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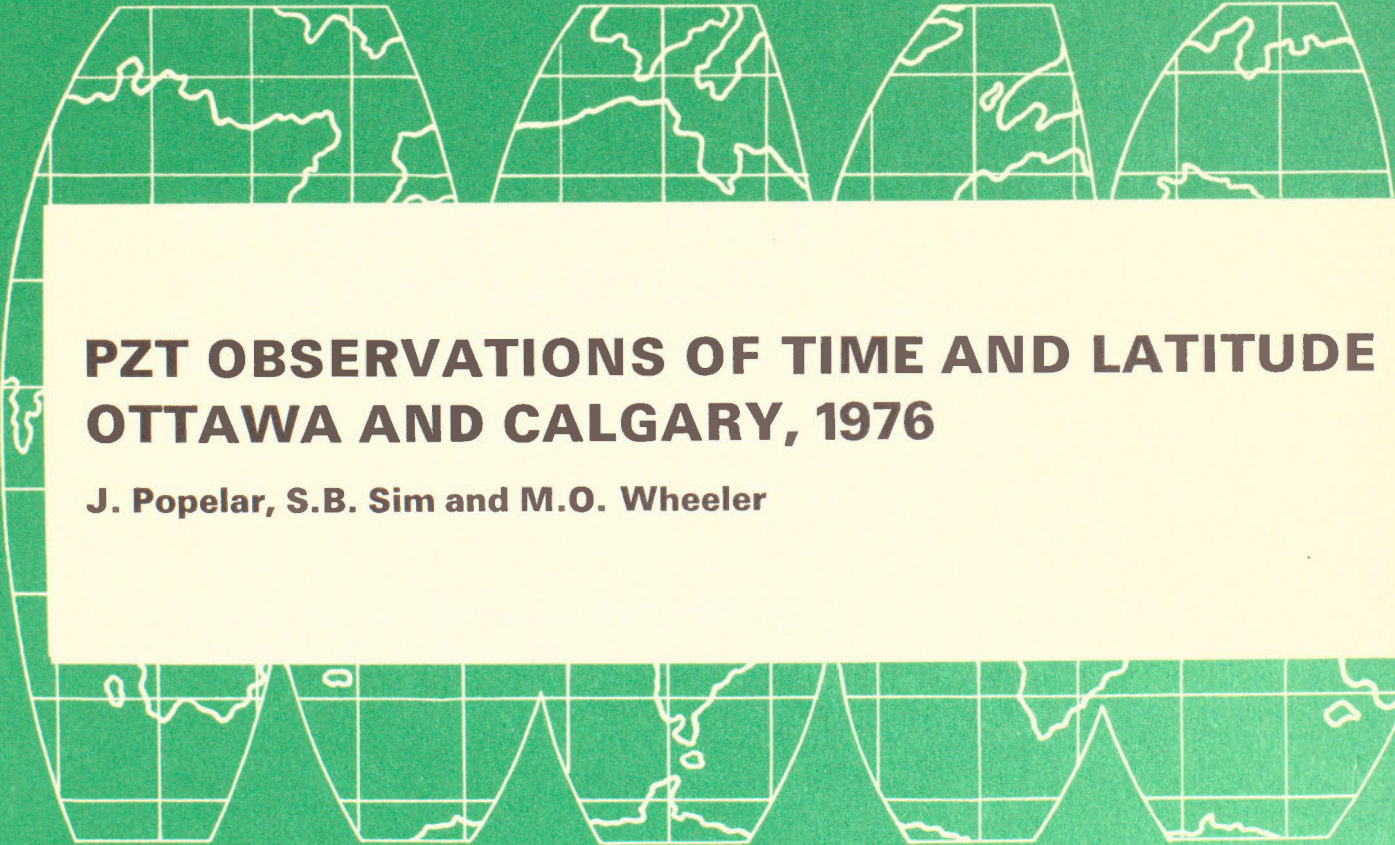
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PZT OBSERVATIONS OF TIME AND LATITUDE OTTAWA AND CALGARY, 1976

J. Popelar, S.B. Sim and M.O. Wheeler

Geodynamics Series Bulletin No. 69
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FOREWORD

This bulletin presents in summary form the results of time and latitude observations made with two Photographic Zenith Tubes (PZT) located near Ottawa, Ontario and Calgary, Alberta. As such, it is a continuation of the previous Time and Latitude Bulletins issued by the Positional Astronomy Group of the now defunct Dominion Observatory. On April 1, 1970, the PZT observatories became part of the Earth Physics Branch of the Department of Energy, Mines and Resources. Since July 1, 1973, the Geodynamics Section of the Gravity and Geodynamics Division has had the responsibility for the PZT program.

J.G. Tanner, Director
Gravity and Geodynamics Division

AVANT-PROPOS

Ce bulletin présente, sous forme de résumé, les résultats des observations effectuées sur l'heure et la latitude, à l'aide de deux télescopes photographiques zénithaux (PZT), situés, l'un près d'Ottawa (Ontario), et l'autre près de Calgary (Alberta). Par conséquent, le bulletin fait suite aux Bulletins de latitude et de l'heure antérieurs, émis par le Groupe d'astronomie positionnelle de l'ancien observatoire fédéral. Le 1^{er} avril 1970, les observatoires de PZT sont devenus partie intégrante de la Direction de la physique du globe du ministère de l'Énergie, des Mines et des Ressources. Depuis le 1^{er} juillet 1973, le programme du PZT relève de la Section de géodynamiques de la Division de la gravité et géodynamique.

J.G. Tanner, Directeur
Division de la gravité et
géodynamique

PZT OBSERVATIONS OF TIME AND LATITUDE OTTAWA AND CALGARY, 1976

J. Popelar, S.B. Sim and M.O. Wheeler

This bulletin presents the results of time and latitude observations made with the Ottawa and Calgary photographic zenith tubes (PZT) during 1976, in continuation of Bulletin No. 68. The data from both PZT instruments have been contributed regularly during the year to the international programs of the BIH and IPMS.

OTTAWA PZT has been located at Shirleys Bay near Ottawa since December 30, 1970. The adopted BIH co-ordinates for the instrument are:

$$5^{\text{h}} 03^{\text{m}} 40^{\text{s}}.8500 \text{ W} \qquad 45^{\circ} 24' 0'' 800 \text{ N}$$

The observational program is based on the 1972 star catalogue which was published in Bulletin No. 63. Nightly operations of the PZT are pre-programmed and fully automated. The instrument provided consistent data of high quality throughout the year. Altogether 152 photographic plates were obtained from which 3250 transits of program stars were processed. For time comparisons the CHU time signals were used regularly.

In July 1976 the PZT controls were moved into a new field laboratory unit shared with the Ottawa Tranet satellite Doppler tracking station. Major repair work was done on the roof of the PZT observing hut in December.

CALGARY PZT at Priddis near Calgary is located approximately on the same parallel as the Herstmonceux PZT of the Royal Greenwich Observatory. The adopted BIH co-ordinates for the instrument are:

$$7^{\text{h}} 37^{\text{m}} 9^{\text{s}}.5000 \text{ W} \qquad 50^{\circ} 52' 22'' 500 \text{ N.}$$

Since 1975.0 the observational program has been based on the revised Herstmonceux PZT star catalogue (Greenwich Time Report, 1976 January March). Nightly operation of the PZT is also pre-programmed and fully automated. During the year 231 photographic plates were obtained from which 5599 transits of program stars were evaluated. For time comparisons the WWV time signals were used regularly.

