E	14389	55515N	57350	7528N	12525N	7084E
29	5950N	13829W	18200	1845	13	3	69	2933E	14537	55354N	57231	7517N	12645N	7171E
29	5943N	13906W	18200	1850	13	3	69	2919E	14707	55089N	57019	7503N	12822N	7205E
29	5936N	13943W	18200	1855	13	3	69	2852E	14737	54974N	56915	7459N	12905N	7114E
29	5930N	14020W	18200	1900	13	3	69	2831E	15026	54857N	56878	7440N	13201N	7177E
29	5923N	14058W	18200	1905	13	3	69	2815E	15148	54585N	56648	7429N	13343N	7172E
29	5915N	14135W	18200	1910	13	3	69	2803E	15321	54488N	56601	7417N	13520N	7207E
29	5908N	14213W	18200	1915	13	3	69	2735E	15612	54323N	56522	7357N	13837N	7231E
29	5900N	14250W	18200	1920	13	3	69	2718E	15777	54003N	56260	7342N	14018N	7239E
29	5852N	14329W	18200	1925	13	3	69	2655E	15903	53717N	56022	7330N	14178N	7203E
29	5844N	14407W	18200	1930	13	3	69	2644E	16085	53524N	55889	7316N	14365N	7238E
29	5835N	14445W	18100	1935	13	3	69	2630E	16187	53389N	55789	7307N	14485N	7224E
29	5826N	14523W	18100	1940	13	3	69	2624E	16312	53172N	55618	7256N	14609N	7256E
29	5817N	14602W	18100	1945	13	3	69	2556E	16560	52909N	55440	7237N	14892N	7244E
29	5807N	14641W	18100	1950	13	3	69	2554E	16831	52569N	55197	7214N	15139N	7355E
29	5757N	14719W	18100	1955	13	3	69	2525E	16933	52402N	55070	7205N	15292N	7272E
29	5747N	14757W	18100	2000	13	3	69	2500E	17128	52132N	54874	7148N	15522N	7242E
29	5737N	14834W	18100	2005	13	3	69	2438E	17264	51971N	54764	7137N	15693N	7196E
29	5727N	14910W	18100	2010	13	3	69	2433E	17506	51677N	54561	7117N	15922N	7276E
29	5717N	14946W	18100	2015	13	3	69	2358E	17590	51429N	54355	7107N	16072N	7148E
29	5707N	15021W	18100	2020	13	3	69	2314E	17661	51229N	54188	7058N	16227N	6971E
29	5657N	15056W	18100	2025	13	3	69	2304E	17936	51041N	54101	7038N	16502N	7027E
29	5646N	15130W	18100	2030	13	3	69	2304E	18122	50826N	53960	7022N	16672N	7103E
29	5636N	15203W	18100	2035	13	3	69	2231E	18222	50559N	53742	7010N	16831N	6981E
29	5626N	15234W	18100	2040	13	3	69	2217E	18329	50319N	53554	6959N	16959N	6954E
29	5616N	15305W	18100	2045	13	3	69	2204E	18470	50120N	53415	6946N	17116N	6940E
29	5605N	15336W	18100	2050	13	3	69	2141E	18575	49874N	53221	6934N	17260N	6863E
29	5556N	15406W	18100	2055	13	3	69	2117E	18758	49644N	53070	6918N	17479N	6810E
29	5546N	15435W	18100	2100	13	3	69	2104E	18943	49392N	52901	6900N	17675N	6813E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
29	5536N	15503W	18100	2105	13	3	69	2042E	19040	49124N	52685	6848N	17810N	6733E
29	5525N	15533W	18100	2110	13	3	69	2026E	19157	48883N	52503	6836N	17950N	6691E
29	5515N	15602W	18100	2115	13	3	69	2002E	19260	48649N	52323	6824N	18094N	6599E
29	5504N	15631W	18100	2120	13	3	69	1948E	19315	48464N	52172	6816N	18173N	6543E
29	5441N	15528W	21000	2150	13	3	69	2009E	19557	48369N	52174	6759N	18360N	6738E
29	5450N	15501W	21000	2155	13	3	69	2033E	19462	48518N	52276	6808N	18222N	6835E
29	5459N	15434W	21100	2200	13	3	69	2053E	19366	48728N	52435	6819N	18092N	6908E
29	5508N	15406W	21100	2205	13	3	69	2056E	19195	49005N	52631	6836N	17927N	6862E
29	5517N	15338W	21100	2210	13	3	69	2112E	19101	49306N	52877	6849N	17807N	6910E
29	5526N	15309W	21100	2215	13	3	69	2114E	18903	49416N	52908	6904N	17618N	6848E
29	5535N	15239W	21100	2220	13	3	69	2159E	18818	49545N	52998	6912N	17450N	7045E
29	5544N	15209W	21100	2225	13	3	69	2217E	18761	49772N	53191	6920N	17359N	7115E
29	5554N	15142W	21100	2230	13	3	69	2228E	18564	50148N	53474	6941N	17155N	7095E
29	5603N	15114W	21100	2235	13	3	69	2224E	18443	50240N	53519	6950N	17051N	7029E
29	5612N	15045W	21100	2240	13	3	69	2254E	18337	50395N	53628	7000N	16891N	7136E
29	5621N	15017W	21100	2245	13	3	69	2303E	18211	50597N	53775	7012N	16756N	7133E
