DEPARTMENT OF THE INTERIOR CANADA

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Dominion Observatory

OTTAWA

R. MELDRUM STEWART, M.A., Director

Vol. VII

SEISMOLOGY

No. 1

REPORT OF THE SEISMOLOGIC DIVISION FOR 1923

BY

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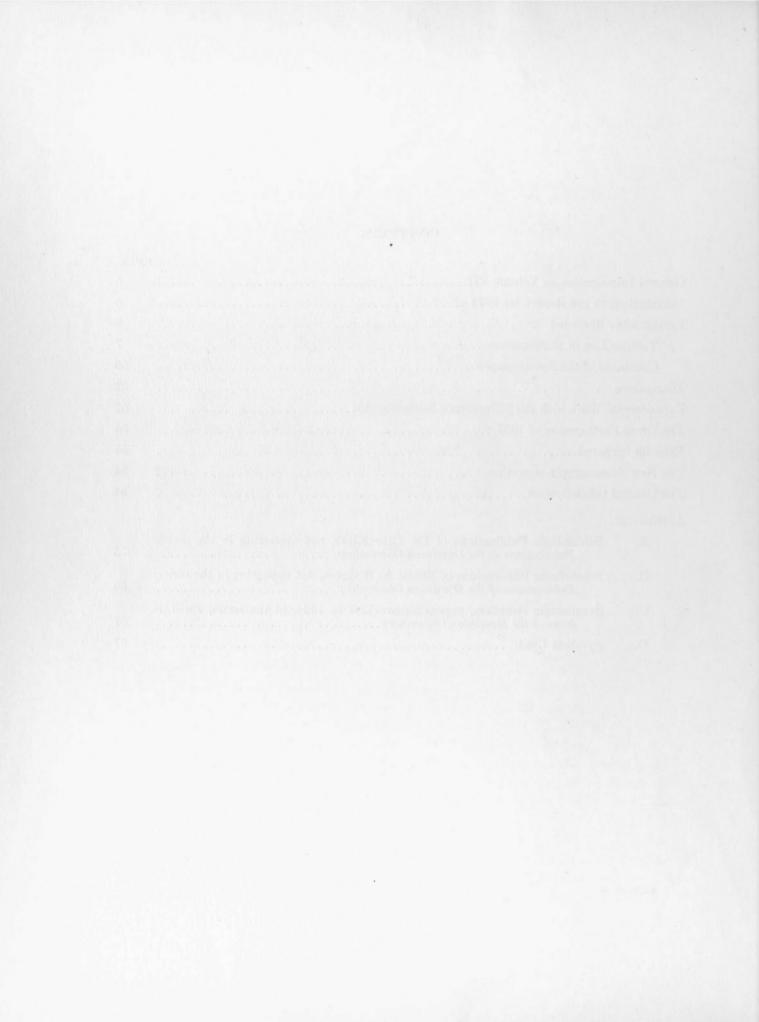
OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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REPORT OF THE SEISMOLOGIC DIVISION FOR 1923

GENERAL INTRODUCTION TO VOLUME VII

The seismologic publications resulting from the work done at the Dominion Observatory, Ottawa, have been printed in various journals, in reports other than the Publications of the Dominion Observatory (hereafter referred to briefly as the Publications), and in scattered numbers of these Publications. They were written by Dr. Otto Klotz, Ernest A. Hodgson, or W. W. Doxsee. All of those by Mr. Doxsee have appeared in the series but those by Dr. Klotz and by Mr. Hodgson have not. As no complete list of these papers has been previously compiled, it seems worth while to make one now. The list has been divided into three parts—The Seismologic Papers of Dr. Otto Klotz, not appearing in the Publications; The Seismologic Papers of Ernest A. Hodgson, not appearing in the Publications; and the Seismologic Numbers, appearing previous to 1924, in the Publications. They are printed as an appendix to this number.

It is planned that the seismologic papers which appear hereafter as part of the series of *Publications* are to be confined to a single volume until that is filled. Then the next unopened volume will be reserved for seismology, till filled—and so on.

It may be pointed out here that *The Location of Epicentres*, 1920, by W. W. Doxsee, M.A., Vol. VIII, No. 2, 1922, was published at the time this scheme was being planned but too soon to be held for Vol. VII, which, it had been decided, was to be reserved for seismology. Thus the locations for 1920 appear in Vol. VIII, while the locations for 1921, next to be issued, will be published as a part of Vol. VII. However, a start had to be made and it was felt that all the papers in seismology should be put into the same volume after 1924, regardless of this single, apparently anomalous, instance of numbering.

A publication is now being prepared giving general details of the work done in seismology, at the Dominion Observatory, from the time the first seismograph was installed until 1924, and giving full details of the system of recording and office management now in use. An outline will be given of the records now on hand, their nature and quality, and a report on the series of records at present being compiled will be included. It is planned to make the article very detailed, in order that the material now available may be made known to any whose researches may require it and to act as a suggestion to others, as well as to prompt suggestions from others as to changes or improvements likely to add to the value of the co-operative work now being carried on by so many seismologic stations.

The report which follows for 1923 is the first of a series of annual reports to appear along with other papers in the seismologic volumes of the *Publications*. Each will outline the work done in seismology during the year. Changes deemed advisable in the system of office management and in the programme of recording will be made, where necessary,

only at the end of each year. These changes will be outlined in the next succeeding report, to supplement the information to be given in the article outlined in the previous paragraph. Any seismologic papers published elsewhere than in the regular series, *Publications* of the Dominion Observatory, which appear during the year under report, will be listed each year to supplement the list appearing in the appendix to this number.

The work being done will thus be readily followed by anyone interested in making use of the records, and everything in that line done by this division of the Dominion Observatory will be found, in detail or as a reference, within the seismologic volumes of the *Publications*, the first of which is the present volume.

INTRODUCTION TO THE REPORT FOR 1923

The work in seismology at the Dominion Observatory was begun in 1905 by Dr. Otto Klotz. Since that time he was constantly in touch with it. After becoming Director, in 1917, he still maintained an active interest. His death on December 28, 1923, is a loss which will be felt by this division for many years. His contributions to the science and the memory of his efforts to make Canada's part in it of value to the world will, however, continue to live, long after the feeling of loss at his death has begun to be softened by time. This is as he would have wanted it to be and as any man, working as he did for the love of a science, must wish.

This report is the first complete outline of the seismologic activities of this observatory issued since 1912, when Dr. Klotz, in Appendix I to the Report of the Chief Astronomer for 1911, gave a description of the work for the year covered by the report. Since then papers covering parts of the investigations have been printed from time to time but no reports on the work as a whole have been published.

For the purpose of ready reference, the report is divided into sections.

EARTHOUAKES RECORDED

During the year 308 earthquakes were registered, of which a large percentage were visible only on the Milne-Shaw sheets. These are reported in tabular form.

The Milne-Shaw seismographs are mounted on a pier 8 feet square, in a vault 20 feet below the surface of the ground. No building is above this vault. The temperature is constant within a few degrees throughout the year and there is practically no daily variation. The constant temperature and the freedom from local disturbances enable the magnification to be set at 250 fold, resulting in greater sensitivity for these intruments than for the Bosch, which are mounted in the basement of the observatory.

Reports on the records have been published monthly as bulletins. The mailing list in 1922 contained 120 addresses; this number was increased in 1923 to 230. All well-marked earthquakes were reported to the press.

A request was made with the January issue that the stations receiving that bulletin would fill out and return a receipt form, as it was felt that the mailing list should be kept free of stations no longer in operation. As soon as a single receipt was received here, the station reporting was put in a special list and receipt forms were no longer sent out to it in succeeding bulletins. At the end of the year over thirty stations had not yet returned any receipt. The practice will be continued of requesting the return of one, and only one, receipt per year from stations receiving our bulletins.

Beginning with January, 1924, a list has been sent out with each bulletin from this station acknowledging the receipt of reports from other observatories. The bulletins received during December, 1923, were so acknowledged. This method will be continued in the future.

The constants of the seismographs were given each month on the first page of the bulletin. The outline of these for the year, in tabular form, follows the list of earthquakes.

TABULAR LIST OF EARTHQUAKES

No.	Phase	Time	Period	1	Amplitud	е	Distance	Remarks
Date				A _E	AN	A _Z		
1371		hms	8	μ	μ	μ	km.	1 - 81-4 - 1 - 1/19 - 282 - 283 5 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -
Jan. 2	e _E	22-58-42 23-09·5	22					N-S lost in heavy micros.
Jan. 3	L F	23-17 0-05 ca						and the second
1372								
Jan. 8	i _E eL	22-12-08 22-24·5						
1373	F	22-50						
Jan. 11	eE	4-46						
	$eL_{\mathbf{E}}$ $M_{\mathbf{E}}$	4-47·5 4-48·8						
1374	F	4-57						
Jan. 12	${ m eL_E} \ { m L_E}$	19–50 19–55						Barely discernible on No. 17.
1375	F	20-05						
Jan. 12	$e_{\mathbf{E}}$ $e\mathbf{L}_{\mathbf{E}}$	21–31 21–33						Very faintly recorded on No. 17 only
1376	F	21-05						Lost in micros.
Jan. 14	eLE	13–35 to 13–50						Can just be detected.
	F	15-50						Lost in micros.

TABULAR LIST OF EARTHQUAKES—Continued

No.	Phase	Time	Period	1	Amplitud	е	Distance	Remarks
Date	2 Haso		Teriou	A _E	AN	A _Z	Distractor	
1377		h m s	8	μ	μ	μ	km.	
Jan. 20	$i_{\mathbf{E}}$	21-57-41						
eist Diny	eLE	22-08						Taylinamin's population
Marin	LE	22-16	21					and a shirt start and a shirt and a shirt
1974	F	22-35						
1378		or pignificant	South the	The state of	30.54130	a on w	DER JOSEPH	
Jan. 21	iE	4-33-37						On No. 17 only.
	$eL_{\mathbf{E}}$	4-55	12					
111.51	LE	4-59 to						
	10	5-06						
(Indiana)	F	5-26						Sail a president and the state of the
1379		The Children				TO LOS		
Jan. 21	е	14-07.5	ALDED S	1.000	1.01-20		DATE OF COMME	Sinusoidal L waves of small ampli
	eS?	14-09.7	1					tude and with a beautiful grada
	eL.	14-32						tion in period from 28s to 15s.
	L	14-34	28			******		tion in period from 208 to 108.
	L	14-57	15					
	F	15-00 ca	10					
		10-00 ca						
1380								
Jan. 22	e? ₁₇	1-18						M. N. N. G.
Jan. 22	e:17	1-20.3						Micros obscure N-S.
	6	1-22						
	eS?E	1-23-48						
	$eL_{\mathbf{E}}$	1-39						Sinusoidal L waves of small ampli
	LE	1-54						tude predominate.
1 - 5 / 62	LE	2-10	19					
1001	F	3–25						
1381			Trap 1				STATE OF THE STATE	
Jan. 22	0	9-04-10					3880	Press reports tremor felt at Sacra
	P	9-11-19						mento, Cal., and Reno, Nev.
	PR_2	9-12-30						
	S	9-16-59						All the second second second
	SR ₂	9-19-17						
	eL	9-20-44						
	M_{17}	9-26-45	19	500				
	E,	12-00 ca						The state of the s
1382								
Jan. 26	е	21-50-28						Faint traces only.
	i	21-52						
	eL	22-00						
No. lead	F	22-30						
1383								The second second
Jan. 27	е	8-09-41						
	eL	8-14						The second secon
	M_1	8-16-08						The second secon
	M ₂	8-17-23						
	TATS	0-11-20						