The time and latitude observations are presented in the same form as in the previous Bulletins, Nos. 64-66 and 68. The smoothing was performed on plate means using the technique suggested by Vondrak (Bull. Astr. Inst. of Czechoslovakia, Vol. 20, No. 6, 1969) with weights proportional to the number of observed stars for each plate. UTC step adjustments were removed before smoothing and the value of 10^{-7} was used as the coefficient of roughness. The smoothed time and latitude curves, with individual plate means for the Ottawa PZT and the Calgary PZT, are shown in Fig. 1 and 2 respectively.

UT2-UTC + 2.9MS/DAY

OTTAWA SB TIME OBSERVATIONS

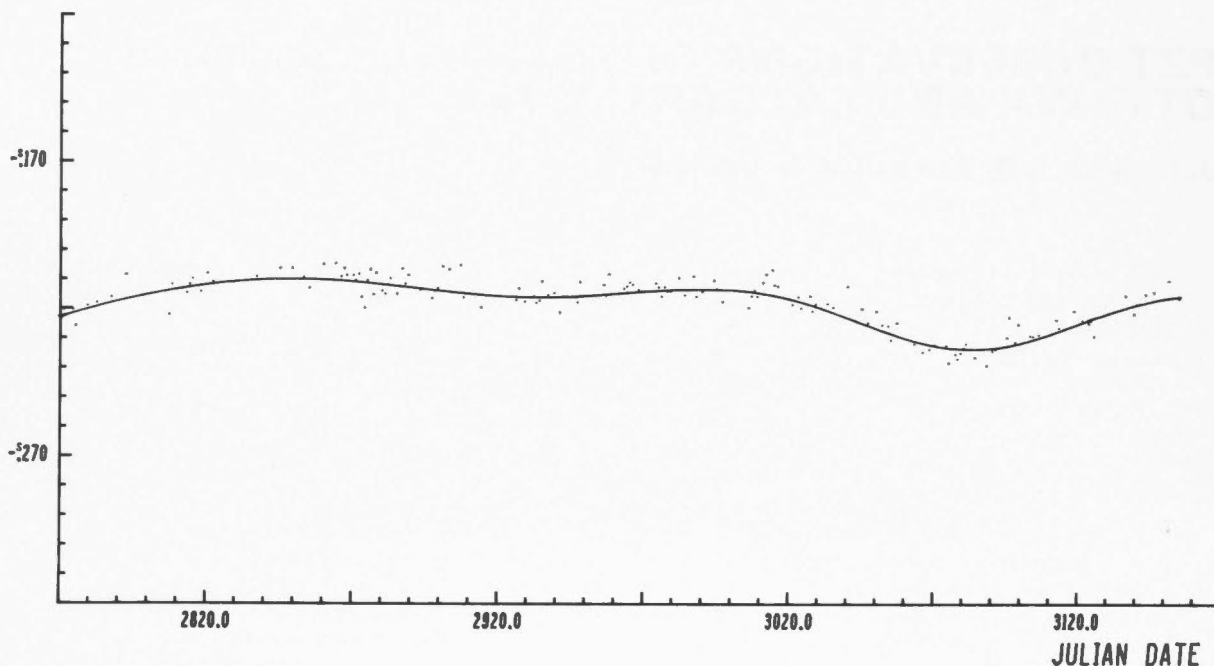


Figure 1a. Individual night observations of time with the Ottawa PZT and the smoothed curve for UT2 - UTC + 2.9 ms/day* (STD 3.2 ms).

PHI 1

OTTAWA SB LATITUDE OBSERVATIONS

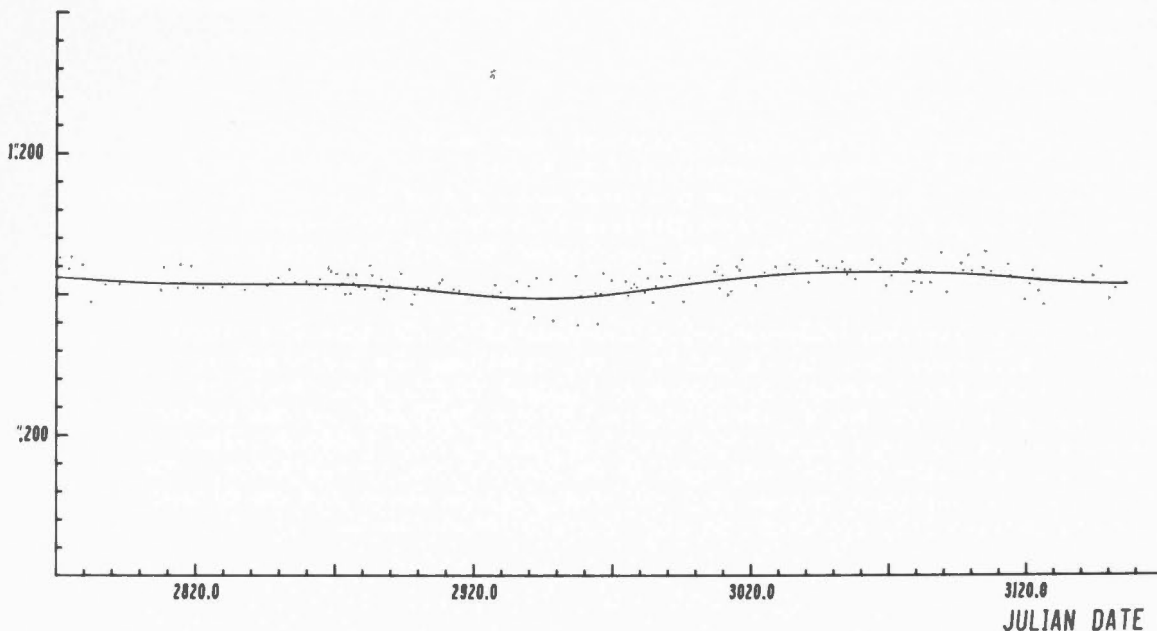


Figure 1b. Individual night observations of latitude with the Ottawa PZT and the smoothed curve for PHI 1 (STD 0!038).

*The UTC step adjustments have been removed.

UT2-UTC + 2.9MS/DAY

CALGARY

TIME OBSERVATIONS

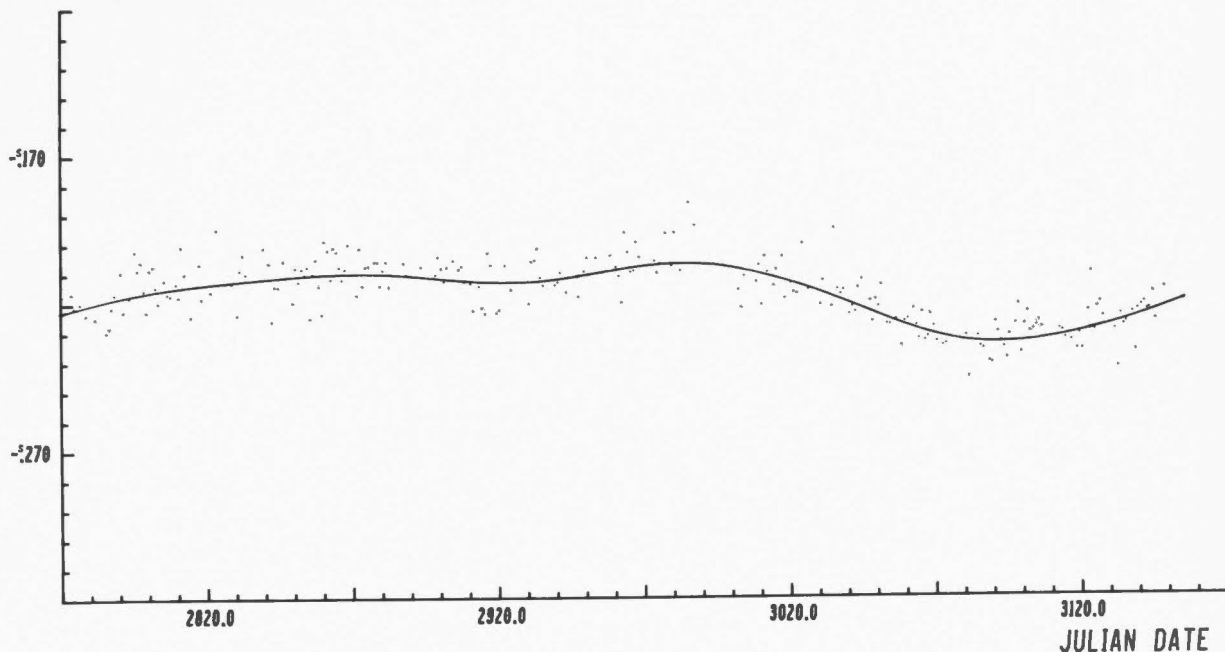


Figure 2a. Individual night observations of time with the Calgary PZT and the smoothed curve for $UT2 - UTC + 2.9 \text{ ms/day}^*$ (STD 5.6 ms).