29	5630N	14950W	21100	2250	13	3	69	2343E	18098	50852N	53976	7024N	16569N	7280E
29	5639N	14921W	21100	2255	13	3	69	2343E	17967	51182N	54244	7039N	16448N	7229E
29	5647N	14852W	21100	2300	13	3	69	2334E	17859	51295N	54316	7048N	16368N	7144E
29	5656N	14823W	21100	2305	13	3	69	2356E	17642	51508N	54446	7105N	16124N	7161E
29	5703N	14754W	21100	2310	13	3	69	2421E	17635	51588N	54519	7107N	16066N	7271E
29	5710N	14726W	21100	2315	13	3	69	2453E	17495	51872N	54743	7121N	15870N	7363E
29	5717N	14658W	21100	2320	13	3	69	2445E	17363	52094N	54911	7133N	15767N	7270E
29	5724N	14631W	21100	2325	13	3	69	2518E	17064	52294N	55008	7155N	15427N	7293E
29	5731N	14604W	21100	2330	13	3	69	2534E	17184	52441N	55185	7151N	15501N	7416E
29	5738N	14537W	21100	2335	13	3	69	2535E	16999	52615N	55293	7205N	15331N	7342E
29	5745N	14501W	21100	2340	13	3	69	2553E	16879	52873N	55502	7217N	15184N	7371E
29	5753N	14423W	21100	2345	13	3	69	2609E	16730	53114N	55686	7230N	15016N	7375E
29	5800N	14347W	21100	2350	13	3	69	2636E	16541	53185N	55698	7243N	14789N	7409E
29	5809N	14309W	21100	2355	13	3	69	2712E	16260	53409N	55829	7304N	14461N	7434E
29	5817N	14231W	21100	0	14	3	69	2713E	16221	53658N	56056	7310N	14423N	7422E
29	5827N	14152W	21100	5	14	3	69	2755E	16005	53872N	56200	7327N	14141N	7496E
29	5835N	14111W	21100	10	14	3	69	2751E	15796	54124N	56382	7343N	13965N	7381E
29	5843N	14029W	21100	15	14	3	69	2756E	15618	54423N	56620	7359N	13796N	7318E
29	5850N	13947W	21100	20	14	3	69	2819E	15463	54593N	56740	7411N	13612N	7336E
29	5859N	13904W	21100	25	14	3	69	2835E	15126	54810N	56859	7434N	13280N	7240E
29	5908N	13821W	21100	30	14	3	69	2857E	15060	54919N	56946	7439N	13176N	7293E
29	5915N	13738W	21100	35	14	3	69	2922E	14869	55246N	57212	7456N	12958N	7292E
29	5923N	13652W	21100	40	14	3	69	2954E	14603	55563N	57450	7516N	12659N	7280E
29	5930N	13606W	21100	45	14	3	69	3007E	14358	55686N	57508	7532N	12419N	7205E
29	5936N	13521W	21100	50	14	3	69	3008E	14113	55823N	57580	7548N	12204N	7087E
29	5943N	13436W	21100	55	14	3	69	2942E	13964	56099N	57811	7601N	12129N	6919E
29	5950N	13350W	21100	100	14	3	69	3018E	13880	56272N	57959	7608N	11983N	7004E
29	5956N	13304W	21100	105	14	3	69	3108E	13683	56427N	58062	7622N	11711N	7075E
29	6002N	13218W	21100	110	14	3	69	3108E	13405	56693N	58256	7641N	11473N	6931E
29	6008N	13130W	21100	115	14	3	69	3059E	13031	56905N	58378	7706N	11170N	6711E
29	6014N	13043W	21100	120	14	3	69	3153E	12869	57081N	58514	7717N	10926N	6799E
29	6020N	12955W	21100	125	14	3	69	3125E	12690	57249N	58638	7730N	10830N	6615E
29	6025N	12908W	21100	130	14	3	69	3121E	12462	57443N	58779	7745N	10641N	6486E
29	6030N	12822W	21100	135	14	3	69	3148E	12213	57617N	58897	7801N	10379N	6436E
29	6035N	12735W	21100	140	14	3	69	3225E	12163	57734N	59002	7806N	10266N	6523E
29	6039N	12649W	21300	145	14	3	69	3255E	11866	57912N	59116	7825N	9961N	6448E
29	6043N	12603W	21300	150	14	3	69	3243E	11823	58075N	59267	7829N	9946N	6391E
29	6046N	12515W	21300	155	14	3	69	3159E	11593	58192N	59336	7843N	9832N	6142E
29	6049N	12428W	21300	200	14	3	69	3247E	11347	58297N	59391	7859N	9540N	6144E
30	5822N	12552W	18200	1615	17	3	69	3028E	13116	57427N	58906	7708N	11303N	6653E
30	5820N	12620W	18200	1620	17	3	69	3024E	13176	57306N	58802	7703N	11364N	6669E
30	5819N	12649W	18200	1625	17	3	69	3023E	13229	57186N	58697	7658N	11411N	6692E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
30	5816N	12719W	18200	1630	17	3	69	3012E	13211	57040N	58550	7657N	11418N	6646E
30	5812N	12751W	18200	1635	17	3	69	2958E	13388	57306N	58849	7651N	11597N	6689E
30	5809N	12823W	18200	1640	17	3	69	3013E	13603	56915N	58519	7633N	11753N	6848E