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks	
Date				A _E	AN	AZ			
		h m s	8	μ	μ	μ	km.	Towns and the second	
1384							MAKE A		
Feb. 1	e _E	19-45-38							
	e _E	19-55-38						S: 1-1 T	
	eLE	20-02-39	04					Sinusoidal L waves.	
	L	20-21	34	63					
	L F	20-36	18				,		
1905	r	21-50							
1385 Feb. 2	0	1-16-53				With the York	6500		
red. 2	P	1-10-55					0000		
	8	1-34-56							
	L	1-41-46							
	M	1-49	20	38					
	L	1-56	20	00					
	F	1 00						Lost in micros at 3-25 ca.	
1386								2000 12 2220200 10 0 20 0	
Feb. 2	0	5-08-21					7260		
	P	5-19-03							
	S	5-27-45							
	SR ₁	5-32-41							
	eL	5-36-00							
	L	5-40	43						
	$M_{^{1}E}$	5-48	17	140					
	M_{2E}	5-54	17	140				6 A 10 A 17 A	
	L	6-05	15				, , . ,		
	L	6-20	16						
	L	6-40	15					AND THE PERSON NAMED IN	
	L	6-55	15						
	L	7-25	15					olog 28-01-5	
	L	7-51	15					10 db 11 db	
	L	8-00	15					35-56	
	L	8–20	15					ed ministration in a small c	
1007	F	9–10 ca							
1387		10.01 50	- Barrell	TO be	May 2 d		mago		19 07 200
Feb. 3	OP	16-01-56					7620	The Saskatoon and Hali	
	S	16-12-57						indicate, respectively, d	
	SR ₂	16-21-58						5750 km. and 8440 (?)	km.
	eL	16-29-50						THE REPORT OF SALES	
	M ₁	16-34-00 16-42							
	M ₂	16-45-40	16	4400					
	L	17-00	16						
	L	18-00	16						
	L	19-00	16						
	L	20-00	16						
	L	21-00	14			1			
	L	23-04							
Feb. 4	L	1-49							
1177,111	L	6-42							
	F	7-00							

TABULAR LIST OF EARTHQUAKES—Continued

No.	Phase	Time	Period		mplitud	le	Distance	Remarks
Date	2 21000	2		A _E	AN	AZ		
		h m s	8	μ	μ	μ	km.	
1388	. T	11 42						Small amplitude L waves—an "af
Feb. 4	eL eL	11–47 12–55						quake" to No. 1387.
	eL	13-08						quanc 00 110. 1001.
	F	14–10						
1389	F	14 10						
Feb. 4	eL	16-20						Very faint traces only. Record
200, 2	F	17-00						only on M-S.
1390								
Feb. 4	eL	17-55						Very faint traces only. Record
	F	18-07						only on M-S.
1391			1 1 1 1 1 1 1					
Feb. 4	eL	18-51						
	L	19-10						
	L	19-15	16					
	F	19-25						
1392			1199			1 1 1 1 3 d		
Feb. 5	e	3-30						
	eL	4-00						
	L	4-04	13					
	F	4-40						
1393								
Feb. 5	eLE	8–37						
	F	8–55 ca						
1394	-	10.01						
Feb. 5	LE	12-21						
1005	F	12-50 ca						
1395 Feb. 5	-T	23-01.5						
Feb. 5	eLE	23-01.6	15					
	$egin{array}{c} \mathbf{L_E} \ \mathbf{L_E} \end{array}$	23-26	10					
	LE	23-25	15					
	LE	23-40	10					
Feb. 6	F	0-05 ca						
100.	J. Wall	0 00 04						
1396								The succession of the successi
Feb. 6	eL	13-06						Faint traces only.
	F	13-25 ca						
1397								to the state of th
Feb. 6	eL	22-28						Faint traces only.
	F	22-45 ca						
1398								
Feb. 8	0	0-33-23					3660	
	P	0-40-15						
	S	0-45-42						
	eL	0-50						
	L	0-52						
	L	1-04						
	F	1-30 ca						

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks
Date	I MONO			A _E	AN	AZ	2	
Market.		h m s	8	μ	μ	μ	km.	Am hongestad a same to a
1399		10.50	144					
Feb. 8	eL	3-56	36					ALLES DO TO THE LOCAL PROPERTY OF THE PARTY
	L	4-00	22					
	L	4-10	15					
	F	4-20						
1400			Est Park		174	J. MALEN	2000	
Feb. 8	e?	7-53.3						
	e?	8-02						
	eL	8-26	22					
	L	8-29			,			
	L	8-38	15					PHYSIC CHARLES AND STREET
	F	9–10						[2] [1] [1] [2] [2] [2] [2] [2] [2] [2] [2] [2] [2
1401				The colors	Mary Services	Harris Francisco	A	
Feb. 8	е	14-24-2				,		
	eL	14–32						
	F		,					Lost in changing the records.
. 1402						14 3 17		
Feb. 9	eLE	11-33						Traces very small.
	eLE	12-05						
1403	F	12-28						
	aT.	1-50	Defreien		The state of	3000	1000	
Feb. 11	eLE	1-53						
	Lœ	2-00						
	L _E F	2-10						
1404	F	2-10						
Feb. 11	е	17-43		DWM .			A 1977	Small amplitudes only.
100. 11	eL	17-49	18					Sman amphodos omy.
378/11	L	17-50	15					
1 13 14	F	18-27	1					
1405		T-MANAGE STATE						
Feb. 11	0?	22-59-47					(2930)	A curious phenomenon is the appear
	P?	23-05-37						ance at 0-35.5 of what was a
	S?	23-10-15						first believed to be LR _i . It
	eL	23-13.0						appeared at the minute expected
	L	23-25	16					but one hour too early. The true
	L	23-32	16					interpretation of this increase in
	L	23-43	15					period of the L waves is not
Feb. 12	L	0-05	15					known. It would be interesting
	L	0-35.5	30					to know whether other stations
	F	0-55						found the same period increase on
		The Republic						their records.
								Δ may be much greater—of the
								order of 10000 km. with the F
	187	15						wave missing. Not much success
								has resulted from our attempts to
							1	so read it.

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	A	Mplitud	le	Distance	Remarks
Date	I Hass	T IIIIO	Jones	A_E	AN	AZ		
		h m s	8	μ	μ	μ	km.	
1406							0100	
Feb. 12	0	2-09-01					6160	
	P	2-18-41						
	S	2-26-26						
	eL	2-31						
Marie 1	L	2-35.5						
	M_{E}	2-43	22	58				
	L	3-00 to						
7 114 1		3-45						
	F	4-10 ca						
1407		10.10						
Feb. 12	eLE	13–18						
55.	LE	13-22						
	F	13-38						
1408	_	15 50						Faint traces only.
Feb. 14	eLE	17-59						Faint traces only.
4017	$\mathbf{L}_{\mathbf{E}}$	18-08	1					
	F	18–22 ca						
1409	-							Heavy micros mask much.
Feb. 15	eL	23-14 to				******		Heavy micros mask much.
		23-31						
1410	-							Heavy micros mask much.
Feb. 16	L	7-15.7						Heavy micros mask muon.
	F	7–35						
1411		0.07.0						Heavy micros mask much.
Feb. 16	e	9-37.6						Heavy micros masa mass.
	eL	9-50.5						
	F	10-12 ca						
1412	0	09 50 05	I In the				5880	
Feb. 18	0	23-50-25					9000	
T. I. 10	P	23-59-49 0-07-19						Te-05-82
Feb. 19	S							L waves taper off to very sm
	eL	0-12-5						amplitudes after M has passed.
1000	L	0-17	19	26				ampiroudes arous 112 mas passes.
	M _E F	0-23-24 2-00	19	20				
1413	r	2~00						
		6-39-26	TV N					
Feb. 19	eE							
	e _E	6-51·4 6-56·2	1					and the second second second
	e _E							La College Col
	eLE	7–10				1	1	
	LE	7–17 7–36·5						
	L _E F	8-25 ca						
		0-20 Ca						- N
1414	T.							a 11 11 1
1414		1-01					1	Small amplitudes.
	eL	1-01				1		Small amplitudes.
1414 Feb. 21	eL L	1-09						Small amplitudes.
	eL					1		Small amplitudes.

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks
Date	1 Haso	1440	2 0220	A_E	AN	Az		must be a second
		h m s	8	μ	μ	μ	km.	
1415		0.40						Small amplitudes.
Feb. 21	e eL	3–40 3–46	******					Sman aminiences.
	eL L	4-00						
	L	4-15						
1000	L	4-25						
	F	4-45 ca						
1416		1 10 00						Charles and the control of the contr
Feb. 23	0	6-05-28					4750	March and the Lor
. 0.51	P	6-13-39			(000)			
AV.	i	6-14-23						
711	S	6-20-08						
	eL	6-25.5						Periods of L waves very irreg-
Cilrui I	L	6-31						ular, amplitudes small.
	L	6-43						
	L	6-53						
1307 60	L	7-04						
	F	8-17						
1417								
Feb. 24	0	7-34-48					7390	
	P	7-45-37						Make the second section of the second
	S	7-54-26						
	SR_1	7-59-32						The Land St. Land St. Land
	SR_2	8-02-08						1 100 m = 20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	eL	8-05	45					
	L	8–10						
ETALES!	$M_{\mathbf{E}}$	8-14.5	16	410				The second secon
Miles 19	L	8–20 to						
		11-00	8					
	F	11-40						or 00-0
	HALIFA	x Record						0.04
	0	7-36-40					7620	
A TOTAL	P	7-47-41						
200	S	7-56-42						
	eL	8-04						
700	M_1	8-15						
180 Te	M_2	8-21						
	F	9-20 ca						
	SASKATO	ON RECORD						
1000	0	7-36-34	1111		111111111111111111111111111111111111111		5400	The difference in time for O is
	P	7-45-28					0400	probably due to clock errors in
	S	7-52-32						Saskatoon and Halifax. The
	eL	8-00						values of Δ for Ottawa and
	L	8-02						Saskatoon give an intersection at
	M ₁	8-05.5						Kamchatka. Strasbourg wireless
1111111111	M ₂	8-11.5						gives the epicentre as Kamchatka
	-							I S I S I S I S I S I S I S I S I S I S

No.	Phase	Time	Period	A	mplitud	le	Distance	Remarks
Date	Z Maso	11110	20104	A _E	AN	Az		
		h m s	B	μ	μ	μ	km.	
1418	. T	10 10						
Feb. 24	eL F	18–58 19–05						
1419	r	19-05						
Feb. 25	eL	4-37						Very small amplitudes only.
100. 20	L	4-39						Tory britain temperature of the
	F	5-00						
1420		0 00						
Feb. 27	0	20-39-12					2850	
	P	20-44-54						
	S	20-49-26						
	eL	20-51-38						
Phone V	L	20-53-45						
	F	21-30 са						
1421			10 10 10 10		1111111111		hall list his	
Feb. 28	0	(22-20-33)					(2640)	Small amplitudes only.
	P?	22-25-55						
	S	22-30-11						
	eL	22-34						
	M	22-38						
	F	23-18						
1422					111111111111111111111111111111111111111			
Mar. 1	0	(8-26-15)					(6240)	Small amplitudes only.
No particular	P	(8-36-00)						
	S	8-43-49						
	i	8-45-47						
	i	8-47-38						
WIN / I WA	eL	8-53						
	L	8-56						
	п	9-00 to 10-00		* * * * * * *			*******	
	F	11-00 ca						THE RESERVE THE PARTY AND THE
1423	r	11-00 ca						
Mar. 2	e?	17-01-44						Halifax record contains traces of I
ANIGHT. 2	eS?	17-09-32						waves but no P or S.
	i	17-19-49						waves but no 1 or b.
0.5	i	17-26-45						
	L	17-43						
	M	17-57	23					· · · · · · · · · · · · · · · · · · ·
	L	18-09	21					
	L	18-36	19					
	F	20-05						The second second second
1424								
Mar. 3	i	22-33-18						Very small amplitudes.
	е	22-42-00						
	eL	22-57						ma /u
	L	23-05 to						
		23-25						in the state of th
	F	23-53						

No.	Phase	Time	Period	A	Amplitud	le	Distance	Remarks
Date	Гпазе	Time	1 61104	A _E	AN	A _Z	Distance	2002268 AND
1.10		h m s	8	μ	μ	μ	km.	
1425 Mar. 4	eL	0-29						Traces only.
MINI. A	L	0-25						Titoos only.
	F	1-15 ca						leader to make the leader of the
1426		1 10 00						Endow Digital Herican Service
Mar. 4	eL	7-44						Very small amplitudes.
	L	7-47 to						
	Menuich	8-26						The state of the s
	F	9-30						
1427								
Mar. 10	eL	0-02						The base of the same of the sa
	L	0-08						
	F	0-38						
1428					San San F	Sais de	15 miles	
Mar. 10	e	8-33						
	e(L or S)	8-38						
	L	8-55						
	L	9-00.5						
	F	9-40 ca						Section 19 1
1429			19 4		10/4/18	200		
Mar. 11	0	23-06-45					3960	Small amplitudes only.
	P	23-14-00						
	S	23-19-45						
	eL	23–25						
	M	23-29						
1400	F	0–15 са						
1430	-	10.00	S. Fredri		Anna di I	The state of		
Mar. 12	eL L	10-25						
	F	10-34						
1431	I.	10–50						
Mar. 13	i	20-08-38						
Mar. 13	eL	20-08-38						
	L	20-19·5 20-24·5 to						
	ь	20-24.5 to				Property of	State In State	
	F	21-15 ca						
1432	T.	21-10 Ca						
Mar. 14	0	(20-54-49)					(6580)	Very small amplitudes throughout
WIGH. IT	P	(21-04-53)					(0000)	very sman amphitudes unroughout
	S	(21-13-00)						
	eL	21-21.5	W. W.					
	L	21-43			The second second second			
	M ₁	21-49	22					
	M ₂	21-54.5	21					
	L	22-02	19					
	Ĺ	22-08	18					
	L	22-12-5	16		S Alderson			
	F	23–15 са						
						1		