PHI 1

CALGARY

LATITUDE OBSERVATIONS

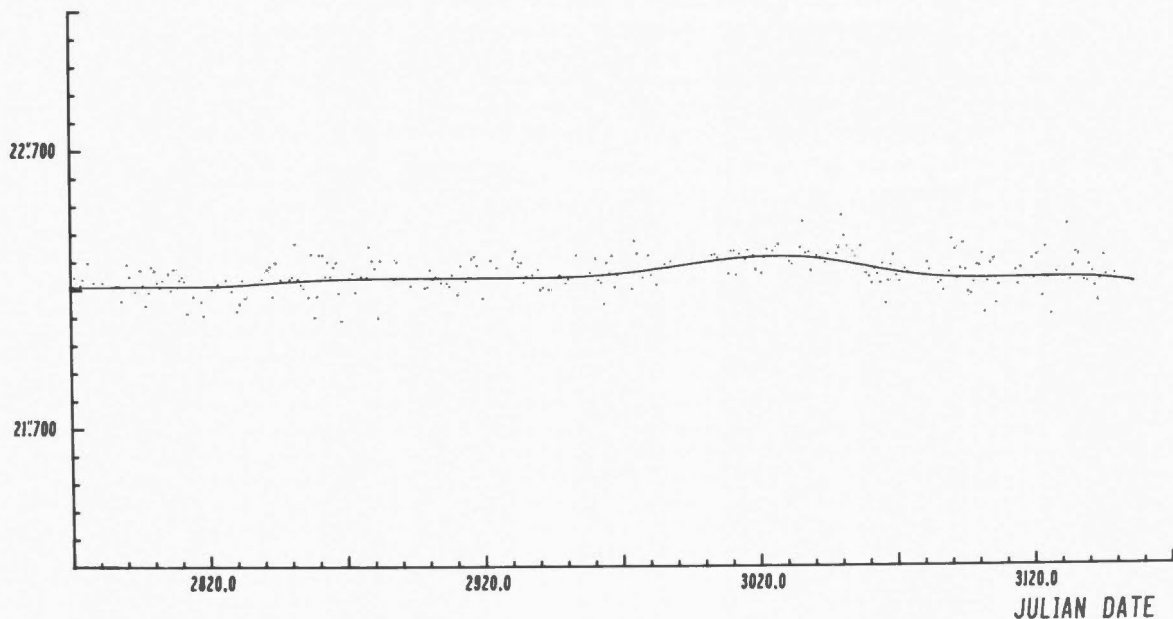


Figure 2b. Individual night observations of latitude with the Calgary PZT and the smoothed curve for $PHI 1$ (STD 0:053).

*The UTC step adjustments have been removed.

TABLE 1 presents the results of time and latitude observations arranged by nights (plates) separately for the Ottawa and Calgary stations.

<u>Column</u>	<u>Description</u>
1	<u>Date (UT)</u> of mid-observation.
2	<u>Julian Date</u> of mid-observation.
3	<u>N</u> - number of observed stars.
4	<u>UTO - UTC observed</u> - raw time observations.
5	<u>UT2 - UTC smoothed</u> - smoothed values of time after reduction for the longitude variation and the seasonal change in the rate of rotation as given in the BIH Circulars for 1976.
6	<u>UT Res.</u> - differences between the smoothed and raw values of UT2-UTC.
7	<u>PHI 0 observed</u> - raw latitude observations.
8	<u>PHI 1 smoothed</u> - smoothed values of latitude after reduction for the latitude variation as given in the BIH Circulars for 1976.
9	<u>PHI Res.</u> - differences between the smoothed and raw values of PHI 1.

TABLE 2 gives the smoothed values of UT2 - UTC and PHI 1 at standard five (5) day intervals for the Ottawa and Calgary stations.