30	5805N	12854W	18200	1645	17	3	69	3010E	13525	56959N	58543	7638N	11692N	6800E
30	5802N	12924W	18200	1650	17	3	69	3001E	13847	56909N	58569	7619N	11988N	6929E
30	5758N	12957W	18200	1655	17	3	69	2930E	14206	56513N	58271	7553N	12364N	6996E
30	5754N	13030W	18200	1700	17	3	69	2930E	14254	56237N	58015	7546N	12405N	7020E
30	5749N	13103W	18200	1705	17	3	69	2915E	14346	55966N	57775	7537N	12515N	7012E
30	5745N	13136W	18200	1710	17	3	69	2836E	14518	55871N	57726	7526N	12746N	6950E
30	5740N	13211W	18200	1715	17	3	69	2835E	14660	55783N	57677	7516N	12872N	7016E
30	5736N	13246W	18200	1720	17	3	69	2834E	14840	55808N	57748	7506N	13033N	7096E
30	5731N	13320W	18200	1725	17	3	69	2856E	15018	55446N	57445	7450N	13143N	7267E
30	5726N	13355W	18100	1730	17	3	69	2819E	15085	55220N	57243	7443N	13280N	7156E
30	5721N	13430W	18100	1735	17	3	69	2806E	15206	55100N	57160	7434N	13413N	7163E
30	5715N	13504W	18100	1740	17	3	69	2812E	15499	54955N	57099	7414N	13658N	7328E
30	5710N	13538W	18100	1745	17	3	69	2801E	15636	54683N	56875	7402N	13802N	7347E
30	5704N	13613W	18100	1750	17	3	69	2744E	15728	54544N	56766	7354N	13919N	7322E
30	5659N	13647W	18100	1755	17	3	69	2735E	15879	54377N	56648	7343N	14073N	7353E
30	5653N	13720W	18100	1800	17	3	69	2720E	16039	54181N	56505	7330N	14248N	7366E
30	5647N	13753W	18100	1805	17	3	69	2710E	16202	54049N	56425	7318N	14413N	7400E
30	5640N	13826W	18100	1810	17	3	69	2659E	16323	53817N	56238	7307N	14545N	7408E
30	5633N	13858W	18100	1815	17	3	69	2653E	16488	53711N	56185	7256N	14705N	7456E
30	5626N	13930W	18100	1820	17	3	69	2652E	16645	53396N	55931	7241N	14847N	7525E
30	5620N	14004W	18100	1825	17	3	69	2631E	16693	53326N	55878	7237N	14937N	7453E
30	5615N	14037W	18100	1830	17	3	69	2640E	16940	53155N	55789	7219N	15136N	7606E
30	5548N	13942W	18100	1900	17	3	69	2621E	17068	53204N	55875	7212N	15294N	7577E
30	5555N	13905W	18100	1905	17	3	69	2629E	16952	53309N	55940	7221N	15172N	7561E
30	5601N	13828W	18100	1910	17	3	69	2634E	16782	53492N	56063	7234N	15010N	7506E
30	5607N	13752W	18100	1915	17	3	69	2702E	16694	53619N	56158	7242N	14869N	7590E
30	5613N	13715W	18100	1920	17	3	69	2657E	16543	53831N	56316	7254N	14745N	7500E
30	5618N	13638W	18100	1925	17	3	69	2711E	16420	54053N	56492	7306N	14606N	7502E
30	5623N	13601W	18100	1930	17	3	69	2724E	16338	54262N	56669	7314N	14505N	7519E
30	5629N	13528W	18100	1935	17	3	69	2728E	16166	54479N	56828	7328N	14342N	7459E
30	5633N	13454W	18100	1940	17	3	69	2745E	16014	54629N	56928	7339N	14170N	7459E
30	5639N	13416W	18100	1945	17	3	69	2813E	15889	54971N	57222	7352N	14001N	7513E
30	5644N	13338W	18100	1950	17	3	69	2804E	15635	55161N	57334	7410N	13795N	7358E
30	5650N	13300W	18100	1955	17	3	69	2807E	15605	55200N	57363	7412N	13762N	7357E
30	5655N	13222W	18100	2000	17	3	69	2841E	15418	55521N	57622	7428N	13525N	7402E
30	5700N	13145W	18100	2005	17	3	69	2841E	15187	55706N	57739	7445N	13321N	7292E
30	5706N	13107W	18100	2010	17	3	69	2830E	15005	55841N	57822	7457N	13186N	7160E
30	5711N	13029W	18100	2015	17	3	69	2907E	14765	56102N	58013	7515N	12899N	7185E
30	5716N	12950W	18100	2020	17	3	69	2907E	14590	56193N	58056	7526N	12745N	7100E
30	5721N	12912W	18100	2025	17	3	69	2911E	14619	56379N	58244	7527N	12762N	7129E
30	5724N	12832W	18100	2030	17	3	69	2925E	14442	56603N	58417	7541N	12579N	7094E
30	5728N	12752W	18100	2035	17	3	69	3007E	14218	56884N	58634	7557N	12298N	7136E
30	5732N	12711W	18100	2040	17	3	69	2920E	13726	57418N	59036	7633N	11964N	6727E
30	5738N	12631W	18100	2045	17	3	69	2926E	13703	57013N	58637	7629N	11934N	6734E
30	5741N	12548W	18100	2050	17	3	69	2934E	13617	57325N	58921	7638N	11843N	6719E
30	5744N	12504W	18100	2055	17	3	69	2931E	13573	57416N	58999	7641N	11811N	6687E