TABULAR LIST OF EARTHQUAKES—Continued

No.	Phase	Time	Period	A	Amplitud	le	Distance	Remarks	
Date	Z Muso		20000	A _E	AN	Az			
1433		h m s	8	μ	μ	μ	km.	The median series	
Mar. 15	0	5-40-16					7020		
	P	5-50-45							
	S	5-59-15						A STATE OF THE STA	
	eL	6-05.5						TO SEE MALE	
	M	6-18							
	F	7-35 ca							
1434			14 67		N. C. C.	No.	The state of the state of	THE RESERVE OF THE PARTY OF THE	
Mar. 16	0	22-12-33					6320	Strasbourg wireless gives	
	P	22-22-22						O=22-15-45	
	S	22-30-15						$\Delta = 12500$ km.	
	eL	22-39-15							
	L	22-58	32						
	M	23-12	22					25 49 11 11 11 11	
	L	23-16	19						
	L	23-23	17						
	L	23-30 to							
Mar. 17		0-00	15						
	L	0-05	14					The state of the s	
	F	1-05 ca						The second of the second of	
1435		- 00 00							
Mar. 18	eL	20-45-15						1 St. OF ST. OF ST.	
	L	20-45.8						L. Chicares History	
	M	20-48							
	F							Micros interfere.	
1436									
Mar. 19	е	11-23						All the instrument less out a color and	
	S?	11-26-32							
	L	11-29							
	M	11-35							
	F	12-27 ca							
1437	-	12 21 00							
Mar. 19	eL	16-57						A STATE OF THE STA	
AVICEI. IU	L	17–15				1			
	L	17-20						100 100 20 100 100 100 100 100 100 100 1	
	L	17-28							
3	. F	17-45 ca							
1438	. 1	11-10 00							
Mar. 19	eL	21-56	100	Mary Pr				Small amplitudes.	
MIST. 19	L	22-03.5						Sman ampittudes.	
	L	22-05				1		100 L00 L100 R	
	F	22-30 ca							
1439	r	22-30 Ca							
Mar. 24		9 97		1				Small amplitudes.	
1VI al. 24	e L	2-37						Sman amphiduces.	
	F	2-41						The state of the s	
1440	T,	3-00 ca						12 1 1	
1440		0 54 4			11111111				
Mar. 24	е	8-51-4							
	L	8-55.4							
	L	8-57							
	F	9-10 ca	1					1	

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks
Date				A _E	AN	A _Z		
1 500		hms	8	μ	μ	μ	km.	Too mid all and a second
1441	F 1 587	The Market		1337			C. Street	Hall as made to the second state of the second
Mar. 24	e _E	13-00-6						Earthquake does not appear to have
	e	13-04-53						been a single abrupt shock. The
	S	13-06						phases seem to result from several
	eL	13–18						shocks and do not admit of reso-
	L	13-25						lution.
	M_1	13-38-5	30					
	M ₂	13-42-5	26					
	L	13-43 to						
	11111111	14-00	18					The tient of world in
	L	14-10 to						A THE MENT OF THE PERSON OF TH
		15-45	13					
	F	15-30 ca						Charles Annual Charles
1442	## DAY		History.	and the last		AVENT		A STATE OF THE STATE OF
Mar. 26	eLE	14-57						Small sinusoidal L wavet
	$L_{\rm E}$	15-00	40					
	LE	15-02-5	24					
	LE	15-10-5	21					1 Sept 20 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	LE	15-14	18					S STATE OF THE STA
	L	15-24.5	22					
	LE	15-32	20					0.00
	F	15-49 ca						A TENER DE LE CONTROL DE LA CO
	THE A	1 2 60						and an asset of the second
1443		7-75-75				A. A.	100 100	and the second second
Mar. 28	e	(5-10)						Times uncertain. Time signals faint
	e	(5-15)						owing to the intensity of the light
	eL?	(5-21)						spot.
	L	(5-26 to						A STATE OF THE STA
		6-20)						412 20-6
	F	(6-30)						10.00
		11 11 10 10	1 13 6 5				1 1 1 1 1 1 1	
1444			I MANA	1		6		T TOP-
April 5	eL	(23-00)						Times uncertain owing to halation
	L	(23-06)						trouble on record.
	F	(23-20) ca						
1445		Section 1	100	1			1.3	The Ball of the Ba
April 13	e	10-26-26						Small amplitudes and irregular
	e	10-27-58						periods.
	е	10-33-16						
	i or eL	10-36-08						
	L	11-20						
	eL	12-00						
	F	12-25		1				

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	1	Amplitud	6	Distance	1	Remarks	
Date	1 11000	1 mio	101100	A _E	AN	AZ	Distance		I WOLLING IN	nuncs •
		h m s	8	μ	μ	fit.	km.	A TENERA		
1446	_									
April 13	0	15-31-12					7380			
	PM	15-42-00						On M-S only.		
	S	15-50-48								
	SR ₂	15-58-20								
	eL?	16-02								
	M ₁₋₁₇	16-09	17	110						
	M ₂₋₁₇	16-13	22	275						
	M ₃₋₁₇	16-15	19	195				1 0 7 1 1		
	M ₄₋₁₇	16-17	17	140						
	L	16-20 to	17							
		18-00	10							
	F	18-40						0.10-00		
1447										
April 13	eL	21-16.5 to								
		21-26								
	F	21-37								
1448					1 1 1 1 1 1 1 1		1 16	The State of the S		
April 14	eL17	9-31.5 to								
		9-44								
	F	9-50 ca								
1449							100	A A A A A A A A A A A A A A A A A A A		
April 14	eL	15-57								
Legion 1	L	16-00 to								
		16-08								
	F							Lost in micros		
1450	a Villand	vitre real re		and a				The state of the s		
April 19	е	3-31-41						1111-0		
	eL?	3-51						al of the state of		
	L	4-05	45					The state of		
	L	4-12	32					140.00		
	L	4-25	22							
	L	4-39-5								
	L	4-50						DV2-023		
	L	5-03						767-42		
	F	5-45						10 175 125		
1451										
April 23	0	. 3-33-48					5580	Very faintly re	corded as t	o P and S
	P	3-42-53								
	S	3-50-07						1 1 16 18		
	eL	3-58.5						THE PERSON NAMED IN		
	L	4-04	45							
	L	4-10	30					100		
	M	4–16	17	26						
	L	4-24	14	20				117,201		
	L	4-31	11							
	F	5-25								

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks
Date	Thase	Time	101104	A _E	AN	A _Z	2330000	
1452		h m s	8	μ	μ	μ	km.	
April 24	eS?	22-58-15						Δ probably the same as for No. 1453.
	eL	23-04				5		Very irregular periods.
	M	23-05.5	,,,,					
	F	23-37						
1453	0	10 91 40	B CONS		Made Into	(B)	4200	Innomials Boom a striking
April 25	0	19-31-46 19-39-26					4300	Irregular periods. Bears a striking resemblance to No. 1452.
	. P	19-39-20						resemplance to No. 1452.
	eL	19-40-50						
13.	M	19-52-5						
	L	19-55						
	L	20-07.5						
1100	F	20-50						
1454		20 00						
April 27	e	10-49						
	eL	11-05-5						
	L	11-33	25					
mon-2	F	12-06						The second second second
1455								
April 29	0	2-31-08					3900	Small amplitudes.
M. Pople	P	2-38-19						
SANT THE	S	2-44-00						
	eL?	2-49.5						
	L	2-51.7						A SMINAL PRIMARY
	M	2-54.4	12	12				
1450	F	3-35 са						
1456	-0	0.40.4	1000		100			St
April 29	e?	9-46·4 9-56·5						Sinusoidal L waves of small ampli-
	eL L	10-10	30				,	tude.
You will	L	10-10	21					
	L	10-19	18					
	L	10-27	16					
	F	10-44 ca	10					
1457		20 22 00						
April 29	eL	19-33						Traces on M-S only.
	L	19-35	23					
	F	19-43						
1458			1 1 1					
April 30	e?	16-37.5						
	eL	16-43						
	F	17-05						
1459								
April 30	eL	20-55						
	L	20-58	23					
	L	21-11.5						
	F	21–20						

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks		
Date	2 11000		2 02104	A_E	AN	A _Z		1000		
		h m s	B	μ	μ	μ	km.	100000000000000000000000000000000000000		
1460		1 2 / 2 / 2						1111年11日 11日 11日 11日 11日 11日 11日 11日 11日		
May 1	e	10-55								
	е	11-01								
	eS?	11-10-38								
	eL	11-17-5								
	L	11-34-44								
	F	12-05						at the second of		
				Lance In Column						
1461			11 3	100	- 6 PE			3.00.40		
May 2	e	16-34-52						Irregular small periods.		
	e	16-36-15								
	eL	16-41-5								
	L	16-42 to								
		17-05	-							
	F	17-30 ca						10 March 1997 1997 1997 1997 1997 1997 1997 199		
		11-00 00								
1462										
		10 00 04					7700	TT - 1 '- 0 10 00 01 A 0040		
May 4	0	16-26-34					5520	Harvard gives $O = 16-26-31 \Delta = 6040$		
	P	16-35-35						km. Strasbourg gives O = 16-26-35		
	†PR _{1M}	16-37-34						$\Delta = 8500$ km. These values for Δ		
	PR _{2M}	(16-38-07)						give circles which intersect as		
	S	16-42-45						$\varphi = 54^{\circ}$ N. $\lambda = 155^{\circ}$ W., near		
	i	16-45-08						Kodiak, Alaska.		
	SR ₁	16-46-37								
	SR ₂	(16-47-30)						在研究		
	eL	16-49	49	360				The state of the s		
	M _{1M}	16-53-08	25	412						
	M _{2M}	16-56-5	15	307				\$2.00 DE DESIGNATION OF THE RESIDENCE OF		
	M _{3M}	17-04-7	13	84						
	M _{4M}	17-07	13	120						
	M _{5M}	17-10-5	13	90				A STATE OF THE STA		
	Mom	17-13-3	13	90						
	M _{7M}	17-22-3	13	85				re-or		
	L	17-25 to	10	00						
	1	20-05						The state of the s		
	F	20-30 са						THE PERSON NAMED IN COLUMN		
	F	20-30 ca								
1400										
1463		(00 00 00)								
May 4	0	(22-26-50)					(8100)			
	P?	22-28-20						The second secon		
	S?	22-47-41								
	SR ₂ ?	22-56								
	eL	23-01						994		
	L	23-10						the first of the f		
	L	0-40								
	F	1-15								
1464										
May 5	eL	9-57.5								
	F	1						1		

 $\dagger M$ subscript indicates registration on Milne-Shaw seismographs only.