TABLE 1A OTTAWA SR PZT TIME AND LATITUDE OBSERVATIONS

DATE (UT)	JULIAN DATE 2440000.	N	UT0-UTC OBSERVED .0001S	UT2-UTC SMOOTHED .0001S	UT RES. .0001S	PHI 0 OBSERVED 45°24'	PHI 1 SMOOTHED 45°24'	PHI RES.
1	2	3	4	5	6	7	8	9
76 JAN 2	2779.638	34	7360	7190	2	.964	.753	.043
76 JAN 5	2782.732	36	7279	7109	5	.840	.751	-.085
76 JAN 10	2787.758	32	7149	6976	11	.911	.747	-.021
76 JAN 15	2792.784	22	7075	6843	75	.924	.745	-.016
76 JAN 30	2807.651	25	6499	6442	-90	.935	.739	-.032
76 JAN 31	2808.640	30	6570	6414	9	1.018	.739	.049
76 FEB 5	2813.704	38	6392	6277	-26	.958	.738	-.023
76 FEB 6	2814.720	29	6392	6249	1	1.044	.738	.061
76 FEB 7	2815.733	23	6379	6221	18	.982	.737	-.003
76 FEB 10	2818.518	8	6252	6144	-29	1.049	.737	.057
76 FEB 12	2820.789	26	6244	6081	28	.977	.737	-.021
76 FEB 14	2822.726	32	6158	6028	-1	.981	.737	-.022
76 FEB 21	2829.643	26	5941	5835	-12	1.001	.737	-.018
76 FEB 29	2837.620	20	5713	5609	3	1.009	.737	-.029
76 MAR 8	2845.710	36	5483	5377	28	1.041	.738	-.013
76 MAR 12	2849.720	33	5354	5261	30	1.077	.738	.015
76 MAR 16	2853.707	19	5192	5145	-1	1.114	.739	.044
76 MAR 18	2855.720	30	5090	5086	-36	1.072	.739	-.002
76 MAR 22	2859.740	5	4986	4968	-6	1.084	.739	.002
76 MAR 23	2860.687	25	5006	4940	44	1.074	.739	-.010
76 MAR 26	2863.680	27	4854	4851	-5	1.076	.739	-.013
76 MAR 27	2864.778	5	4873	4818	50	1.100	.738	.008
76 MAR 29	2866.690	30	4766	4761	8	1.071	.738	-.024
76 MAR 30	2867.713	20	4758	4731	36	1.145	.738	.048
76 MAR 31	2868.588	6	4707	4705	14	1.137	.738	.038
76 APR 2	2870.692	25	4635	4642	15	1.131	.737	.029
76 APR 3	2871.678	17	4586	4613	0	1.095	.737	-.010
76 APR 4	2872.709	30	4570	4582	20	1.104	.737	-.003
76 APR 5	2873.772	17	4458	4550	-54	1.069	.736	-.040
76 APR 6	2874.719	27	4389	4522	-91	1.138	.736	.027
76 APR 7	2875.709	27	4448	4492	2	1.075	.736	-.038
76 APR 8	2876.712	28	4450	4462	39	1.113	.735	-.001
76 APR 9	2877.719	27	4333	4432	-42	1.146	.735	.030
76 APR 10	2878.673	12	4373	4403	30	1.105	.734	-.013
76 APR 12	2880.715	28	4244	4342	-26	1.100	.733	-.022
76 APR 13	2881.749	22	4198	4311	-36	1.118	.733	-.005
76 APR 14	2882.715	28	4197	4282	-3	1.190	.732	.064
76 APR 15	2883.595	8	4188	4255	17	1.158	.732	.031
76 APR 17	2885.758	16	4063	4190	-31	1.119	.731	-.011
76 APR 18	2886.739	28	4055	4161	-5	1.149	.730	.017
76 APR 19	2887.717	27	4081	4132	54	1.082	.729	-.051
76 APR 20	2888.693	21	3998	4102	5	1.112	.729	-.022
76 APR 21	2889.742	10	3990	4071	34	1.133	.728	-.002
76 APR 25	2893.710	21	3807	3951	-9	1.182	.725	.043
76 APR 29	2897.766	10	3641	3829	-34	1.082	.722	-.061
76 APR 30	2898.719	29	3634	3801	-9	1.117	.721	-.026
76 MAY 1	2899.737	15	3611	3770	2	1.146	.720	.003
76 MAY 3	2901.590	7	3622	3714	77	1.143	.718	-.001
76 MAY 5	2903.694	21	3543	3651	79	1.148	.716	.003
76 MAY 9	2907.633	14	3427	3533	88	1.169	.712	.023
76 MAY 10	2908.713	24	3283	3501	-18	1.183	.711	.037
76 MAY 14	2912.698	19	3165	3382	-3	1.151	.707	.007
76 MAY 16	2914.720	23	3054	3321	-47	1.146	.705	.002
76 MAY 28	2926.770	9	2701	2965	-15	1.131	.695	-.005
76 MAY 29	2927.718	13	2711	2937	23	1.170	.694	.035
76 MAY 31	2929.711	18	2606	2879	-29	1.144	.693	.011
76 JUN 2	2931.695	20	2562	2821	-4	1.123	.691	-.008
76 JUN 3	2932.714	15	2534	2792	-1	1.118	.691	-.012
76 JUN 4	2933.695	20	2483	2763	-23	1.084	.690	-.045
76 JUN 5	2934.695	20	2461	2734	-17	1.081	.690	-.047
76 JUN 6	2935.669	7	2496	2706	47	1.180	.690	.053
76 JUN 8	2937.740	9	2391	2646	2	1.121	.689	-.004
76 JUN 10	2939.740	8	2340	2589	8	1.160	.689	.037
76 JUN 12	2941.730	10	2217	2532	-58	1.049	.688	-.072
76 JUN 13	2942.679	17	2243	2505	-6	1.185	.688	.065

TABLE 1A OTTAWA SB PZT TIME AND LATITUDE OBSERVATIONS (CONT.)

DATE (UT)	JULIAN DATE 2440000.	N	UT0-UTC OBSERVED .0001S	UT2-UTC SMOOTHED .0001S	UT RES. .0001S	PHI 0 OBSERVED 45° 24'	PHI 1 SMOOTHED 45° 24'	PHI RES.
1	2	3	4	5	6	7	8	9
76 JUN 18	2947.716	14	2084	2362	-27	1.175	.689	.059
76 JUN 19	2948.692	13	2126	2334	40	1.029	.689	-.086
76 JUN 27	2956.753	15	1900	2106	25	1.177	.694	.067
76 JUN 28	2957.680	10	1839	2080	-12	1.001	.694	-.108
76 JUN 29	2958.680	7	1885	2052	59	1.104	.695	-.005
76 JUL 4	2963.722	19	1707	1910	6	1.107	.700	.001
76 JUL 5	2964.717	19	1689	1882	13	.996	.701	-.109
76 JUL 6	2965.780	8	1676	1852	26	1.101	.702	-.004
76 JUL 7	2966.780	6	1643	1824	17	1.172	.703	.067
76 JUL 9	2968.718	19	1577	1769	-1	1.094	.705	-.010
76 JUL 10	2969.707	19	1547	1741	-7	1.143	.706	.039
76 JUL 15	2974.675	13	1455	1600	17	1.132	.713	.029
76 JUL 16	2975.684	17	1418	1572	3	1.083	.714	-.020
76 JUL 17	2976.702	16	1362	1543	-28	1.106	.715	.003
76 JUL 18	2977.740	9	1368	1513	1	1.118	.717	.015
76 JUL 19	2978.690	20	1332	1486	-12	1.106	.718	.003
76 JUL 20	2979.680	18	1309	1458	-12	1.169	.719	.067
76 JUL 22	2981.680	20	1267	1401	-7	1.083	.722	-.019
76 JUL 23	2982.678	19	1282	1372	30	1.131	.723	.030
76 JUL 25	2984.672	18	1179	1315	-26	1.043	.726	-.058
76 JUL 26	2985.670	20	1171	1286	-11	1.100	.727	-.001
76 JUL 28	2987.703	19	1171	1227	36	1.131	.730	.030
76 JUL 29	2988.706	12	1079	1198	-31	1.174	.731	.074
76 JUL 31	2990.658	19	1050	1141	-15	1.130	.734	.030
76 AUG 4	2994.698	23	993	1023	23	1.089	.739	-.009
76 AUG 5	2995.653	14	942	995	-4	1.028	.741	-.069
76 AUG 7	2997.713	21	851	935	-46	1.106	.743	.010
76 AUG 16	3006.670	21	616	667	-61	1.110	.754	.024
76 AUG 17	3007.740	20	631	635	-19	1.130	.756	.044
76 AUG 18	3008.695	26	628	606	1	1.047	.757	-.037
76 AUG 19	3009.698	25	584	575	-16	1.089	.758	.006
76 AUG 21	3011.689	24	582	514	32	1.016	.760	-.065
76 AUG 22	3012.712	17	586	483	63	1.025	.761	-.053
76 AUG 24	3014.800	9	550	419	81	1.107	.764	.032
76 AUG 25	3015.715	20	476	390	32	1.093	.765	.019
76 AUG 26	3016.715	20	447	359	29	1.128	.766	.056
76 AUG 31	3021.700	20	262	203	-19	1.023	.771	-.041
76 SEP 2	3023.743	23	235	138	10	1.049	.772	-.011
76 SEP 3	3024.728	25	173	107	-24	1.060	.773	.002
76 SEP 6	3027.730	27	138	11	24	1.044	.776	-.009
76 SEP 7	3028.673	14	63	-18	-22	1.071	.777	.020
76 SEP 8	3029.716	14	59	-51	3	1.041	.777	-.008
76 SEP 12	3033.717	27	-39	-181	20	1.066	.780	.024
76 SEP 14	3035.723	24	-105	-246	13	1.044	.781	.006
76 SEP 19	3040.710	8	-166	-408	102	.985	.784	-.043
76 SEP 22	3043.687	27	-365	-505	-4	1.054	.785	.033
76 SEP 24	3045.719	19	-379	-571	44	1.030	.786	.014
76 SEP 26	3047.701	20	-480	-636	4	1.017	.786	.005
76 SEP 29	3050.607	6	-523	-731	53	1.009	.787	.004
76 OCT 1	3052.680	30	-627	-798	15	1.028	.787	.028
76 OCT 2	3053.711	35	-679	-832	-4	.998	.788	.000
76 OCT 3	3054.693	32	-688	-863	17	.976	.788	-.019
76 OCT 4	3055.703	31	-763	-896	-25	.992	.788	-.001
76 OCT 6	3057.693	32	-764	-960	37	.952	.788	-.035
76 OCT 12	3063.694	37	-1007	-1152	-15	1.006	.788	.034
76 OCT 15	3066.584	12	-1120	-1243	-35	.971	.788	.007
76 OCT 17	3068.828	15	-1176	-1313	-20	.901	.787	-.057
76 OCT 19	3070.657	32	-1216	-1369	-2	.933	.787	-.022
76 OCT 23	3074.714	26	-1340	-1493	0	.966	.786	.022
76 OCT 24	3075.685	39	-1426	-1522	-55	.981	.786	.039
76 OCT 26	3077.870	6	-1464	-1588	-25	.860	.786	-.077
76 OCT 27	3078.642	29	-1502	-1610	-39	.894	.785	-.041
76 OCT 28	3079.683	38	-1515	-1641	-20	.928	.785	-.004
76 OCT 29	3080.782	13	-1530	-1673	-2	.929	.785	.000
76 OCT 30	3081.549	14	-1540	-1695	11	.983	.785	-.044