30	5746N	12420W	18100	2100	17	3	69	2924E	13499	57684N	59243	7649N	11760N	6629E
30	5749N	12334W	18100	2105	17	3	69	2914E	13263	57804N	59306	7704N	11573N	6478E
30	5752N	12248W	18100	2110	17	3	69	3022E	13165	58144N	59616	7714N	11357N	6657E
30	5754N	12202W	18100	2115	17	3	69	2927E	12845	58558N	59950	7737N	11184N	6317E
30	5757N	12116W	18100	2120	17	3	69	2841E	12601	58649N	59987	7752N	11053N	6051E
30	5759N	12030W	18100	2125	17	3	69	2843E	12246	58458N	59727	7810N	10739N	5885E
30	5801N	11943W	18100	2130	17	3	69	3001E	12203	58566N	59824	7813N	10565N	6108E
30	5802N	11857W	18100	2135	17	3	69	2853E	12152	58897N	60138	7820N	10639N	5872E
30	5743N	11903W	18100	2205	17	3	69	2724E	12216	58623N	59882	7813N	10845N	5623E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
30	5742N	11932W	18100	2210	17	3	69	2750E	12271	58637N	59907	7810N	10850N	5731E
30	5742N	12002W	18100	2215	17	3	69	2846E	12355	58698N	59984	7806N	10829N	5948E
30	5740N	12033W	18100	2220	17	3	69	2759E	12404	58420N	59723	7800N	10953N	5821E
30	5739N	12105W	18100	2225	17	3	69	2757E	12614	58523N	59867	7750N	11141N	5915E
30	5737N	12136W	18100	2230	17	3	69	2816E	12845	58411N	59807	7735N	11312N	6085E
30	5735N	12206W	18100	2235	17	3	69	2911E	13089	58376N	59826	7721N	11427N	6384E
30	5717N	12124W	18100	2250	17	3	69	2816E	12970	58296N	59722	7727N	11424N	6142E
30	5719N	12040W	18100	2255	17	3	69	2822E	12828	58314N	59708	7735N	11288N	6095E
30	5721N	11954W	18100	2300	17	3	69	2745E	12607	58599N	59940	7751N	11157N	5870E
30	5722N	11908W	18100	2305	17	3	69	2735E	12450	58351N	59664	7757N	11034N	5764E
30	5725N	11823W	18100	2310	17	3	69	2910E	12413	58489N	59792	7801N	10838N	6051E
30	5727N	11738W	18100	2315	17	3	69	2856E	12189	59091N	60335	7820N	10667N	5897E
30	5843N	11923W	18200	0	18	3	69	2947E	11706	58663N	59820	7842N	10159N	5815E
30	5843N	11954W	18200	5	18	3	69	3005E	11685	58536N	59691	7842N	10110N	5858E
30	5843N	12024W	18200	10	18	3	69	2859E	11873	58359N	59555	7830N	10386N	5753E
30	5840N	12054W	18200	15	18	3	69	2830E	11770	58449N	59623	7836N	10343N	5617E
30	5838N	12124W	18200	20	18	3	69	2904E	12038	58777N	59997	7825N	10521N	5849E
30	5835N	12156W	18200	25	18	3	69	3019E	12353	58621N	59909	7805N	10663N	6237E
30	5834N	12227W	18200	30	18	3	69	3049E	12543	58345N	59678	7752N	10772N	6426E
30	5833N	12259W	18200	35	18	3	69	2952E	12577	58090N	59436	7747N	10906N	6263E
30	5831N	12332W	18200	40	18	3	69	2916E	12674	58143N	59509	7742N	11055N	6198E
30	5830N	12405W	18200	45	18	3	69	3005E	12916	58194N	59610	7729N	11174N	6477E
31	5943N	11958W	16100	1555	18	3	69	3036E	11212	58768N	59828	7911N	9651N	5708E
31	5942N	12030W	16100	1600	18	3	69	2921E	11210	58656N	59718	7910N	9770N	5495E
31	5940N	12103W	16100	1605	18	3	69	2911E	11221	59003N	60061	7913N	9795N	5474E
31	5938N	12136W	16100	1610	18	3	69	3148E	11435	58950N	60049	7901N	9718N	6027E
31	5936N	12208W	16100	1615	18	3	69	3041E	11586	58625N	59759	7849N	9962N	5915E
31	5933N	12241W	16100	1620	18	3	69	2959E	11699	58663N	59818	7843N	10133N	5847E
31	5931N	12313W	16100	1625	18	3	69	2959E	11698	58875N	60026	7845N	10132N	5848E
31	5927N	12417W	16100	1635	18	3	69	3253E	12230	58827N	60085	7815N	10269N	6641E
31	5925N	12448W	16100	1640	18	3	69	3311E	12457	58200N	59518	7755N	10425N	6818E
31	5924N	12521W	16100	1645	18	3	69	3154E	12452	57853N	59178	7751N	10571N	6580E
31	5921N	12553W	16100	1650	18	3	69	3129E	12595	57808N	59164	7742N	10740N	6579E
31	5919N	12625W	16100	1655	18	3	69	3121E	12722	57654N	59041	7733N	10865N	6619E
31	5917N	12657W	16100	1700	18	3	69	3053E	12795	57463N	58871	7726N	10979N	6570E
31	5914N	12730W	16100	1705	18	3	69	3052E	12770	57423N	58826	7727N	10961N	6552E