No.				4	Amplitud	le			
and Date	Phase	Time	Period	A _E	AN	AZ	Distance	Remarks	Wild white
1465		h m s	8	μ	μ	μ	km.		
May 5	е	15-17-12							
	eL	15-23							
	L	15-27							
	F	16-00							
1466			100	and we	STATE OF THE PARTY		Sea of Maria		
May 8	е	19-23-00						Very faint traces only.	
	eS?	19-27-22							
	eL?	19-32	,						
	L	19-34							
	L	19-46 to							
271 /121		20-07							
	F	20-18	1						
1467			1 111						
May 10	е	4-01-32						Very small amplitudes.	
212003 20	e	4-10-00							
	e	4-11-41						A STATE OF THE STA	
	e	4-13-32							
		4-19-26							
or this lead	e eL	4-19-20 4-47 to							
	еп		10						
	-	5-04	19						
* 100	F	6-20 ca							
1468		(0.10.50)	A control	200 000	103 103	100	101117109	The state of the s	
May 11	e?	(8-42-52)							
	е	8-44-00							
	е	8-49-37							
	е	8-54							
	L	9-20 to	35					The state of the s	
		9–38	19					CONTRACTOR OF A CONTRACTOR	
000	F	10 ca							
1469			li beca	loning.	1	WILL STATE			
May 12	e	1-41-30						61 3 10 3 1 60 E C C C C C C C C C C C C C C C C C C	
	е	1-43-16						THE RATE OF THE STATE OF THE ST	
	е	1-55							
	е	2-08							
	eL	2-22						of sillenting and the	
	L	2-29	44					TOTAL STATE	
	L	2-40 to							
		2-59	22					the same of the same	
	L	3-02 to							
	_	3-27	21						
	F	4-00 ca							
1470	1	2 00 04							
May 15	0	21-43-00					(7600)		
	P?	21-54-00					(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
	S?	22-03-00				1000000000			
	eL?								
		22-09-5					*******		
	L	22-20							
	L	22-23 to	10					1.00	
		22-50	16						
	L	22-51 to							
	_ 11	23-05	16						
	F	23-35	1						

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	1	Amplitud	е	Distance	Remarks	
Date	I Habo	T MIC	1 02104	A _E	AN	A _Z		200200320	
	,	hms	8	щ	μ	μ	km.		A WILL
1471								The state of the state of	
May 16	е	(18-27-28)							
	е	18-34-00							
	е	18-39-6							
	eL	19-04.5						Small sinusoidal L waves.	
	L	19-11	19						
	L	19-19 to							
		19-43	16					AT AN ARREST POLICE	
	F	20-00							
1472									
May 23	0	22-37-21					7580		
	P	24-48-20						The section of the second	
	S	22-57-19						La median a la mana	
	eL	23-05-22						DE LIBERTAN DE LA CONTRACTOR DE LA CONTR	
	M_1	23-14							
	M ₂	23-20.5	18						
	M _a	23-23-2	18						
	L	23-26 to							
May 24		0-06	15						
	L	0-06 to							
		2-06							
	F	2-45 са							
1473									
May 25	е	22-45-45						On M-S No. 17 only.	
	e?	22-52-15						100-100	
	eL	22-58							
	L	23-05	34						
	L	23-15	17					Market Control	
May 26	F	0-00 са							
1474									
May 26	0	3-29-41		* * * * * * *			4480	TOTAL STREET	
	P	3-37-34							
	S	3-43-48						11 10 10 15 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	eL	3-49.5							
	L	4-00						A CONTRACT OF THE CONTRACT OF	
	L	4-07	21						
	F	4-55							
1475								I Washer Tolker	
May 26	e	9-13-5						The state of the s	
	е	9–19							
	eL	9–35					1		
	L	9-41	30				1		
	L	9-54	20						
			40		1				
	F	10-45 ca							

No.	Phase	Time	Period	A	mplitud	le	Distance	Remarks	
Date	Тцаро	11110	2 02304	A _E	AN	AZ			
		h m s	s	μ	μ	μ	km.		
1476			The Carte						
May 28	eP17?	1-48-45							
	eL	2-05-40		,					
	L	2-37	30						
	L	2-42	25						
	L	2-50 to							
	ш	3-48	15						
	-		19						
1	F	4-00 ca							
Econo. 4		Time no	HLAN-	10 NOT	200	100	The letter of the letter		
1477				Service.	100	A THE			
May 30	eP17?	8-48-23							
	eL	8-57			,	, ,			
17-10-7	L .	9-01		, ,					
7-14	L	9-16							
	F	10-00							
1181	T.	10 00							
1480		N. S.	Mark Co	DELL'E			PART NE		
1478		10.00							
May 30	eL ₁₇	16-02		,	,,				
	L	16-11 to							
		16-18				, , ,			
43/15	F	16-25							
1479		De la lace de la lace		1000			COLUMN TO SERVICE STATE OF THE		
May 30	i	18-14-30							
	L	18-25							
1777	L	18-27	15						
	L	18-36 to	10						
	П		15						
	-	19-01	10				Too	t in changing sheets.	
200	F						LOS	of the changing success	
1480		THE PARTY OF		WAY INS	March 1988	The Contract	Ecos help 1		
May 31	е	6-19-52							
	е	6-26			, ,				
	eL	6-35							
	L	6-46 to							
		6-54	23						
per la	L	6-54 to							
	-	7-16	16						
	F	7-35	10						
# CHD	r	טפר ז							
1401				1000	8 1 1 1 1 1 1 1 1 1				
1481		00 05 10			0.0		2200		
May 31	0	22-05-48	* * * * * * * *				3380		
	P	22-12-19							
100	S	22-17-28							
•	eL	22-20							
	L	22-21.5 to							
		22-25	21						
	L	22-29 to							
	-	22-54	16						
-	F	23-25	10			1			

TABULAR LIST OF EARTHQUAKES-Continued

No. and	Phase	Time	Period	A	Amplitud	le	Distance	Remarks	
Date				A _E	AN	AZ			
		-							
1482		h m s	8	μ	μ	μ	km.		
June 1	0	17-25-31					9320	CA-CA-ST MATERIAL	
-	P	17-38-00						District Alle	
	PR ₁	17-41-46							
	S	17-48-26						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	i	17-48-49							
	i	17-50-00						A SHEET AND A	
	SR ₁	17-54-5						an total	
	L	18-09							
	L	18-14-5	23						
	M	18-19-5							
	M	18-24-5							
	M	18-28-5						and the second second	
	L	18-30 to							
		20-00						10-01	
	F							Lost in next quake.	
1483									
June 1	P							Lost in preceding quake.	
	S	20-39-23						ALCOHOLD TO THE	
	L	20-46							
	L	20-55							
	L	21-02	23						
	M	21-13-5						and the state of t	
	L	21-20 to						A STATE OF THE STA	
		22-40						THE RESERVE OF THE PARTY OF THE	
	F	23-26							
1484			I de la			100	1	and the state of the state of	
June 2	е	1-20.5							
	е	1-28							
	eL	1-36							
	L	2-04						02.0	
	F	3-30 ca						110	
1485				F Jan			1	and dileter	
June 2	eL	5-53.5						4000	
	F	6-03						es deal, a second	
1486							1 STATE		
June 2	$eL_{\mathbf{M}}$	13–39						On M-S only.	
	L _M	13-43.5							
1	F	14-26 ca							
1487								10 10 10 10 10	
June 2	e?	14-43.7							
	e	14-54							
	L	15-14-5						150	
	F	16-00 ca							
1488	-								
June 2	eL	23-58							
June 3	F	0-10 ca					1		

No.	Phase	Time	Period	A	Amplitud	le	Distance	Remarks	
and Date	Гцаяс	Time	Teriou	A _E	AN	A _Z	233000	2002303.223	antile .
1489		hms	8	μ	μ	μ	km.	1 × 7a	
June 3	eL	12-23						30.00	
June o	L	12-30-5						Caraba Haraka	
	L	12-35 to							
	19 3 3	12-50							
	F	13-00 ca							
1490									
June 4	e?	(21-20)						Small traces only.	
	eL	(21-40)							
	L	21-51 to						S MATERIAL MATERIAL STREET	
		21-56						高型 自然性的 可以使用的	
	F	22-50 са						ar in a	
1491									
June 5	е	(6-26.0)							
ouno o	e	6-31.5						A 85-8	
	eL?	6-35							
	L	6-39 to						Ul ni-t in	
		6-55							
	F	7-00 ca						00-80-8	
1492								36-40-40 US	
June 6	е	18-00-34						May be two quakes.	Distant
0 0000	е	18-07						Phases not marked. S	trasbourg
Int. Ob-	eL	18-16						gives $\Delta = 8880$ km. and	
	L	18-29 to						O=17-42-01.	
		19-12							
	L	19-40						The same of the same	
	L	20-07						14-15-2	
M. A.P.	L	20-29						All the same of the same	
-Uma 191	F	20-55 са							
1493								The state of the s	
June 6	е	23-10-23						Nearer than 1492 on same	sheet.
- 111	eL	23-14							
	M	23-15.5						A SECTION ASSESSMENT AND A SECTION ASSESSMENT ASSESSMEN	
June 7	F	0-00 ca						30.31	
1494	aT.	0 10	11/2/1	1477				Faint traces cala	
June 8	eL	8-16						Faint traces only.	
	L	8–18 to							
	773	8-27							
440#	F	8-50 ca							
1495		1 10					1111111	D 1 1 - 11	
June 10	eL	1-46						Barely discernible.	
1406	F	2-00 са							
1496 June 10		10.02 5							
June 10	e eL	19-03-5		******					
	GT	19-10-5							
	L?	19-36							

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	A	mplitud	le	Distance	Remarks	
Date	rnase	1 me	161101	A _E	AN	A _Z	Distance	The state of the s	
		h m s	8	μ	μ	μ	km.		
1497								g 11 4	
June 10	e?	20–38						Small traces only.	
	e?	20-51.3							
	eL L	20-57 21-00 to						10 经 10 10 10 10 10 10 10 10 10 10 10 10 10	
	ь	21-23						The second of the second of	
	F	21-40							
		22 20							
1498		roll ship-ending					1	100-100-10-10-10-10-10-10-10-10-10-10-10	
June 11	е	11-30-4						discussion of the same of	
	eL	11-37 to						A DOMESTIC	
		11-47						100-95 50 101	
	F	12-00 ca							
						N. D.			
1499									
June 12	eL	6-42							
	L	6-46 to				1000			
		6-53							
4 200	F	7–10						THE WEST LINES OF	
1500		0 10 00		00000		TO BE BUT	No. of the last		
June 14	e	6-16-20 6-19-45			* * * * * * * *				
	eL F	6-49							
	T.	0-49						A STATE OF THE STA	
1501	L. Talling								
June 18	0	8-26-16					4680	Strasbourg gives P=8-31	-40 an
	e?	8-31-00						$\Delta = 7700$ km.	
	P	8-34-23							
	S	8-40-48						the third	
	i	8-41-41						10-05	
	SR ₂	8-44-15							
	eL	8-50						Readings difficult to interpr	ret acci
	L	9–06						rately.	
	L	9-12 to						EX-OTION IN THE REST	
		9–33	20					A STATE OF THE STA	
	L	9-34·5 to	13						
	F	10–50 11–35	19				,	Carrier Transfer	
	r	11-00						the second of the last	
1502									
June 18	e?	17-16							
20	e?	17-20-8							
	eL	17-28-6							
	F	17-38							
1503								the state of the state of	
June 18	е	18-19-5							
	eL?	18-24				, , ,		The state of the s	
	L	18-46 to						The state of the s	
		18-51						F BALLETS	
	F	19-12 ca							

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remar	elra	
Date	Phase	Time	renod	A _E	AN	AZ	Distance	Itema	.a.o	
		hms	8	μ	μ	μ	km.	1.06		
1504		The state of the state of	MOS							
June 19	0	22-43-32					4900			
	P	22-51-53								
	PR ₁	22-53-38								
	S	22-58-30								
	i	23-01-02								
	SR ₁	23-02-12								
	eL	23-06								
	M_1	23-07.5								
	M ₂	23-10.5								
	L	23-14 to								
June 20	I SHOW	0-10								
	F	1-10 ca								
		Silver St.	1 Man	TV THE ST	- Y 3 1/3 /	100 1100	STATE OF THE STATE OF			
				E STATE	200					
		RECORD	State of		TO A SHEET	The least				
June 19	0	22-41-42					6450			
	P	22-51-39								
	S	22-59-39								
	L	23-10-40								
	M	23-14.5								
	F	Lost								
1505										
June 20	eL	6-28								
	F	6-44								
1506		1.00								
June 22	e	4-02								
	eL	4-05-4								
	L	4-08								
	F	4-38								
1507	CINTED I				A H					
June 22	0	(6-54-19)	111				(0100)			
June 22	P	(7-03-56)					(6100)			
	S									
	SR ₂ ?	7-11-37 7-17-06								
	eL	7-17-00								
	L	7-19-30								
	M	7-41.5				1				
	M	7-41.5								
	M	7-44.5								
	M	7-53.5	******							
	M	7-55.5								
	I M	V_(1)								
	M L	8-02 8-07 to								
	L L	8-02 8-07 to 9-45	1							