TABLE 1A OTTAWA SB P7T TIME AND LATITUDE OBSERVATIONS (CONT.)

DATE (UT)	JULIAN DATE 2440000.	N	UT0-UTC OBSERVED .0001S	UT2-UT0 SMOOTHED .0001S	UT RES. .0001S	PHI 0 OBSERVED 45°24'	PHI 1 SMOOTHED 45°24'	PHI RES.
1	2	3	4	5	6	7	8	9
76 NOV 2	3084.674	35	-1680	-1786	-33	.876	.784	-.042
76 NOV 6	3088.584	14	-1827	-1897	-64	.972	.782	.065
76 NOV 8	3090.670	23	-1842	-1955	-13	.829	.782	-.073
76 NOV 9	3091.696	42	-1866	-1983	-12	.893	.781	-.006
76 NOV 13	3095.698	29	-1949	-2093	20	.919	.780	.031
76 NOV 14	3096.602	14	-1908	-2117	86	.892	.779	.006
76 NOV 16	3098.530	5	-2051	-2169	-1	.942	.778	.061
76 NOV 17	3099.724	37	-2029	-2201	54	.885	.777	.007
76 NOV 21	3103.698	32	-2187	-2305	7	.887	.775	.019
76 NOV 22	3104.667	26	-2220	-2331	1	.943	.774	.078
76 NOV 24	3106.621	15	-2273	-2381	2	.869	.773	.009
76 NOV 30	3112.736	35	-2407	-2539	32	.887	.768	.039
76 DEC 1	3113.703	40	-2464	-2563	1	.846	.767	-.000
76 DEC 6	3118.880	8	-2561	-2695	41	.755	.762	-.082
76 DEC 8	3120.721	33	-2657	-2742	-6	.809	.761	-.025
76 DEC 9	3121.781	32	-2680	-2769	-1	.855	.760	.023
76 DEC 11	3123.928	8	-2754	-2823	-19	.783	.758	-.045
76 DEC 13	3125.855	20	-2852	-2873	-68	.733	.756	-.092
76 DEC 24	3136.793	23	-3032	-3155	33	.816	.749	.005
76 DEC 27	3139.714	45	-3177	-3231	-36	.807	.747	-.002
76 DEC 28	3140.700	43	-3172	-3257	-5	.801	.746	-.007

TABLE 18 CALGARY PZT TIME AND LATITUDE OBSERVATIONS

DATE (UT)	JULIAN DATE 2440000.	N	UTC-UTC OBSERVED .0001S	UT2-UTC SMOOTHED .0001S	UT RES. .0001S	PHI 0 OBSERVED 50° 52'	PHI 1 SMOOTHED 50° 52'	PHI RES.
1	2	3	4	5	6	7	8	9
76 JAN 1	2778.777	52	7251	7213	-39	22.457	22.210	.008
76 JAN 4	2781.862	34	7143	7131	-60	22.463	22.210	.006
76 JAN 8	2785.780	12	6977	7027	-114	22.716	22.211	.250
76 JAN 9	2786.864	18	6958	6998	-102	22.464	22.211	-.005
76 JAN 10	2787.701	21	6999	6976	-37	22.465	22.211	-.006
76 JAN 11	2788.779	31	7012	6947	6	22.412	22.211	-.061
76 JAN 13	2790.852	22	7023	6891	76	22.547	22.211	.070
76 JAN 14	2791.773	26	6863	6865	-56	22.507	22.211	.027
76 JAN 16	2793.822	16	6846	6811	-14	22.457	22.211	-.027
76 JAN 18	2795.723	12	6943	6759	137	22.537	22.211	.050
76 JAN 19	2796.652	17	6852	6734	73	22.486	22.211	-.003
76 JAN 20	2797.676	23	6947	6706	93	22.414	22.211	-.077
76 JAN 21	2798.795	30	6718	6676	1	22.463	22.211	-.031
76 JAN 22	2799.744	15	6615	6650	-73	22.556	22.211	.060
76 JAN 23	2800.755	36	6724	6622	65	22.546	22.211	.047
76 JAN 24	2801.768	46	6707	6594	76	22.508	22.211	.007
76 JAN 25	2802.837	26	6604	6565	4	22.491	22.211	-.012
76 JAN 26	2803.742	32	6522	6540	-50	22.518	22.211	.012
76 JAN 28	2805.749	37	6536	6485	23	22.545	22.211	.036
76 JAN 29	2806.905	21	6455	6453	-23	22.489	22.211	-.023
76 JAN 30	2807.836	31	6420	6427	-31	22.567	22.211	.053
76 FEB 1	2809.836	37	6398	6372	5	22.534	22.211	.016
76 FEB 2	2810.777	33	6324	6346	-40	22.546	22.211	.025
76 FEB 3	2811.650	9	6466	6322	127	22.533	22.211	.610
76 FEB 4	2812.777	15	6340	6290	36	22.420	22.212	-.106
76 FEB 6	2814.908	31	6130	6231	-109	22.484	22.212	-.047
76 FEB 9	2817.869	18	6214	6140	62	22.474	22.212	-.064
76 FEB 10	2818.654	11	6072	6127	-54	22.426	22.212	-.114
76 FEB 13	2821.773	33	5996	6040	-35	22.526	22.213	-.022
76 FEB 15	2823.811	9	5142	5982	172	22.550	22.214	-.062
76 FEB 18	2826.729	12	5868	5901	-9	22.571	22.215	.012
76 FEB 20	2828.891	26	5796	5840	-14	22.534	22.216	-.030
76 FEB 22	2830.854	11	5628	5785	-121	22.466	22.217	-.103
76 FEB 23	2831.758	18	5747	5759	26	22.493	22.218	-.078
76 FEB 24	2832.825	36	5766	5729	73	22.580	22.218	.006
76 FEB 25	2833.820	16	5670	5701	14	22.517	22.219	-.059
76 MAR 2	2839.858	18	5560	5531	95	22.595	22.223	.005
76 MAR 4	2841.723	23	5449	5479	44	22.631	22.224	.038
76 MAR 5	2842.759	29	5217	5450	-153	22.645	22.225	.050
76 MAR 6	2843.811	32	5298	5420	-39	22.537	22.226	-.060
76 MAR 7	2844.820	21	5264	5392	-40	22.660	22.226	.060
76 MAR 9	2846.713	12	5289	5333	46	22.603	22.229	-.000
76 MAR 12	2849.859	36	5045	5249	-95	22.609	22.230	-.001
76 MAR 13	2850.840	30	5127	5222	19	22.617	22.230	.005
76 MAR 14	2851.864	32	5047	5193	-27	22.737	22.231	.123
76 MAR 15	2852.948	13	5053	5162	14	22.613	22.232	-.002
76 MAR 16	2853.984	14	4999	5133	-5	22.594	22.232	-.023
76 MAR 17	2854.904	18	4994	5106	19	22.582	22.233	-.037
76 MAR 18	2855.790	6	4791	5081	-153	22.943	22.233	.322
76 MAR 19	2856.808	24	4905	5052	-5	22.552	22.234	-.070
76 MAR 20	2857.809	29	4920	5024	42	22.707	22.234	.083
76 MAR 21	2858.945	14	4793	4991	-46	22.484	22.235	-.142
76 MAR 22	2859.856	16	4667	4965	-141	22.550	22.235	-.069
76 MAR 23	2860.707	14	4885	4941	105	22.708	22.235	.079
76 MAR 24	2861.820	21	4816	4909	73	22.739	22.236	.078
76 MAR 25	2862.959	14	4679	4877	-24	22.635	22.236	.002
76 MAR 26	2863.752	24	4758	4854	30	22.637	22.236	.053
76 MAR 27	2864.832	33	4707	4823	67	22.637	22.237	.001
76 MAR 28	2865.834	27	4621	4794	15	22.671	22.237	.034
76 MAR 29	2866.816	37	4545	4766	-26	22.638	22.237	.049
76 MAR 30	2867.814	37	4545	4737	6	22.580	22.238	-.060
76 MAR 31	2868.795	30	4596	4709	91	22.493	22.238	-.159
76 APR 3	2871.860	24	4319	4620	-78	22.637	22.239	-.010
76 APR 4	2872.770	11	4443	4593	77	22.658	22.239	.010
76 APR 5	2873.850	27	4280	4562	-47	22.591	22.239	-.058