31	5911N	12803W	16100	1710	18	3	69	3052E	13137	57253N	58741	7704N	11276N	6740E
31	5908N	12836W	16100	1715	18	3	69	3056E	13099	57103N	58587	7704N	11235N	6735E
31	5905N	12908W	16100	1720	18	3	69	3043E	13279	56965N	58493	7652N	11416N	6784E
31	5901N	12941W	16100	1725	18	3	69	3054E	13279	56889N	58419	7651N	11393N	6821E
31	5857N	13014W	16100	1730	18	3	69	3046E	13473	56820N	58396	7639N	11576N	6892E
31	5853N	13046W	16100	1735	18	3	69	3027E	13758	56583N	58232	7620N	11858N	6975E
31	5849N	13118W	16100	1740	18	3	69	3024E	13687	56448N	58084	7622N	11804N	6928E
31	5845N	13151W	16100	1745	18	3	69	3014E	14054	56468N	58191	7601N	12141N	7079E
31	5830N	13107W	16000	1805	18	3	69	2925E	13979	56450N	58155	7605N	12175N	6868E
31	5835N	13024W	16000	1810	18	3	69	2955E	13951	56596N	58290	7609N	12091N	6959E
31	5839N	12941W	16000	1815	18	3	69	3008E	13772	56743N	58390	7621N	11909N	6917E
31	5844N	12857W	16400	1820	18	3	69	3011E	13642	56887N	58500	7630N	11791N	6860E
31	5848N	12815W	16400	1825	18	3	69	3004E	13472	57148N	58715	7644N	11658N	6752E
31	5853N	12732W	16400	1830	18	3	69	3037E	13210	57200N	58705	7659N	11366N	6731E
31	5856N	12649W	16400	1835	18	3	69	3049E	13151	57349N	58838	7705N	11294N	6739E
31	5900N	12607W	16400	1840	18	3	69	3106E	13036	57500N	58959	7713N	11160N	6736E
31	5902N	12524W	16400	1845	18	3	69	3123E	12865	57651N	59069	7725N	10983N	6700E
31	5906N	12441W	16400	1850	18	3	69	3228E	12853	57991N	59398	7730N	10844N	6900E
31	5909N	12358W	16400	1855	18	3	69	3121E	12686	58711N	60066	7748N	10832N	6603E
31	5912N	12315W	16400	1900	18	3	69	2936E	12274	58755N	60024	7811N	10671N	6065E
31	5915N	12231W	16400	1905	18	3	69	2942E	12021	58342N	59567	7821N	10440N	5959E
31	5917N	12147W	16400	1910	18	3	69	3135E	11936	58602N	59805	7829N	10167N	6253E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
31	5920N	12103W	16400	1915	18	3	69	2938E	11593	59033N	60160	7853N	10075N	5734E
31	5922N	12019W	16400	1920	18	3	69	2918E	11446	58578N	59686	7856N	9981N	5602E
31	5925N	11935W	16400	1925	18	3	69	3027E	11357	58673N	59762	7902N	9789N	5757E
31	5904N	12004W	16400	1955	18	3	69	3021E	11471	58578N	59690	7855N	9898N	5796E
31	5902N	12036W	16400	2000	18	3	69	2945E	11433	58445N	59553	7855N	9926N	5674E
31	5900N	12108W	16400	2005	18	3	69	2813E	11534	58687N	59810	7852N	10163N	5453E
31	5858N	12141W	16400	2010	18	3	69	3007E	11918	58936N	60129	7834N	10308N	5982E
31	5856N	12213W	16400	2015	18	3	69	3110E	12142	58557N	59803	7817N	10389N	6284E
31	5854N	12246W	16400	2020	18	3	69	3022E	12197	58217N	59481	7809N	10523N	6167E
31	5852N	12320W	16400	2025	18	3	69	2912E	12411	58285N	59591	7758N	10833N	6056E
31	5850N	12351W	16400	2030	18	3	69	2927E	12579	58434N	59773	7751N	10953N	6186E
31	5848N	12422W	16400	2035	18	3	69	3054E	12825	58384N	59776	7736N	11003N	6588E
31	5846N	12453W	16400	2040	18	3	69	3124E	13079	57970N	59427	7717N	11162N	6816E
31	5844N	12524W	16400	2045	18	3	69	3101E	13017	57690N	59140	7717N	11155N	6709E
31	5842N	12556W	16400	2050	18	3	69	3022E	13074	57519N	58986	7711N	11279N	6610E
31	5839N	12628W	16400	2055	18	3	69	3059E	13168	57402N	58893	7704N	11306N	6750E
31	5837N	12659W	16400	2100	18	3	69	3011E	13268	57313N	58829	7657N	11467N	6674E
31	5834N	12731W	16400	2105	18	3	69	3005E	13423	57131N	58687	7646N	11614N	6729E
31	5830N	12803W	16400	2110	18	3	69	2949E	13488	56992N	58567	7641N	11702N	6707E
31	5827N	12835W	16400	2115	18	3	69	2948E	13575	56879N	58477	7634N	11779N	6747E
31	5823N	12905W	16400	2120	18	3	69	2930E	13765	56830N	58473	7623N	11979N	6781E
31	5820N	12936W	16400	2125	18	3	69	3005E	13717	56860N	58491	7626N	11868N	6876E
31	5817N	13008W	16500	2130	18	3	69	3008E	14029	56891N	58595	7608N	12132N	7043E