TABULAR LIST OF EARTHQUAKES-Continued

No.	701	(D)	Desir 1	A	Amplitud	le	Distance	Remarks	
and Date	Phase	Time	Period	AE	AN	AZ	Distance	Remarks	
		h m s	s	μ	μ	μ	km.		
1508							The state of		
June 22	e	(21-12-38)						Passaulting I the	
	е	(21-16-23)						I BOOK BOOK BOOK BOOK BOOK BOOK BOOK BOO	
	eL	21-24						A SHOP THE SHOP	
	L	21-45	30						
	L	21-48	24					THE RESERVE OF THE PARTY OF THE	
	L	21-51 to						Contract of the second	
		21-57	20					and the same of th	
	L	21-58 to						1 20 (0)	
		22-03	18					Chicago I and the second	
	L	22-03 to						and the second	
		22-21	17					A STATE OF THE STA	
	L	23-02							
	F	23-14							
								M. Charles and M. Charles	
1509					1311	la la la			
June 24	eL	13-54						Very heavy micros.	
	F							Lost in changing sheets.	
							The state of		
1510							1	W-40-WE - W	
June 24	eL	20-32							
	L	20-35						100	
	F							Micros.	
1911				Mally:	119				
1511		(40 48)						A STATE OF THE PARTY OF	
June 25	eL	(13–15)						Lost in micros.	
	F							Lost in inicros.	
1512					Page 1				
June 25	eL	22-14 to							
June 25	er	22-14 to							
	F	22-23						Lost in micros.	
1513	F				4			Lost in inicios.	
June 26	eL	2-01	1000		100		15		
эше 20	F	2-01 2-10 ca							
1514	r	2-10 ca							
June 28	e?	19-04-3	1 (79.19		14814				
June 20	eL.	1							
	F	19-12 19-16						I THE LAKE	
1515	F	15-10						Market - Nation	
June 30	eL	0-29.5						16-67-5	
ounc oo	L	0-23							
	F	0-50 ca							
1516	1	0 00 04					1	1 1 2 2 1 1 2	
July 1	eL	8-49							
and a	L	8-55 to							
	_	9-11	18				1		
	F	9-33 са	1				1		

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period		Amplitud	le	Distance	Remarks
Date				A _E	AN	AZ		· Francisco de la constantina della constantina
1517		hms	8	μ	μ	μ	km.	.TD9-9-9-1 0 100
July 2	e?	2-21.5						
	e?	2-39-04						Charles de la
	e?	2-51-00						
	0	(2-45-49)					(7940)	
	eP?	2-57-07						
	eS?	3-06.4	9					
91366	eL?	3-21-30	43					The L waves are fairly sinusoidal
	L	3-30	23					never great in amplitude, and
2 M (40)	L	3-45	13					taper off rapidly in amplitude
911	F	4-50					100 100 100 100 100 100 100 100 100 100	after about 4–15.
1518								
July 2	е	16-59 to	14					
ouly 2	F	17-10	1					The second second second second
1519		1, 10						Treserve 4 of Person
July 3	е	18-02-35 to		an Mich				May not be seismic. On M-S only
omy o	F	18-11-15						litay not be semine. On the seminer
1520	r	10-11-10						
July 4	e?	5-42-30						Irregular faint trace of seismi
July 4	The second second second	5-44-30 to						
	e F							origin.
1501	F	6–13						
1521	0	(0.10.00)		THE REAL	EN PAR		(0100)	
July 4	0	(8-12-36)					1	
	eP?	(8-22-17)						of the county and want to a mile on a second
	iS?	8-30-03						
ALC: YES	eL	8-39-5						THE DESCRIPTION OF THE PARTY OF THE PARTY.
	L	8-45	15					
WAS ALL	L	9–20	10					
	F	9–55						
1522			975	STATE OF	MINE AND	11111111	1	
July 4	eL	23-55 to						Sinusoidal L waves of small ampli
July 5	L	0-05	18					tude.
	F	0-20						A CONTRACTOR OF THE PARTY OF TH
1523					DAY BELL	1000	A TANDEN	
July 5	е	16-13 to						Faint traces on M-S only. Irregular
	L	16–38						11.90
1524				The state of the s	1			
July 6	е	6-06 to						Sinusoidal L waves. Very small
	L	6–15	17					On M-S only.
1525						1 11 11 11		
July 7	е	6-24-45						
	е	6-29-40						
	L17	6-40 to						
	VIII A TO THE	6-45	14					
	F	7-05						
1526	BARRING IS	Part of the last						
July 7	eL	13-40 to						Sinusoidal L waves of small ampli
	L	13-46	20					tude. Beginning lost in changing
	L	13-53 to						the sheets.
		14-00	14					5120000
	F	14-15	**					

TABULAR LIST OF EARTHQUAKES-Continued

No.				1	Amplitud	e	D' (D1-
and Date	Phase	Time	Period	AE	A _N	AZ	Distance	Remarks
1527		h m s	8	μ	μ	μ	km.	
July 10	e?	0-41						
	iS?	0-50-32						
	eL?	1-00.5						The Party of the Control of the Cont
	L	1-25	13					
	L	1-45	12					
	L	2-08	12					
	L	2-31	12					
1.7 1910	L	3-06	12					
7-13-14	F	3-30						
1528		0 00						
July 10	e?17	5-48						Very small amplitudes. On M-S
July 10	eL ₁₇	6-00 to						No. 17 only.
	Lit	6-10	15					140. If only.
	F	6-25	10					
1500	F	0-20						
1529	0	(0 10 10)		DAY MA		The last of the la	(10940)	The second of D is seemed doubtful
July 12	0	(3-19-40)					(10340)	The emergence of P is very doubtfu
Thomas in	eP ₁₁	(3-32-58)						at the time shown, though it i
	i ₁₇	3-34-44						evident a few seconds later. Th
	iS ₁₇	3-44-17						agreement between the other
Alfred .	SR ₁	3-50-37						phases, including LR ₁ is extra
	eL ₁₇	4-06.5						ordinarily good. The distance
	L	4-10 to						may prove a little greater than
		4-15	23					that given here.
	L	4-20 to						TORREST FOR THE BEST OF
		4-35	17					Larry Section Comments of the
	L	4-50 to						
		5-10	15					
	L	5-15	15					
	LR	5-27	21					
	L	5-33 to						
		5-42	16					
	F	6-10 ca	1					
1530	-	0-10 03						
July 12		9-42-07	1 100	The least	-900 -300	-		
July 12	eS? ₁₇	9-48-40						and the published the same of the published
			20					
	eL ₁₇	10-06	32					A RECEIPED AND A STREET AND ASSESSMENT
	L	10-13	21					The second secon
	L_{17}	10-17	16					
	L ₁₇	10-29	14					1 01 37 to 1
	L_{17}	10-40	14					ALS STATES
	F	11-05						1001
1531								1/ 31-49-31 (Fig. 1979)
July 13	0	11-14-45					9520	The maximum was recorded wit
	P	11-27-24						about the same period and ampl
	PR ₁	11-31-25						tude, and at about the same tim
	S	11-38-00						on all three types of seismograp
	eL	11-58-00						of quite different constants. Agree
	L	12-06	29					ment very good for Δ .
	M	12-16	17	60				
	L	12-30	17				1	
	L	13-00	15					
	F	20 00	10					Lost in changing sheets at about
	-				1	1		13-30.

No.	Phase	Time	Period	A	mplitud	ө	Distance	Remarks
Date	Thase	Time	10100	A _E	AN	Az		
344 1		hms	s	μ	μ	βL	km.	F 10 10
1532		6-37-37	9.8 7	Mark 1				
July 13	e ₁₇	16-47-40						the transfer of the state of th
	eL ₁₇	16-57 to						The state of the s
		17-09	16				******	
	F	17–12						1 - 10 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
1533		15-51-11			10 A 172	1971119	111 177	
July 14	6	0-20-40						
	е	0-30-40						
	eL	0-42	32					
	L	0-51	25					
100 AV	L	0-59	18					
	L	1–13	16				, , , , , , , , ,	
	L	1-26	16					
3000	L	1-42	12					Company of the state of the sta
aug.	F	2-00 са						N SHARES
1534		Carlotte III	124	1991 P. 194	gar the	THE PROPERTY.	Hour Silv	
July 16	e ₁₇	13-58-36						
	117	14-04-15						
	i ₁₇	14-05-36						
	117	14-08-29						
Me and	i ₁₇	14-10-20						
	eS?17	14-14-58						
	eL?	14–36						L waves distinctly sinusoidal but of
	L	14-38 to	23					very small amplitude. Prelimi-
73460		15-00	15					nary phase indications on M-S
	L	15–10	15					only.
	L	15-56	17					
	F	16–30						
1535					11/1/	1771 175	Sallara III	The second secon
July 17	e?	1-10-15						
	е	1-16-43						
	e	1-20-00						Irregular L waves of small ampli-
	eL?	1-23.6 to						
April 1	773	1-33						tude.
1500	F	1–38						
1536	_	4 05 55	Charles and			1	3600	Small record but very good agree-
July 18	0	1-05-55					3000	
	P	1-12-43						ment.
VI I	S	1-18-07						
	eL	1-22 to	29					
	. 77	1-27	15					
	· F	2-00 ca					*******	
1597								
1537	0	6 00 12					3580	Undoubtedly from the same epi-
July 18	O P	6-02-13					9980	centre as No. 1536. The very
		6-09-00						characteristics of each phase are
	S	6-14-22 6-18-5 to	29					the same. A remarkable pair of
						1		THE REPORT OF THE PROPERTY OF
	eL	6-28	15		1			records in the experience of this

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period		Amplitud	le	Distance	Remarks
Date	I Habo			$\mathbf{A_{E}}$	AN	Az	Distance	Ivellatas
		h m s	8	μ	μ	μ	km.	The annual section of the section of
1538								
July 20	i	5-06-00						Very small traces of L waves on M-S
	eL	5-20 to						only.
	F	5-45						man la
1539		No. of the last			10		Fail TW	
July 20	е	15-14-00						On M-S only. Wireless from Stras-
	i	15-23-45						bourg gives $P = 15-12-00 \Delta = 6000$
	eL	15–31						
37914 11	L	15–36	28					
	L	15-47	16					The second secon
	L	16-05	14					M-S No. 23 not recording after
	F	16-52 ca						July 20.
1540							300	
July 21	eL	14-13.5						
	L	14-21 to						The state of the s
		14-30	13					The state of the s
	L	14-40						The second second second
	F	14-45						
1541						Me 44		
July 22	0	14-18-07					7320	Long continued appearance of I
	P	14-28-52						waves, quite sinusoidal, but of
	S	14-37-40						small amplitude.
79-700 //	SR ₂	14-45-5						A SUPPLY NAMED TO SUPPLY SUPPL
2010111	eL	14-51						
gent mo	L	15-06	13					
	L	15-35	12					The state of the s
	F	17-00 ca						10-18
1710			photos:					
1542	0	= 00 10					I PE	
July 23	e?	7–38–10						Irregular L waves of small amplitude
	е	7-48-00 to						and short period.
	177	7-55						Methods I have been a
anne in	F	8-10						AND THE RESERVE OF THE PARTY OF
1540		7 Tribitana						
1543	. T	(0.10) 1	00			1	de Panti	
July 26	eL	(8–10) to	23					Sinusoidal L waves only. Time
	177	(8-40)	15					marks uncertain.
	F	(9-00)						0-00
1544								The Real Property of the State
1544	a.T	(10 50) 4	00					
July 26	eL	(10–50) to	30					Sinusoidal L waves only. Time
	T/A	(11-15)	15					marks uncertain.
	F	(11-50)						
1545								
July 30	oT.	02 52 4	00					100
July 31	eL	23–53 to 0–05	20 10					M-S only.
		1 12-1/2)						

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks	
Date	1 Hase	Time	101.04	A _E	AN	AZ			
1546		h m s	S	μ	μ	μ	km.		
July 31	i	5-53-59							
	i	5-54-48							
Bun Foll	е	5-59						The Administration of the Control of	
Total of the	L	6-01	9		,				
damen i	F	6-20							
1547		sale Age to From		on the		130	MIL A		
July 31	е	15-23-00							
	e	15-27-30						The second secon	
194 17 1	е	15-39-50							
	е	15-41-10							
	eL	15-42 to	17						
		16-18	10						
Street !	F	17-15						E STATE OF THE STA	
1548	NE 140- W	AREST IN DOLL	1 100	THE REAL PROPERTY.		The last			
Aug. 1	eL	5-24						No. 17 only.	
71500		5-34	20						
Sep. 19.	L	5-55	16						
	L	6-30	16						
	F	7-00						THE PROPERTY OF THE PARTY OF TH	
1549			To All The		7	DEFE		Very slight traces which are probably	
Aug. 1	i	8-37-20						not seismic appear at 8-28.	
	i	8-37-47						not seismic appear at 5-20.	
	eL	8-53	14						
4 ***	F	9–15						2100	
1550	TOWN I	0 45.04	La Trans					the state of the second	
Aug. 2	e	9-45-24 9-48·2	10						
	eL	9-48-2	6					the state of the s	
	F	9-55	0					00-72-1-2-2-1-2-1-2-1-2-1-2-1-2-1-2-1-2-1-	
1551	r	9-00							
Aug. 4	eL	17-13 to	20					Small sinusoidal L waves on No. 17	
Aug. 4	en	17-55	10					only.	
	F	18-00	10						
1552	T.	10-00							
Aug. 8	eL	9-05						No. 17 only.	
raug. O	F	9-23							
1553		0 20							
Aug. 8	e	11-04 to						Very short periods, small amplitudes,	
zzug.		11–15	5					w (0)	
	F	11-18							
1554									
Aug. 8	0	(12-01-48)					(3500)		
0. 0	iP?	12-08-28							
	i	12-09-51							
	eS?	12-13-45							
	eL	12-16-5							
	L	12-24	14						
	F	1						Lost in succeeding quake.	