TABLE 18

CALGARY

PZT TIME AND LATITUDE OBSERVATIONS (CONT.)

DATE (UT)	JULIAN DATE 2440000.	N	UT0-UTC OBSERVED .0001S	UT2-UTC SMOOTHED .0001S	UT RES. .0001S	PHI 0 OBSERVED 50° 52'	PHI 1 SMOOTHED 50° 52'	PHI RES.
1	2	3	4	5	6	7	8	9
76 APR 6	2874.847	27	4308	4532	15	22.641	22.239	-.009
76 APR 7	2875.847	27	4277	4503	19	22.650	22.239	-.002
76 APR 9	2877.833	26	4222	4445	34	22.649	22.240	-.005
76 APR 10	2878.790	18	4187	4417	34	22.758	22.240	.103
76 APR 11	2879.872	21	4069	4385	-46	22.712	22.240	.055
76 APR 12	2880.824	22	4087	4357	5	22.685	22.240	.027
76 APR 13	2881.900	9	4078	4325	35	22.508	22.240	-.151
76 APR 14	2882.842	23	3961	4297	-48	22.713	22.240	.053
76 APR 19	2887.871	16	3865	4147	36	22.650	22.240	-.014
76 APR 20	2888.875	11	3792	4117	-1	22.712	22.240	.047
76 APR 25	2893.840	6	3646	3968	29	22.630	22.240	-.037
76 APR 30	2898.842	15	3447	3819	6	22.622	22.240	-.046
76 MAY 1	2899.841	16	3473	3789	67	22.626	22.240	-.041
76 MAY 2	2900.843	15	3400	3759	29	22.687	22.240	.020
76 MAY 3	2901.830	18	3323	3729	-13	22.654	22.240	-.013
76 MAY 4	2902.803	11	3337	3700	34	22.662	22.240	-.005
76 MAY 6	2904.826	18	3292	3639	60	22.640	22.240	-.027
76 MAY 8	2906.815	16	3197	3580	32	22.636	22.240	-.029
76 MAY 9	2907.823	17	3172	3550	42	22.625	22.240	-.040
76 MAY 10	2908.816	18	3087	3521	-8	22.664	22.241	.000
76 MAY 12	2910.806	18	3015	3462	-13	22.593	22.241	-.069
76 MAY 13	2911.889	9	2889	3429	-103	22.694	22.241	.033
76 MAY 15	2913.885	17	2905	3370	-21	22.638	22.241	-.021
76 MAY 16	2914.877	18	2802	3341	-92	22.650	22.241	-.008
76 MAY 17	2915.874	16	2749	3312	-112	22.714	22.241	.057
76 MAY 18	2916.880	15	2921	3282	91	22.722	22.241	.067
76 MAY 19	2917.869	18	2850	3254	52	22.690	22.241	.035
76 MAY 21	2919.870	8	2625	3195	-108	22.568	22.241	-.084
76 MAY 22	2920.855	16	2604	3166	-99	22.639	22.241	-.011
76 MAY 24	2922.833	9	2691	3109	50	22.698	22.241	.051
76 MAY 26	2924.849	17	2548	3051	-30	22.668	22.241	.025
76 JUN 1	2930.833	36	2319	2880	-81	22.690	22.241	.061
76 JUN 2	2931.819	13	2431	2852	59	22.711	22.241	.084
76 JUN 3	2932.825	19	2407	2824	63	22.657	22.241	.032
76 JUN 4	2933.807	14	2418	2796	102	22.666	22.241	.044
76 JUN 5	2934.825	19	2291	2768	4	22.593	22.241	-.027
76 JUN 6	2935.817	13	2235	2740	-23	22.612	22.241	-.006
76 JUN 8	2937.815	19	2194	2684	-9	22.613	22.241	.001
76 JUN 10	2939.824	13	2121	2628	-27	22.626	22.242	.019
76 JUN 11	2940.805	16	2103	2601	-19	22.551	22.242	-.054
76 JUN 12	2941.705	13	2109	2576	11	22.556	22.242	-.046
76 JUN 14	2943.797	18	1986	2510	-57	22.542	22.242	-.054
76 JUN 18	2947.784	16	1863	2409	-78	22.581	22.243	-.004
76 JUN 20	2949.856	20	1893	2352	4	22.546	22.244	-.032
76 JUN 21	2950.836	14	1912	2325	47	22.557	22.244	-.018
76 JUN 24	2953.790	7	1835	2244	43	22.633	22.245	.066
76 JUN 29	2958.770	6	1717	2108	44	22.554	22.248	.001
76 JUL 1	2960.770	7	1627	2053	1	22.597	22.249	.050
76 JUL 2	2961.817	23	1571	2024	-30	22.517	22.250	-.027
76 JUL 3	2962.814	22	1456	1997	-121	22.503	22.251	-.038
76 JUL 4	2963.770	11	1668	1970	112	22.425	22.251	-.113
76 JUL 5	2964.807	23	1578	1942	46	22.567	22.252	.031
76 JUL 6	2965.811	19	1487	1914	-21	22.527	22.253	-.007
76 JUL 7	2966.798	21	1467	1887	-18	22.586	22.254	.055
76 JUL 8	2967.804	19	1538	1859	74	22.472	22.255	-.056
76 JUL 9	2968.795	16	1465	1831	24	22.511	22.256	-.016
76 JUL 14	2973.850	15	1332	1690	5	22.445	22.261	-.071
76 JUL 15	2974.840	18	1270	1662	-34	22.614	22.262	.100
76 JUL 16	2975.836	17	1277	1634	-5	22.567	22.263	.055
76 JUL 18	2977.837	18	1333	1577	94	22.473	22.266	-.035
76 JUL 20	2979.826	16	1179	1520	-13	22.547	22.268	.042
76 JUL 21	2980.840	14	1267	1491	96	22.474	22.270	-.029
76 JUL 23	2982.870	6	1093	1432	-31	22.433	22.272	-.067
76 JUL 26	2985.815	13	1255	1346	197	22.496	22.276	.001
76 JUL 28	2987.814	21	1135	1287	123	22.501	22.279	.010

TABLE 18 CALGARY PZT TIME AND LATITUDE OBSERVATIONS (CONT.)