31	5813N	13040W	16500	2135	18	3	69	2931E	14176	56396N	58151	7553N	12335N	6986E
31	5809N	13111W	16500	2140	18	3	69	2918E	14349	56475N	58269	7544N	12513N	7022E
31	5805N	13142W	16500	2145	18	3	69	2846E	14456	56386N	58210	7537N	12671N	6958E
31	5801N	13212W	16500	2150	18	3	69	2906E	14712	56192N	58086	7519N	12854N	7156E
31	5726N	13129W	16500	2210	18	3	69	2828E	15026	56026N	58005	7459N	13209N	7162E
31	5731N	13047W	16500	2215	18	3	69	2845E	14630	56121N	57996	7523N	12825N	7039E
31	5736N	13005W	16500	2220	18	3	69	2832E	14570	56281N	58136	7529N	12799N	6963E
31	5741N	12923W	16500	2225	18	3	69	2901E	14574	56551N	58399	7532N	12744N	7070E
31	5745N	12841W	16500	2230	18	3	69	2915E	14231	56859N	58613	7556N	12416N	6954E
31	5750N	12758W	16500	2235	18	3	69	2955E	13814	57044N	58693	7623N	11972N	6892E
31	5754N	12715W	16500	2240	18	3	69	2922E	13639	57185N	58789	7635N	11885N	6689E
31	5758N	12633W	16500	2245	18	3	69	2951E	13552	57166N	58751	7639N	11753N	6747E
31	5802N	12550W	16500	2250	18	3	69	2955E	13482	57340N	58904	7646N	11684N	6726E
31	5805N	12506W	16400	2255	18	3	69	3009E	13452	57559N	59110	7650N	11631N	6758E
31	5808N	12421W	16400	2300	18	3	69	2946E	13251	57996N	59491	7707N	11502N	6580E
31	5811N	12336W	16400	2305	18	3	69	2910E	12956	58033N	59461	7724N	11311N	6316E
31	5813N	12252W	16400	2310	18	3	69	3004E	12855	58103N	59508	7731N	11125N	6441E
31	5816N	12207W	16400	2315	18	3	69	3017E	12548	58554N	59883	7754N	10835N	6330E
31	5819N	12122W	16400	2320	18	3	69	2834E	12163	58721N	59968	7817N	10681N	5818E
31	5820N	12038W	16400	2325	18	3	69	2835E	11867	58391N	59585	7830N	10419N	5680E
31	5822N	11952W	16400	2330	18	3	69	2950E	11836	58440N	59627	7833N	10267N	5889E
31	5824N	11905W	16400	2335	18	3	69	3025E	11797	58812N	59983	7839N	10171N	5975E
31	5706N	11835W	16400	20	19	3	69	2820E	12492	58316N	59639	7754N	10994N	5930E
31	5706N	11906W	16400	25	19	3	69	2718E	12479	58221N	59543	7754N	11088N	5725E
31	5705N	11938W	16400	30	19	3	69	2747E	12541	58489N	59819	7753N	11095N	5846E
31	5705N	12010W	16400	35	19	3	69	2804E	12866	58208N	59612	7732N	11352N	6053E
31	5705N	12042W	16400	40	19	3	69	2739E	12957	58274N	59698	7727N	11476N	6015E
31	5702N	12113W	16400	45	19	3	69	2716E	13562	58033N	59597	7650N	12054N	6215E
31	5640N	12054W	16400	110	19	3	69	2739E	13289	58066N	59568	7706N	11770N	6168E
31	5642N	12010W	16400	115	19	3	69	2805E	13068	58178N	59627	7720N	11529N	6152E
31	5643N	11925W	16400	120	19	3	69	2736E	12696	58526N	59887	7745N	11250N	5884E
31	5645N	11839W	16400	125	19	3	69	2724E	12657	58254N	59614	7744N	11236N	5826E
31	5646N	11752W	16400	130	19	3	69	2811E	12728	58699N	60063	7745N	11217N	6014E
31	5646N	11706W	16400	135	19	3	69	2711E	12510	58947N	60260	7801N	11127N	5717E
32	5625N	11717W	16100	1715	19	3	69	2727E	12680	58849N	60200	7750N	11251N	5848E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
32	5624N	11750W	16100	1720	19	3	69	2704E	12727	58584N	59951	7744N	11332N	5792E
32	5623N	11823W	16100	1725	19	3	69	2719E	12768	58395N	59774	7739N	11344N	5860E
32	5622N	11855W	16100	1730	19	3	69	2646E	12604	58533N	59874	7750N	11253N	5678E
32	5621N	11927W	16100	1735	19	3	69	2755E	12927	58646N	60054	7734N	11422N	6053E
32	5620N	11959W	16100	1740	19	3	69	2851E	13233	58278N	59762	7712N	11590N	6386E
32	5619N	12031W	16100	1745	19	3	69	2757E	13390	57976N	59502	7659N	11827N	6277E
32	5617N	12105W	16100	1750	19	3	69	2744E	13384	58048N	59571	7700N	11845N	6230E
32	5615N	12138W	16100	1755	19	3	69	2802E	13663	58020N	59607	7644N	12058N	6424E
32	5613N	12212W	16100	1800	19	3	69	2806E	13841	58029N	59657	7635N	12208N	6521E
32	5611N	12245W	16100	1805	19	3	69	2855E	14128	57768N	59471	7615N	12365N	6834E