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	A	mplitud	le	Distance	Rema	rks	
Date	A HOUSE		2 04404	$^{\mathrm{A}}\mathrm{E}$	AN	AZ	22000000	2.00228	er 200	
		h m s	S	μ	μ	μ	km.			and the
1555	-TP9	10 07 20		1				(T)	4.47	SE YES
Aug. 8	eP? _v	12-27-39 12-35·8						There is no doubt the distinct quakes h		
	eL ₁₇ ?	12-42.7						1555. The P way		
	L ₁₇	12-45-6	30			1		in the coda of 15		
	L17	12-51	16					except the vertice		1000146
	F	13-50 ca						CACCPO VIIIC VOI IIICA	•4.	
1556							beat tell			
Aug. 10	L	3-08 to						No. 17 only.		
	F	3–18						Ito. It omy.		
1557										
Aug. 10	eL	16-45	25					Sinusoidal L waves	on No.	17 only
	L	16-55	30					Micros heavy.		T WILL
	L	17-05	25					Tuen III		
	F	17–20						100		
1558					h. Walla					
Aug. 10	eL	23-08	,					Sinusoidal L waves.	No. 17.	Heavy
	L	23-15 to	27					micros.		
		23-45	15							•
Aug. 11	F	0-10						10.0		
1559			1000		Tarriby.			BAR U		
Aug. 11	е	1-27.7						Sinusoidal L waves.	No. 17.	Heavy
	i	1-38						micros.		
	eL?	1-51.5	40							
	L	1-59	26							
	L	2-05	23					solution Landau Market		
1 454	L	2-20	16							
	L	2-38	13					1		
1560	F	3–15						- Bount		
Aug. 12	e?	6-55						No. 17 only.		
1148. 12	e	7-04 to				1				
		7-12								
	L	7-13 to								
		7-28	14					07.30-625 30-61		
	F	7-35						10-11		
1561										
Aug. 12	e?	10-24-46						The second		
	e	10-25 · 2						Strong and the		
	eL?	10-54								
	\mathbf{L}	11-01 · 5 to	28					a Planting		
		11–35	12					1 12 11 11 11		
	F	12-00 ca						1 Labor 2 P.		
		1								
1562 Aug. 12	eL	17-42 to	14							

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks	
Date	Thase	Se Time	2 02104	A _E	AN	Az		2404444	
		h m s	S	μ	μ	μ	km.		
1563									
Aug. 16	е	20-44-40						Sinusoidal L waves. Record on	
	e?	20-53-8						No. 17 only. Small amplitude.	
	eL	21-03	22						
	L	21-12	20						
Magain a	L	21–20							
	F	22-00 ca							
1564			LP ST	0.00					
Aug. 17	i	1-25-31						No. 17 only. Sinusoidal L waves of	
	е	1-24						small amplitude.	
1100	eL	1-45.5	18						
Miles I	F	2-15							
1565	State of the					189-18			
Aug. 17	eL	4-27 to	20					No. 17 only.	
	F	5-00 ca							
1566									
Aug. 17	L	12-14 to						No. 17 only.	
Same of		13-10	20						
	F							Lost in changing sheets.	
1567			1 Tolaras			A PART			
Aug. 19	е	12-56.5						No. 17 only.	
Alexander	i	13-01-28							
	eL?	13-18-5							
	L	13-25	24	6					
	L	13–35	18						
En Physiol 10	L	13-46	16						
	F	14-15							
1568				Marine I	MATON				
Aug. 20	L	19–20 to	20	1				A THE DESCRIPTION OF THE PROPERTY OF THE PROPE	
54. 51	F	20–10						Physical Research	
1569							ATT	A STATE OF THE STA	
Aug. 23	0	(5-21-31)					1		
	eP	5-30-03						Only traces on Bosch instruments.	
	eS	(5-36.8)							
RULE	eL	5-42.9	18	6					
And T	L	5-51	14						
	F	7-00 ca							
1570									
Aug. 26	L	(14–30)	22	1.5				Small sinusoidal waves. L easily read	
1000	F	(15–15)						but time marks uncertain.	
1571									
Aug. 28	0	23-15-17					3470		
	iP	23-21-55				:			
	iS	23-27-10							
	eL	23-31							
	' M	23-34	(8)	(307)				Period at M may have been greater	
	L	23-49	14	58				than 8 seconds as it was difficult	
Aug. 29	L	0-18	11	8				to determine.	
	L	0-50`	11	1					
	F	2-00 ca			1	1			

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remark	
Date	Tilasc		- 02.00	A _E	AN	AZ	Distance	Remar	k8
		h m s	8	μ	μ	μ	km.	L to the latest terms of t	
1572									
Aug. 30	L	(15-00)	18	1				Time marks uncertain	. No. 17 only
4 ##	F	(15-45)						record.	
1573		0 50 50							
Sept. 1	0	2-58-59					9760		
	eP	3-11-49							
	iS	3-22-36	(00)						
	eL	3–37	(60)						
	M	3-53.5	20	381					
	L	4-03	17	171					
	L	4-30	16	71				1 A 780 %	
	L	4-54	14	37					
	L	5-16	14	16					
	L	5-48	14	9					
	Ţ.	6-05	13					THE RESIDENCE OF THE PARTY OF T	
	L	6-40	13						
	L	7-05						and the strate to	
	eL	8-20						the state of the s	
	L	8–25	28	15					
	L	8-34	19	9				100	
	L	8–50	13						
	F	9–50						State His	
	SASKATO	ON RECORD							
	0	2-58-35					8520	Good record on bo	oth horizontal
	P	3-10-25						components.	TO THOUSAND
	S	3-20-09						O O JAMES O DE LA COLOR	
	eL	3-31 · 5 ca						and a	
	HALIFA	x Record						Made 1	
			The Alband	No.				THE ARMS TO SERVICE STREET	
	0	2-58-55					10050	100.400-2	
	P	3-12-00						Total Control of the	
	PRı	3-15-50						the property of the last	
	S	3-23-00							
	SR ₁ ?	3-29-18						la l	
	eL	3-42-30							
1574								month	
Sept. 2	0.	2-47-11					9560	13-18	
	P	2-59-52					0000		
	PR ₁	3-03-49						71.07-07	
	S	3-10-30							
	i	3-12-17						na train	
	1								
								200 000	
	SR ₁ eL	3-17-30				1		100	
	SRI		19	247		1		67 M	

No.	Phase	Time	Period	A	mplitud	ie	Distance	Remarks	
Date	Phase	Time	Time	Tenou	A _E	AN	AZ	Distance	
Alexa II		h m s	s	μ	μ	μ	km.	End of the good bearing	
1575			1466				(0000)	Tri	
Sept. 2	0	(9-24 · 1)					(9900)	Time marks failed on all seismo-	
	P	(9-37.0)						graphs.	
	PR ₁	(9-40-7)							
	S	(9-47.9)							
Here 2	SR ₁	(9-54-2)			,				
	SR ₂	(9-58-3)							
	eL	(10-04)							
South 18	M	(10-22)							
	F	(12–30)							
1576						Maria Maria		M.O1-	
Sept. 2	e	13-51						M-S only.	
	eL	13–57							
To hear	L	14-02 to							
		14-07							
	F	14-30 ca							
1577				and 4	Marie av	100			
Sept. 2	e	15-06.7							
	L	15–10					,		
	F	15-21 ca							
1578			The same			1446	2010		
Sept. 2	0	$(22-38\cdot 6)$					6340	Time marks uncertain.	
	P	$(22-48\cdot 5)$							
	S	$(22-56\cdot 4)$							
THE PARTY	SR ₁ ?	(23-01.7)							
A STATE OF	eL	(23-05)							
	M	(23-09)	Irreg						
Sept. 3 1579	F	1-10 ca							
Sept. 9	0	4-18-18						Very faintly defined.	
	P	4-25-52					4220		
	S	4-31-52							
	eL	4-36-30						The state of the s	
	F	5-05						A STATE OF THE STA	
1580								The state of the s	
Sept. 9	eL	18-03.7						Faint traces on M-S only.	
	L	18-08						Company and the least of the Land	
	F	18-15							
1581									
Sept. 9	0	(22-13-17)					(5960)		
Tilly Ta	P	(22-22-45)							
	S	22-30-19							
	eL	22-38-08							
	M	23-00	34						
	L	23-04	(26)						
	L	23-18	(16)						
Sept. 10	F	1-20							
					1				

No.	Phase	Time	Period		Amplitud	le	Distance	Remarks	
Date				A _E	AN	AZ		2002200	
1582		h m s	s	μ	μ	μ	km.	1 (a-d	
Sept. 10	e?	9-51.5							
	eL	9-54							
	L	9-59							
	F	10-27 ca							
1583									
Sept. 10	e?	12-52-5							
	eL	12-55							
	F	1305							
1584				SMI				The Control of the Parket	
Sept. 11	e	9-15-52							
	iS?	9-20-08							
	eL	9-24	,						
	L	9-27							
4 20 2	F	9-55 са							
1585		(0.44)					P. C. III		
Sept. 12	e?	(6-14)						Time marks uncertain.	
	i	(6-20.5)							
	e	(6-23)						Slight traces. Only on M-	S.
	L	6-55	15					All Miles	
4 500	F	7-25							
1586									
Sept. 14	e							Lost in changing sheets.	
	eL	13–48 to	15						
1 202	F	14-10							
1587		10 55 15				P P		150	
Sept. 16	e?	16-55-17						M-S record only.	
	i	16-55-59							
	е	17-02-40						The same of the same	
	е.	17-07-27							
	e	17-13-40						G: 1117	
	eL	17-36-7						Sinusoidal L waves.	
	L	17-42	19	8					
	L	18-01	15					The second secon	
	L	18-44	18						
1500	F	19–25							
1588		1 00 10						1. 160	
Sept. 17	e?	4-03-10				,		Faint traces only. M-S.	
	e	4-11-24							
	eL?	4-24							
	L	4-32							
1500	F	4-50							
1589	,	7 00 45						G'	
Sept. 17	i	7-32-45						Sinusoidal L waves.	
	eL	7-45							
	M	7-52	28	12					
	L	8-01	15	8					
	L F	8-20 9-00 ca	12						