DATE (UT)	JULIAN DATE 2440000.	N	UTC-UTC OBSERVED .0001S	UT2-UTC SMOOTHED .0001S	UT RES. .0001S	PHI 0 OBSERVED 50° 52'	PHI 1 SMOOTHED 50° 52'	PHI RES.
1	2	3	4	5	6	7	8	9
76 AUG 12	3002.774	21	580	834	-76	22 ⁿ 477	22 ⁿ 300	.012
76 AUG 13	3003.808	32	497	802	-133	22.476	22.301	.013
76 AUG 14	3004.768	19	581	772	-25	22.462	22.302	.001
76 AUG 18	3008.836	19	470	645	-35	22.390	22.307	-.063
76 AUG 19	3009.776	20	504	615	22	22.468	22.308	.017
76 AUG 20	3010.790	26	347	583	-108	22.465	22.309	.017
76 AUG 21	3011.829	18	486	550	56	22.376	22.310	-.070
76 AUG 22	3012.801	26	413	520	8	22.447	22.311	.004
76 AUG 24	3014.870	7	319	454	-32	22.422	22.312	-.016
76 AUG 25	3015.796	18	351	425	22	22.451	22.313	.016
76 AUG 27	3017.765	29	350	362	73	22.426	22.314	-.004
76 AUG 28	3018.700	10	188	332	-63	22.374	22.314	-.054
76 AUG 30	3020.768	11	189	266	-7	22.353	22.315	-.070
76 AUG 31	3021.752	25	135	234	-35	22.405	22.315	-.014
76 SEP 1	3022.795	16	105	201	-37	22.433	22.315	.016
76 SEP 3	3024.760	6	227	137	137	22.421	22.316	.009
76 SEP 5	3026.826	24	24	71	-9	22.440	22.315	.033
76 SEP 9	3030.825	29	-124	-58	-47	22.370	22.314	-.027
76 SEP 10	3031.821	30	-67	-91	36	22.358	22.314	-.036
76 SEP 13	3034.814	27	-229	-189	-40	22.412	22.312	.026
76 SEP 14	3035.791	21	10	-221	227	22.505	22.311	.121
76 SEP 15	3036.802	28	-218	-254	27	22.390	22.310	.008
76 SEP 16	3037.804	31	-262	-287	13	22.391	22.309	.013
76 SEP 17	3038.801	29	-272	-319	31	22.323	22.308	-.053
76 SEP 19	3040.825	40	-405	-386	-41	22.372	22.306	.002
76 SEP 20	3041.824	41	-407	-419	-14	22.362	22.305	-.004
76 SEP 21	3042.819	40	-449	-452	-26	22.357	22.303	-.006
76 SEP 22	3043.816	38	-394	-485	58	22.341	22.302	-.019
76 SEP 23	3044.916	10	-395	-521	90	22.369	22.300	.013
76 SEP 26	3047.873	16	-544	-618	31	22.364	22.296	.017
76 SEP 27	3048.804	41	-638	-649	-35	22.384	22.294	.040
76 SEP 28	3049.801	37	-591	-682	42	22.501	22.293	.160
76 SEP 29	3050.795	25	-642	-715	22	22.426	22.291	.089
76 SEP 30	3051.817	24	-597	-748	98	22.388	22.289	.054
76 OCT 2	3053.757	25	-780	-812	-24	22.365	22.286	.037
76 OCT 3	3054.760	23	-810	-845	-23	22.346	22.284	.021
76 OCT 5	3056.775	37	-848	-911	0	22.380	22.280	.062
76 OCT 7	3058.786	42	-991	-977	-80	22.281	22.276	-.032
76 OCT 8	3059.814	51	-937	-1010	5	22.268	22.274	-.042
76 OCT 9	3060.810	49	-956	-1043	17	22.244	22.272	-.063
76 OCT 10	3061.807	49	-1010	-1075	-4	22.293	22.271	-.012
76 OCT 11	3062.803	49	-978	-1107	58	22.275	22.269	-.027
76 OCT 12	3063.857	20	-1063	-1141	6	22.243	22.267	-.056
76 OCT 13	3064.706	27	-1132	-1169	-36	22.310	22.265	.013
76 OCT 14	3065.867	22	-1077	-1206	54	22.168	22.263	-.126
76 OCT 15	3066.780	47	-1196	-1235	-35	22.248	22.262	-.045
76 OCT 16	3067.695	22	-1210	-1265	-20	22.303	22.260	.013
76 OCT 17	3068.643	9	-1162	-1295	56	22.339	22.259	.051
76 OCT 18	3069.786	51	-1234	-1331	20	22.265	22.257	-.021
76 OCT 19	3070.784	48	-1314	-1363	-28	22.245	22.255	-.039
76 OCT 21	3072.764	46	-1386	-1425	-37	22.288	22.252	.007
76 OCT 22	3073.846	20	-1411	-1459	-29	22.275	22.251	-.003
76 OCT 29	3080.746	37	-1583	-1671	10	22.310	22.243	.041
76 OCT 30	3081.699	36	-1750	-1700	-126	22.282	22.242	.015
76 NOV 2	3084.858	29	-1707	-1794	11	22.232	22.239	-.032
76 NOV 3	3085.820	50	-1769	-1823	-22	22.240	22.239	-.024
76 NOV 4	3086.759	37	-1804	-1851	-29	22.207	22.238	-.056
76 NOV 6	3088.816	19	-1907	-1911	-70	22.272	22.237	.010
76 NOV 7	3089.658	13	-1938	-1936	-76	22.390	22.237	.129
76 NOV 8	3090.880	7	-1836	-1971	61	22.355	22.236	.094
76 NOV 9	3091.797	51	-1895	-1998	29	22.252	22.236	-.009
76 NOV 10	3092.797	51	-1955	-2026	-1	22.285	22.236	.024
76 NOV 11	3093.790	51	-2006	-2055	-23	22.377	22.235	.116
76 NOV 12	3094.789	51	-2072	-2084	-59	22.282	22.235	.022
76 NOV 13	3095.747	42	-2022	-2111	17	22.202	22.235	-.058

TABLE 18 CALGARY PZT TIME AND LATITUDE OBSERVATIONS (CONT.)