32	5609N	12318W	16100	1810	19	3	69	2847E	14226	57335N	59073	7603N	12468N	6850E
32	5608N	12350W	16100	1815	19	3	69	2819E	14267	57117N	58872	7558N	12559N	6769E
32	5556N	12220W	16000	1835	19	3	69	2752E	14143	57493N	59207	7610N	12503N	6611E
32	5557N	12143W	16000	1840	19	3	69	2725E	13958	57843N	59503	7625N	12390N	6428E
32	5559N	12106W	16000	1845	19	3	69	2723E	13686	57932N	59527	7642N	12152N	6297E
32	5601N	12028W	16000	1850	19	3	69	2716E	13565	57950N	59517	7649N	12056N	6216E
32	5602N	11950W	16000	1855	19	3	69	2835E	13459	58371N	59903	7700N	11818N	6440E
32	5603N	11916W	16000	1900	19	3	69	2643E	13263	58615N	60097	7714N	11846N	5965E
32	5604N	11840W	16000	1905	19	3	69	2614E	12808	58527N	59912	7739N	11488N	5663E
32	5604N	11803W	16000	1910	19	3	69	2650E	12945	58327N	59747	7729N	11551N	5843E
32	5605N	11725W	16000	1915	19	3	69	2622E	13030	58723N	60152	7729N	11674N	5789E
32	5606N	11650W	16000	1920	19	3	69	2525E	12916	58725N	60129	7735N	11665N	5544E
32	5546N	11731W	15900	1945	19	3	69	2547E	13222	58375N	59854	7714N	11905N	5753E
32	5545N	11804W	15900	1950	19	3	69	2515E	12999	58477N	59904	7727N	11756N	5548E
32	5545N	11837W	15800	1955	19	3	69	2618E	13297	58732N	60218	7714N	11920N	5894E
32	5543N	11910W	15800	2000	19	3	69	2633E	13549	58564N	60111	7658N	12119N	6058E
32	5543N	11942W	15800	2005	19	3	69	2731E	13919	58434N	60069	7636N	12344N	6431E
32	5542N	12013W	15800	2010	19	3	69	2756E	13862	57803N	59442	7630N	12246N	6497E
32	5540N	12045W	15800	2015	19	3	69	2700E	13838	57823N	59456	7632N	12330N	6283E
32	5539N	12117W	15800	2020	19	3	69	2727E	14108	57930N	59624	7618N	12520N	6504E
32	5537N	12150W	15800	2025	19	3	69	2739E	14305	57631N	59380	7603N	12670N	6641E
32	5535N	12221W	15800	2030	19	3	69	2743E	14515	57471N	59276	7549N	12849N	6752E
32	5532N	12251W	15800	2035	19	3	69	2815E	14578	57164N	58994	7541N	12841N	6900E
32	5514N	12231W	15900	2050	19	3	69	2725E	14713	57055N	58922	7532N	13060N	6775E
32	5516N	12154W	15900	2055	19	3	69	2646E	14643	57405N	59244	7541N	13074N	6595E
32	5517N	12117W	15900	2100	19	3	69	2651E	14373	57675N	59439	7600N	12822N	6495E
32	5519N	12040W	15900	2105	19	3	69	2639E	14113	57820N	59517	7616N	12614N	6330E
32	5520N	12004W	15900	2110	19	3	69	2652E	14085	57854N	59544	7618N	12563N	6368E
32	5522N	11928W	16000	2115	19	3	69	2620E	13990	58201N	59859	7629N	12537N	6209E
32	5524N	11852W	16000	2120	19	3	69	2517E	13875	58417N	60043	7638N	12546N	5926E
32	5525N	11816W	16000	2125	19	3	69	2427E	13507	58407N	59949	7658N	12295N	5590E
32	5525N	11742W	16000	2130	19	3	69	2433E	13403	58102N	59628	7700N	12191N	5569E
32	5525N	11709W	16000	2135	19	3	69	2523E	13404	58376N	59896	7704N	12109N	5747E
32	5526N	11631W	16000	2140	19	3	69	2439E	13095	58387N	59838	7721N	11900N	5463E
33	5250N	10949W	19300	1820	20	3	69	1928E	13653	59119N	60675	7659N	12872N	4551E
33	5246N	10913W	19300	1825	20	3	69	1940E	13511	58755N	60289	7702N	12722N	4549E
33	5242N	10837W	19300	1830	20	3	69	1911E	13599	58982N	60530	7701N	12842N	4471E
33	5244N	10801W	19300	1835	20	3	69	1857E	13635	58979N	60535	7658N	12895N	4430E
33	5246N	10725W	19300	1840	20	3	69	1909E	13282	59424N	60890	7724N	12546N	4358E
33	5245N	10648W	19200	1845	20	3	69	1733E	12798	59329N	60693	7749N	12201N	3860E
33	5243N	10611W	19200	1850	20	3	69	1907E	12893	59747N	61123	7749N	12181N	4224E
33	5241N	10534W	19200	1855	20	3	69	1629E	12879	59802N	61173	7750N	12349N	3654E
33	5237N	10459W	19200	1900	20	3	69	1535E	12724	59477N	60823	7755N	12256N	3420E
33	5234N	10424W	19200	1905	20	3	69	1547E	12722	59360N	60708	7754N	12242N	3462E
33	5230N	10349W	19200	1910	20	3	69	1516E	12674	59422N	60758	7757N	12226N	3338E