TABULAR LIST OF EARTHQUAKES-Continued

No.				A	mplitud	le		
and Date	Phase	Time	Period	$\mathbf{A_{E}}$	A _N	AZ	Distance	Remarks
1590		h m s	S	μ	μ	μ	km.	
Sept. 18	L	4-38 to						Faint sinusoidal L waves on M-S
With the	F	4-40						only.
1591		8-39 to						Irregular faint traces on M-S only
Sept. 19	e	0 00 00						lifegular failt braces our 112-6 only
1500	F	8-52						
1592 Sont 10	е	19-47 to		12.0		Marie II		Faint traces only.
Sept. 19	F	19-58						
1593	r	19-00						Medical Manager and Manager an
Sept. 20	е	9-33 to		V. (1.1)				Irregular faint traces only.
Dept. 20	F	9-49						
1594		0 10						
Sept. 20	eL	(16-00)						Faint sinusoidal L waves. M-S only
Dopu. 20	F	(16-02)						Time uncertain.
1595		(/						
Sept. 21	e?	20-24-15						No. 17 only.
	eL	20-49 to						Faint sinusoidal L waves.
		20-54	16	1				
	L	21-00 to	14					
11.65		21-06						
	F	21-15						
1596				100	172 113		MAN ALL	
Sept. 22	е	(12-47)						
	i	12-50.5						
Floring 1st	F	13–10						
1597		45 50		1011111		Man and	THE RESERVE	
Sept. 22	eL	15-50 to	23 17					Small amplitude—less than 1µ.
+	F	16–25 16–35	11					Sman amphibude—less than 14.
1598	r	10-35						8000
Sept. 22	P?	21-04-20						of manager and a second
Sept. 22	e	21-11-4						The state of the s
	i	21-15-28						
	eL?	21-26						
	L	21-29	50	70				Chambon Lock at the Control of
The Mary	L	21-45	17	21				
	L	22-04	14	3				
	L	23-05	18					Very small trace at 23-05.
Sept. 23	F	0-00 ca						
1599								
Sept. 23	eL	4-04 to	9					Regular faint traces of small ampli-
	F	4-30						tude and short period.
1600		48 11 00	1					
Sept. 23	i	17-44-08						
	e	17-47-8		, .				
	eL?	17-52-7	11					1.
	M	17-57-5	11 10	6		1		
	L	18-10	10					

TABULAR LIST OF EARTHQUAKES-Continued

and Date	Phase	Time	Period		Amplitud		Distance	1	Remarks	
			101104	$\mathbf{A_{E}}$	AN	AZ	District		TO THE REAL PROPERTY.	
15-3/2 an	Breide d	h m s	8	μ	μ	μ	km.			
1601		and a ride								
Sept. 23	е	21-31.5						No. 17 only.		
Sien Sil	eL	21-35.6	,					00 BH-01		
	F	21-52								
1602										
Sept. 24	eL	16–11						Faint sinusoidal	trace.	
1000	F	16-13						53-01		
1603		(0 (0)								
Sept. 26	e?	(2-43)	1					Time marks u		
S Park	i	(2-47.7)						No definite p	phase mark	ings.
	eL	$(2-54\cdot3)$								and a
y me early	L	3-10	13					199-411		
1604	F	3–50								
Sept. 26		8-48-2						NT. J.C.:		
Берь. 20	e eL?	9-05						No definite pha	ses snown.	
	L	9-11								
	M	9-19	20							
	L	9-26	14							
	L	9-43	14					P. L. Maria		
	L	10-03	14					110000		
	F	10-40 ca								
1605	r	10-10 Ca						The High shall be		
Sept. 27	e	(7-36-8)						On M-S only.	Faint tran	es. Sinu-
ooper m,	eL?	(7-41.6)						soidal L way		co. Dilly
	L	8-05	16					Soldar 13 Way	Ci3,	
	L	8-25	16							
	F	9-00 ca								
1606										
Sept. 28	е	21-15-10						Except for abou	t five minu	ites at the
	eL	21-18-50						maximum, tl		
	M	21-23	Irreg.					trace of irreg		
	F	22-05						the same		
1607								19-10		
Sept. 29	eL	7-46 to						Very faint sinus	soidal trace	on No. 17
	F	7-58						only.		
	40,7314	MICH. CONTENT	W			0.00	1. 11. 21	10 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -		
1608				A 10 10 10 10 10 10 10 10 10 10 10 10 10				no (80-6)		
Sept. 30	0	1-20-56					3040			
	P	1-26-56								
	S	1-31-42								
	eL?	1-34 ca	******					er to-k		
	M ₁₇	1-40	12	300				The substitution		
	L	1-50	10							
	L	2-17	10					30-12-71		
	L	2-44	10					17-47-8		
	L	3-17	11			* * * * * * * *		1-93/11		
	L	4-45	18					1-14-37		
	L	5–12 5–30 ca	10					111-311		

No.	Phase	Time	Period	1	Amplitud	le	Distance	Remarks	
Date	1 Huoo			A _E	AN	AZ	11		
		h m s	s	μ	μ	μ	km.		
1609									
Oct. 1	e?	8-55						on the state of the state of the	
	eL	9-04	30					DE DE DE LE CONTROL DE LA CONT	
	L	9–13	19					5490	
	L	9–19	16					A CHARLE SOLVE	
10el. (c)	F	9-48						[1] 7 (de Marille, form 连接)	
			1		0/4/4	11/4/1/3	Margarette		
1610		00 10 01	1		(major)	darlay	10040	W-11 1 - 1 - 1 - 1 - 1	
Oct. 1	0	22-40-21					10040	Well-marked phases.	
Mon. : 01	P	22-53-25						Very small amplitudes.	
	S	23-04-25						ALTONOMY TO A COLUMN THE ACTION AND ACTION ASSESSMENT AS A COLUMN THE ACTION AS A COLUMN	
	eL	23-24	31	5				H 49 4 3 4 1	
S. Mari	ŗ	23–33	16						
	L	23-43	15					THE REPORT OF THE PARTY OF THE	
Oct. 2	F	0-10						11.10.10.10.10.10.10.10.10.10.10.10.10.1	
			100						
1611			March 1	Mary Land		100000	8/1		
Oct. 3	eL	16-35		11/13-07	1999	17712	Mel M		
Oct. 5	L	16-42	18						
TVE OF	F	16-55	10						
Car Street	P	10-33							
1612		A March Street							
Oct. 4	i	17-50-40	1	7			The bound	Irregular traces preceded b	v a shar
000. 1	L	18-03						impulse.	y or billon
	F	18-25						ampuno.	
	-	10 20							
1613									
Oct. 7	0	(3-26-06)					(12140)	125.30	
in the s	eP	3-51-09						120-31	
	S	(4-03-35)							
	е	4-08-5							
	er	4-13-8						The state of the s	
	eL,	4-31						Sinusoidal L waves.	
	M	4-43	19	70					
	L	4-50	19	30				No. of Contract of	
	L	5-13	16					Market State of the State of th	
1000	L	5-35	16					775.00	
	L	6-02	15						
	L	6-35	13					The state of the s	
	F	7-10							
1614									
Oct. 8	0	3-52-28					1570		
Wan	eP	3-55-49							
The state of	eS	3-58-33							
20.775	eL	3-59.5							
	M	4-03	21	7					
	L	4-06	13					Very faint L waves after 4-	-06.
	F	4-50				1			

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	I	Amplitud	le	Distance	Remarks
Date	1 nase	Time	1 enou	A _E	A _N	AZ	Distance	IVEIDALES
1017		h m s	8	μ	μ	μ	km.	value
1615	0	7-11-08					4460	
Oct. 10	iP	7-11-08		******			4400	
	iPR ₁	7-20-30						
	iS	7-25-12						
	SR ₁	(7-28-4)						
	SR ₂	$(7-29\cdot 4)$ $(7-29\cdot 2)$						
	eL ₁₁	7-31.5						
	M ₁₇	7-33	17	45				
	L ₁₇	7-42	9	10				
	L	7-55	Irreg.	Small				
	F	9-00 ca	micg.	Sinan				
1616	F	9-00 Ca						
Oct. 10	e	23-06 to						Faint traces of L waves on M-S only
066. 10	F	23-30						Faint traces of D waves on M-5 only.
1617	F	20-00						
Oct. 11	e	12-41.5						
Oct. 11	eL?	12-41.5	16					Small sinusoidal L waves.
	L	12-52	13					Sman sinusoidai L waves.
	L	13-00	13	1				
	F	13-25		1				
1618	-	10-20						
Oct. 13	e	4-41.3						
Oct. 15	eL	4-46						to Shift and ser Third Shires and addition
	M	4-48	12	13				
	L	5-01	7	10				
	F	5-30						
1619		0-00						
Oct. 15	e	(8-25)	1 Dominion	600				Horizontal slit on M-S was partially
000. 20	eL?	(8-48)						obscured by a bit of lint at light
	L	9-15	19					
	L	9–33	16					spot to deline record
	L	10-00	16					The second secon
	F	10-15 ca						
1620		20 20 00						The terror in the superior of
Oct. 15	eL	20-45						Faint sinusoidal L waves.
	L	20-46	12	1				
	E	20-55					100	35-6
1621								20-5
Oct. 17	е	6-54 to						Irregular faint traces. M-S.
	F	7-08						11108
1622								
Oct. 18	eL	22-13						2734
	L	22-18	20					Sinusoidal L waves.
	F	22-25				1		
1623								Table 6
Oct. 20	eL	4-06	30					Irregular to sinusoidal L waves.
	L	4-22	16	1	1	1		
	L	4-30	14					Trans. I I I I I I I I I I I I I I I I I I I
	F	4-40						

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	A	Amplitud	е	Distance	Remarks
Date	1 Haso	Amo	10.00	$\mathbf{A_{E}}$	AN	Az		
First 1		h m s	8	μ	μ	μ	km.	
1624			- then	1		hell in	property and party	STATE OF THE SECOND
Oct. 21	е	19-16-38						Irregular small wavelets.
0011 22	F	19-35						
Maly 1		10 00						do de la companya del companya de la companya del companya de la c
1625			The same of			1.54	8 to 100	100 0000 0000
Oct. 22	е	16-22-8						Faint trace, M-S only. Lost in
	F	16-33						micros.
				148			hall had	
1626	1.161	1944			1	DAY HAT		
Oct. 26	e	19-39 to						
000. 20	F	19-49						Irregular faint traces on M-S only.
Ref V		10 20						
1627			1		A TOTAL			
Nov. 1	e	20-16-06						New Zealand paper reports this
2101. 1	eL	20-16-37					10811111001	quake as being observed by Adams
	M	20-17-9	12	12			Bull Intone	at Wellington, N.Z., in adjusting a
	L	20-20	7	2.5		100000000000000000000000000000000000000		transit. The level bubble indicated
	L	20-27	7	1				the L waves.
	F	20-58						0.00 22 17 00 7 00 1
	ONLY N	20 00						
1628	- 164	STATE A	1 1 1 1 1		To the second			
Nov. 2	0	21-14-32	1. Phon				(10040)	Difficult record to read. eS un-
21011	P _v	21-27-36					(20020)	certain as well as the correct
	eP	(21-28-24)		doctor				reading for P.
	PR ₁	(21-32-09)						
AUGUST ST.	PR.	21-34-24		E 30 1 1 1 1		and the		The analysis of the same of th
	eS	(21-38-36)						1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	SR ₁	21-44-52						
	SR ₂	21-49-11						
	eL	21-58-30						
	M ₁	22-19-5	18	72			1 -0 -158	LORDEN LANGE PLANT
	M ₂	22-25.7	17	63				
	M ₃	22-28.5	17	50				
	M,	22-30	17	63				70.8
	L	22-33	17	00				
	L	22-39.5	17					
	L	23-07	24					
	L	23-16						
Nov. 3	L	0-30						
2.01.	F	1-00 ca	1					
1629	-	2 00 00						
Nov. 3	eL	3-41						Sinusoidal L waves
	L	3-48	20		1			TO THE STATE OF TH
	F	4-02						
1630		2 02						
Nov. 3	e?	5-43						Sinusoidal L waves
-1011 0	eL	5-52.5	22		1	1		
	L	6-03.5	20	2.5		1		1
	L	6-16	15		1	1		
	1	0 10	1.0				1	