DATE (UT)	JULIAN DATE 2440000.	N	UT0-UTC OBSERVED .0001S	UT2-UTC SMOOTHED .0001S	UT RES. .0001S	PHI 0 OBSERVED 50° 52'	PHI 1 SMOOTHED 50° 52'	PHI RES.
1	2	3	4	5	6	7	8	9
76 NOV 14	3096.786	50	-2076	-2140	-5	22.195	22.235	-.066
76 NOV 15	3097.763	40	-2045	-2168	53	22.236	22.235	-.024
76 NOV 16	3098.876	20	-2012	-2200	118	22.299	22.235	.039
76 NOV 17	3099.684	25	-2197	-2222	-44	22.296	22.235	.035
76 NOV 18	3100.808	21	-2137	-2254	48	22.339	22.235	.079
76 NOV 19	3101.828	25	-2125	-2282	90	22.131	22.235	-.130
76 NOV 20	3102.762	46	-2219	-2308	22	22.241	22.235	-.020
76 NOV 21	3103.764	49	-2242	-2336	28	22.305	22.235	.043
76 NOV 22	3104.859	36	-2262	-2367	39	22.322	22.235	.060
76 NOV 23	3105.792	18	-2273	-2392	54	22.166	22.235	-.098
76 NOV 24	3106.746	15	-2324	-2419	31	22.229	22.235	-.035
76 NOV 30	3112.783	39	-2511	-2584	13	22.298	22.237	.017
76 DEC 1	3113.774	59	-2546	-2611	6	22.240	22.237	-.033
76 DEC 2	3114.780	37	-2600	-2638	-19	22.300	22.237	.025
76 DEC 4	3116.790	41	-2668	-2692	-32	22.270	22.239	-.007
76 DEC 6	3118.752	13	-2754	-2745	-64	22.338	22.238	.057
76 DEC 7	3119.675	18	-2730	-2770	-15	22.269	22.239	-.014
76 DEC 8	3120.610	10	-2808	-2795	-68	22.354	22.239	.070
76 DEC 10	3122.720	25	-2742	-2851	55	22.210	22.239	-.077
76 DEC 11	3123.690	8	-2639	-2877	184	22.388	22.239	.098
76 DEC 12	3124.850	42	-2868	-2908	-13	22.280	22.239	-.011
76 DEC 13	3125.851	28	-2821	-2935	59	22.151	22.240	-.142
76 DEC 14	3126.692	26	-2828	-2957	75	22.286	22.240	-.008
76 DEC 15	3127.757	30	-2907	-2985	24	22.304	22.240	.008
76 DEC 19	3131.655	18	-3063	-3088	-29	22.482	22.239	.179
76 DEC 20	3132.788	46	-3223	-3117	-159	22.285	22.239	-.019
76 DEC 21	3133.769	35	-3074	-3143	14	22.335	22.239	.029
76 DEC 22	3134.777	50	-3138	-3169	-24	22.388	22.239	.080
76 DEC 23	3135.654	7	-3154	-3192	-17	22.383	22.238	.073
76 DEC 25	3137.790	24	-3183	-3248	7	22.293	22.237	-.019
76 DEC 26	3138.914	8	-3342	-3277	-122	22.290	22.237	-.024
76 DEC 27	3139.641	14	-3226	-3296	12	22.350	22.236	.035
76 DEC 28	3140.781	54	-3244	-3325	23	22.331	22.236	.014
76 DEC 29	3141.795	54	-3262	-3351	30	22.281	22.235	-.038
76 DEC 30	3142.847	11	-3317	-3378	2	22.230	22.234	-.089

TABLE 2 INTERPOLATED SMOOTHED PZT TIME AND LATITUDE OBSERVATIONS

DATE J UT	JULIAN DATE 2400000.	OTTAWA SB		CALGARY	
		UT2-UTC .6001S	PHI 1 45° 24'	UT2-UTC .0001S	PHI 1 50° 52'
76 JAN 2	2779.5	7193	.753	7194	22.210
76 JAN 7	2784.5	7062	.749	7061	22.211
76 JAN 12	2789.5	6930	.746	6927	22.211
76 JAN 17	2794.5	6796	.744	6792	22.211
76 JAN 22	2799.5	6662	.742	6656	22.211
76 JAN 27	2804.5	6527	.740	6519	22.211
76 FEB 1	2809.5	6391	.739	6381	22.211
76 FEB 6	2814.5	6254	.738	6242	22.212
76 FEB 11	2819.5	6117	.737	6103	22.213
76 FEB 16	2824.5	5978	.737	5963	22.214
76 FEB 21	2829.5	5839	.737	5822	22.216
76 FEB 26	2834.5	5697	.737	5682	22.219
76 MAR 2	2839.5	5555	.737	5541	22.223
76 MAR 7	2844.5	5412	.738	5400	22.226
76 MAR 12	2849.5	5267	.738	5259	22.230
76 MAR 17	2854.5	5121	.739	5117	22.232
76 MAR 22	2859.5	4974	.739	4975	22.235
76 MAR 27	2864.5	4826	.738	4832	22.237
76 APR 1	2869.5	4677	.738	4688	22.238
76 APR 6	2874.5	4528	.736	4542	22.239
76 APR 11	2879.5	4378	.734	4395	22.240
76 APR 16	2884.5	4228	.731	4247	22.240
76 APR 21	2889.5	4077	.728	4098	22.240
76 APR 26	2894.5	3927	.724	3948	22.240
76 MAY 1	2899.5	3777	.720	3799	22.240
76 MAY 6	2904.5	3627	.715	3649	22.240
76 MAY 11	2909.5	3477	.711	3500	22.241
76 MAY 16	2914.5	3327	.706	3352	22.241
76 MAY 21	2919.5	3179	.701	3205	22.241
76 MAY 26	2924.5	3031	.696	3061	22.241
76 MAY 31	2929.5	2885	.693	2918	22.241
76 JUN 5	2934.5	2739	.690	2776	22.241
76 JUN 10	2939.5	2595	.689	2637	22.242
76 JUN 15	2944.5	2453	.688	2498	22.242
76 JUN 20	2949.5	2311	.690	2361	22.243
76 JUN 25	2954.5	2169	.692	2224	22.245
76 JUN 30	2959.5	2029	.696	2087	22.248
76 JUL 5	2964.5	1888	.701	1950	22.252
76 JUL 10	2969.5	1747	.706	1811	22.256
76 JUL 15	2974.5	1605	.712	1671	22.262
76 JUL 20	2979.5	1462	.719	1529	22.268
76 JUL 25	2984.5	1319	.726	1384	22.275
76 JUL 30	2989.5	1175	.732	1237	22.282
76 AUG 4	2994.5	1029	.739	1087	22.289
76 AUG 9	2999.5	881	.746	935	22.295
76 AUG 14	3004.5	732	.752	780	22.302
76 AUG 19	3009.5	581	.758	623	22.308
76 AUG 24	3014.5	427	.763	465	22.312
76 AUG 29	3019.5	272	.769	306	22.315
76 SEP 3	3024.5	114	.773	145	22.316
76 SEP 8	3029.5	-45	.777	-16	22.315
76 SEP 13	3034.5	-206	.781	-179	22.312
76 SEP 18	3039.5	-363	.783	-343	22.307
76 SEP 23	3044.5	-532	.785	-508	22.301
76 SEP 28	3049.5	-695	.787	-673	22.293
76 OCT 3	3054.5	-858	.788	-837	22.284
76 OCT 8	3059.5	-1019	.788	-1001	22.275
76 OCT 13	3064.5	-1178	.788	-1163	22.266
76 OCT 18	3069.5	-1334	.787	-1322	22.257
76 OCT 23	3074.5	-1487	.786	-1481	22.250
76 OCT 28	3079.5	-1636	.785	-1634	22.244
76 NOV 2	3084.5	-1782	.784	-1784	22.240
76 NOV 7	3089.5	-1923	.782	-1931	22.237
76 NOV 12	3094.5	-2061	.780	-2076	22.235
76 NOV 17	3099.5	-2195	.778	-2218	22.235

TABLE 2

INTERPOLATED SMOOTHED PZT TIME AND LATITUDE OBSERVATIONS (CONT.)

DATE O UT	JULIAN DATE 2440000.	OTTAWA SB		CALGARY	
		UT2-UTC .0001S	PHI 1 45°24'	UT2-UTC .0001S	PHI 1 50°52'
76 NOV 22	3104.5	-2327	.774	-2357	22°235
76 NOV 27	3109.5	-2456	.771	-2495	22.236
76 DEC 2	3114.5	-2584	.766	-2631	22.237
76 DEC 7	3119.5	-2711	.762	-2766	22.239
76 DEC 12	3124.5	-2839	.758	-2899	22.239
76 DEC 17	3129.5	-2966	.753	-3032	22.240
76 DEC 22	3134.5	-3096	.750	-3163	22.239
76 DEC 27	3139.5	-3226	.747	-3293	22.236