33	5226N	10315W	19200	1915	20	3	69	1511E	12632	59535N	60860	7801N	12190N	3310E
33	5222N	10240W	19200	1920	20	3	69	1415E	12667	59513N	60846	7759N	12277N	3121E
33	5218N	10204W	19200	1925	20	3	69	1436E	12605	59549N	60869	7802N	12197N	3178E

FL	LAT	LONG	ALT	GMT	DA	MO	YR	D	H	Z	F	I	X	Y
33	5215N	10129W	19200	1930	20	3	69	1350E	12410	59763N	61038	7816N	12049N	2970E
33	5210N	10054W	19100	1935	20	3	69	1325E	12355	59663N	60929	7817N	12018N	2867E
33	5206N	10020W	19100	1940	20	3	69	1308E	12372	60275N	61531	7824N	12048N	2814E
33	5201N	9946W	19100	1945	20	3	69	1104E	12347	59963N	61221	7821N	12117N	2370E
33	5156N	9912W	19100	1950	20	3	69	1112E	12371	59839N	61104	7819N	12135N	2404E
33	5151N	9838W	19100	1955	20	3	69	1032E	12416	60007N	61278	7818N	12207N	2271E
33	5145N	9804W	19100	2000	20	3	69	944E	12575	60052N	61354	7810N	12393N	2128E
33	5140N	9729W	19100	2005	20	3	69	842E	12722	59892N	61229	7800N	12576N	1924E
33	5133N	9654W	19100	2010	20	3	69	845E	12743	59715N	61059	7757N	12594N	1939E
33	5128N	9620W	19100	2015	20	3	69	802E	12648	59873N	61194	7804N	12523N	1771E
33	5122N	9545W	19100	2020	20	3	69	724E	12483	59815N	61104	7812N	12379N	1608E
33	5117N	9510W	19100	2025	20	3	69	653E	12474	59813N	61100	7813N	12384N	1498E
33	5110N	9436W	19100	2030	20	3	69	612E	12388	59958N	61224	7819N	12316N	1340E
33	5103N	9404W	19100	2035	20	3	69	505E	12236	59991N	61227	7828N	12188N	1086E
33	5056N	9332W	19100	2040	20	3	69	413E	12391	59817N	61087	7817N	12357N	913E
33	5048N	9300W	19100	2045	20	3	69	427E	12415	59781N	61056	7816N	12378N	965E
33	5042N	9228W	19100	2050	20	3	69	318E	12683	59700N	61032	7800N	12662N	732E
33	5035N	9156W	19100	2055	20	3	69	244E	12500	59593N	60890	7809N	12486N	599E
33	5029N	9124W	19100	2100	20	3	69	215E	12637	59584N	60910	7801N	12627N	496E
33	5021N	9053W	19100	2105	20	3	69	159E	12811	59424N	60789	7750N	12803N	446E
33	5013N	9022W	19100	2110	20	3	69	152E	12612	59421N	60745	7800N	12605N	411E
33	5005N	8951W	19100	2115	20	3	69	33E	12611	59606N	60925	7803N	12610N	124E
33	4957N	8921W	19100	2120	20	3	69	26E	12957	59543N	60936	7743N	12956N	98E
33	4949N	8850W	19100	2125	20	3	69	30W	12732	59619N	60963	7756N	12732N	113W
33	4944N	8818W	19100	2130	20	3	69	228W	12767	59320N	60678	7751N	12755N	551W
33	4936N	8750W	19100	2135	20	3	69	233W	12661	59193N	60532	7755N	12648N	566W
33	4928N	8720W	19100	2140	20	3	69	304W	12878	59097N	60484	7742N	12859N	690W
33	4920N	8650W	19100	2145	20	3	69	334W	12676	59108N	60452	7753N	12651N	792W
33	4911N	8620W	19100	2150	20	3	69	430W	12763	59197N	60558	7749N	12723N	1004W
33	4901N	8549W	19100	2155	20	3	69	441W	13086	59125N	60556	7731N	13043N	1069W
33	4852N	8519W	19100	2200	20	3	69	454W	13208	58926N	60388	7721N	13160N	1131W
33	4843N	8449W	19100	2205	20	3	69	536W	13199	58901N	60362	7722N	13136N	1289W
33	4833N	8420W	19100	2210	20	3	69	602W	13307	58793N	60280	7714N	13233N	1399W
33	4825N	8348W	19100	2215	20	3	69	647W	13336	58680N	60176	7711N	13243N	1576W
33	4808N	8247W	19100	2225	20	3	69	635W	13573	58533N	60086	7656N	13483N	1556W
33	4759N	8217W	19100	2230	20	3	69	744W	13530	58463N	60008	7658N	13407N	1821W
33	4750N	8147W	19100	2235	20	3	69	725W	13660	58462N	60037	7650N	13546N	1767W
33	4740N	8121W	19100	2240	20	3	69	908W	13744	58324N	59922	7644N	13570N	2187W
33	4735N	8054W	19100	2245	20	3	69	914W	13878	58104N	59738	7633N	13698N	2228W
33	4730N	8026W	19100	2250	20	3	69	953W	13984	58076N	59736	7627N	13776N	2401W
33	4724N	8001W	19100	2255	20	3	69	1007W	14035	57951N	59626	7623N	13817N	2466W
33	4717N	7937W	19100	2300	20	3	69	1030W	14150	57873N	59578	7615N	13913N	2581W
33	4709N	7914W	19100	2305	20	3	69	1126W	14313	57750N	59497	7604N	14028N	2840W