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	1	Amplitud	e	Distance	i mari	Remarks	
Date	111100			A _E	AN	AZ				
1631		h m s	В	μ	μ	μ	km.			
Nov. 3	0	8-37-43					2820			
	P	8-43-22						A ANT-OF		
	S	8-47-52						46-01		
	eL	8-50-00								
	M	8-53	20							
pr more	L	8-56	16					10.222		
	L	9-03	12					76-62		
	L	10-07								
	L	10-25								
	F	10-35 ca						The factor of		
1632		ministration in	The state of		To the second		Charles	the car		
Nov. 3	e	16-44-28						The second second		
1000	eS?	16-56-00						L. METTER		
ton and	eL	17-05						and the same		
	M_1	17-13	30	30				TESTER		
	M ₂	17-19	20	20				T. B. Private		
	L	17-22-5	15					100000		
	L	17-34	15					French March 198		
	L	18-20						An inc		
	F							Lost in micros	3.	
1633										
Nov. 4	0	0-12-41					9000	1 SEE 12		
	P	0-24-54						- 1 3 1 1 20 70		
	PR ₂	0-30-12						Grant In		
	e	0-31-49						500 LOT 100		
	S	0-35-04						Mark R		
	SR	0-41-24						(315,310_3T		
	SR ₂	0-45-28						011-111-12		
	eL	0-55						Charles and All		
	M_1	1-08-6	22	89				A service of		
	M ₂	1-10-5	22	90				and the second		
	L	1-17	19					15,000,000		
	L	1-31	15					1		
	L	2-07	15					Vist Line		
	L	2-17	15							
	L	3-00						The state of		
	F	0 00								
1634								100		
Nov. 4	eL	12-53 to						707.00		
1101. 1	F	13-15	1	1		1			3.	
1635	-	10 10								
Nov. 4	е	20-33.5						19.00		
1107. 4	e	20-33-3	1	1	1	1				
		20-40-30				1		1		
	e eL	21-01-45		1						
	eL L		26							
		21-06			1			1		
	M	21-10	20	6	1	1				
	L	21-22	20		1	1				
	L	21-38	16					1		

No.	a descin			1	Amplitud	le				
and Date	Phase	Time	Period	A _E	AN	Az	Distance	Re	marks	
1636	16 4	h m s	8	μ	μ	μ	km.			100
Nov. 4	eL	23-15								
	L	23-24	20							
	F	23-45								
1637										
Nov. 5	L	2-23	22							
. 11	F	2-37								
1638	Man Car	SHESH ST.				and a later				
Nov. 5	eL	14-37								
March 1	L	14-39	29							
	L	14-42	16							
	F	14-55								
1639	No of	190.43								
Nov. 5	0	21-29-07					10140			
21011	P	21-42-16								
	PRi	21-46-13								
	PR	(21-48-18)								
	S	21-53-20			*****					
	i	21-55-20								
	The second second second second									
	SR21	22-04.5								
	eL	22-13		105						
	M ₁	22-16.0	44	105						
	M ₂	22-22-4	28	50						
2011 100 1	M_3	22-27-5	24	35						
	L	22-35.5	16							
	L	23-09 to								
		23-55	16							
Nov. 6	F	1-00 ca								
			N. C.		De l'A					
1640	30.00		I Javano		minutes and	to only in a	Same and the	THE STATE OF		
Nov. 6	i	17-38-08					0	n M-S only.		
	L	17-53	36							
	L	18-00	20				,			
	F	19-35 ca								
1641	manda of	To sailteedly a	N 196			Arch L				
Nov. 6	e	(20-00)								
	eL	20-09	36							
	L	20-20-5	16							
	F	21-12 ca								
1642										
Nov. 7	i	14-14-26						*		
	L	14-30								
	L	14-40	40							
	L	14-47								
	F						L	ost in changing	sheets.	
1643		The second								
Nov. 8	0	0-01-48					3600			
	P	0-08-36					0000			
	S	0-14-00								
	SR ₁ ?	0-15-26								
	eL	0-13-20	8	11						
	F	1-05 ca	0	11						

TABULAR LIST OF EARTHQUAKES-Continued

No.	Dhasa	Time	Period	1	Amplitud	le	Distance	D1	
and Date	Phase	Time	Period	A _E	AN	AZ	Distance	Remarks	
1644		h m s	s	μ	μ	μ	km.		
Nov. 8	e	20-45.5						Sinusoidal L waves on M-S No	0. 1
	eL	20-53						only.	
	L	20-56.5	20						
	F	21-15 ca							
1645		8							
Nov. 9	0	3-22-43					2880		
	P	3-28-28							
	S	3-33-02							
	eL	3-35-39							
	L	3–38							
	L	3-40	35	7					
	L	3-45							
	F	4-45 ca							
1646					The second	100			
Nov. 10	e	4-38							
	eL	4-43							
	F	5-12 ca							
1647						TO US	1000		
Nov. 10	eL?	22-00							
	L	22-22	20						
	L	22-28	18						
	L	22-35	16						
	L	22-59	12						
1010	F	23-05							
1648		0.00		maraba a	1000				
Nov. 11	e?	6-05						May not be seismic.	
	e	6-12							
1040	F	6–15							
1649 Nov. 11		14 10				A DOWN			
1404. 11	e eL	14-18	20						
	L	14-21 14-26	30						
	F	14-20	Irreg.						
1650	P	14-40	123.50						
Nov. 12	0	(11-56-21)					(3580)	Identification of the phases reco	, ada
1404. 12	P?	12-03-08					(3000)	is doubtful.	rue
	S?	12-08-30						is dodbatus	
	SR ₂ ?	12-10-38						1 103:00	
	eL?	12-13							
	L	12-20	30	5					
	L	12-26	15					A STREET STREET	
	F	13-10 ca	10					A TOTAL AND A	
1651	-	20 20 00							
Nov. 16	0	(4-15-22)					(4120)		
	P?	4-22-49					(2220)		
	S	4-28-43							
	eL	4-33.5						10018	
	Mı	4-35.5	11	41				and the second s	
	M ₂	4-38	10	21					
	L	4-47	10						
	L	4-56	15					To the state of th	
	F	5-25 ca							

TABULAR LIST OF EARTHQUAKES-Continued

No.				4	Amplitud	e		
and Date	Phase	Time	Period	$\mathbf{A_{E}}$	AN	A.Z	Distance	Remarks
1652		h m s	8	μ	μ	μ	km.	
Nov. 16	eL	7-26-3						
	L	7-27-15	12					
	L	7-29-34	8					A 189 CH
	F							Micros obscure the exact time of F.
1652A								The state of the s
Nov. 16	eL	19-26						Faint traces only of sinusoidal L
1404. 10	L	19-30	20					waves on M-S No. 17.
	L	19-48.5	20					The state of the s
766		19-40.0						Lost in micros.
4000	F							Lost in inicros.
1653		11/19/2012/06	144	1000		Constitute	H100	
Nov. 17	0	2-52-49					7120	
	P	3-03-23						
	PR ₂	3-07-24						
	S	3-11-58						
	SR ₁	3-16-46						
	SR.	3-18-57						
	eL	3-22	40	5				
	M	3-32.5	16	14				
	L	3-39	16	3				
	L	3-46	16					
	F	The state of the s	10					
1071	P	5-10 ca						
1654		(04 40 0)	Page and	- Halla	Carde in	of Venney	of ordinary	
Nov. 18	e	(21-48-3)				, . , ,		
	S?	21-57-39		,				
	SR ₁ ?	22-03-12						
	eL	22-12						
	L	22-18-5						The State of the S
	L	22-27	20	3				
	L	22-38-5						
	L	22-45	15					
	F	23-35						
1655	1172							AND THE PROPERTY OF THE PARTY O
Nov. 19	eL	9-13-5		100				
1404. 19	L	9-17·3 to						
	п	9-30						
	777	9-30						Test in misses
4050	F			. ,				Lost in micros.
1656			Micro			150	1 94	G
Nov. 22	eL	8–19						Sinusoidal L waves.
	L	8-28	18	1				
	L	8–33			, , ,			
	F	8-45						
1656A								
Nov. 23	e	3-22						
	L	3-28	24					
	F	3-45 ca						
1657								
Nov. 25	eL	(17-50)						Time marks failed. Time approxi-
	L	(17–55)	38					mate.
	L	(17–59)	30		1			
	L							
		(18-06)	15					
	F	(18-40)	1		1			

TABULAR LIST OF EARTHQUAKES-Continued

No.	Phase	Time	Period	A	Amplitud	e	Distance	Remar	les	
Date	Thase	Time	1 criod	$\mathbf{A_{E}}$	AN	AZ	200000100	2404344		
		-,								
1050		h m s	8	μ	μ	μ	km.	Pl grand la		
1658		(19 DE)						Time marks failed.	Time	approxi
Nov. 26	e	(13-05)						mate.	Time	approxi
	L	(13–26)	04					mace.		
	M	(13–37)	24	5				and Sant		
et sellen	L	(14-07)	24							
	F	(14-34)								
1659					100					
Nov. 26	е	16-26-00								
	eL	16-32								
	F	16-42 ca					*******	The Part of the		
1660		TO ASS. THE STATE OF THE STATE	lo south	and the	her April	D. Y. S.	1000			
Nov. 28	e?	0-40								
	eL	0-49	15					Sinusoidal L waves-	small.	
	F	1-00 ca						Dell'A		
1661								I ID-AT-A		
Dec. 2	е	15-13-8						M-S No. 17 only.		
	L	15-40	19	5				Sinusoidal L waves.		
	L	16-00	16							
	F	17-00 ca	10					Marie Control		
1662	P	17-00 Ca								
Dec. 3	eL	0 50						M-S No. 17 only.		
Dec. 3		8-56		1.5				Sinusoidal L waves.		
	L	8-59	19	1.9				Sinusoidai Li waves.		
1000	F	9–15								
1663			1	1	1	The contract of	7010			
Dec. 5	0	20-56-56					7640			
	iP ₁₇	21-07-58								
20	iS ₁₇	21-17-00								
	eL	21-28.0	23	4.5				V _L is very high—nes	rly 248	5 km/m
	M	21-39	15	7				on an average.		
	L	21-43	13	1				BD-600		
	LR ₁ ?	23-16	Irreg.							
	F							Lost in what is record	led as	1664 bu
							Joseph Jan	which may be the	LR ₂ of	1663.
1664			1		2554/97		-			
Dec. 5	eL?	23-18	Irreg.					Sinusoidal L waves.	Some	e micros
	L	23-39	37	8						
	L	23-57	25	3.5				01-6		
Dec. 6	L	0-09	16	1				10-2-1		
200. 0	F	0-50ca	10					and a		
		0 0000					1	1 1 1 1 1		
1665										
	oT.	(16-30)						1 19.3		
Dec. 7	eL ₁₇		Townson					No. of Control of Control		
	L ₁₇	16-32 to	Irreg.							
1000	F	16-40						1 1 2 2 2 2		
1666								THE ART I		
Dec. 11	eL ₁₇	6–11	28							
	L_{17}	6-1-6	23	1.5	1			Mark Mark Mark Mark Mark Mark Mark Mark		
	L17	6-24	16	1				No. of the last of		
	L17	6-33	14					en an u		
	F	6-50						101 E 101 E 1 E 1		

No.	Phase	Time	Period	A	Amplitud	le	Distance	Remarks
Date	Thase	Time	I GIIOU	A _E	A _N	Az	Distance	**College Bio
		h m s	S	μ	μ	μ	km.	
1667					File a	No. 1		
Dec. 13	e ₁₇	17-05-06					1 1 1 1 1 1 1 1 1 1	Micros mask the record a good dea
	e ₁₇	17-07-6						
	eL ₁₇	17–11 17–12	Irreg.				*******	
	F	17-25	meg.	******	******			
		1.1-20			******			
1668	A CONTRACTOR	an Laws to the		J. J. 1004			Switz.	
Dec. 14	0	(10-42-23)					(1820)	Time marks somewhat blurred.
	iP ₁₇	10-46-15						Time uncertain.
	iS ₁₇	(10-49-22)				,		Strasbourg reports a quake by wire
	eL	(10-50)					,	less. No trace of this appears o
	M	10-58.5	23	9				our records. Strasbourg
	L ₁₇	11-08	10					$P = 16-01-32$, $\Delta = 117$ km.—
	F	11-45 ca						Dec. 14.
1000						1.2	interior	Control with
1669	-T	10 50 4-	T	DOME		(4) ET	KACIE SP	S
Dec. 15	eL F	12-52 to 13-05	Irreg.			******		Small L waves lost in micros.
	F	19-09		******			,	
1670	ed that	Dr. Jaluis San (2)	made 3	Sell Ed	distribution to	to Harri	pod Liberty	Committee and Co
Dec. 16	0	7-36-48						THE REPORT OF THE PROPERTY OF
	eP ₁₇	7-45-03						
	eS ₁₇	7-51-34						
	eSR117	7-54-6						
	eL	(7-58)						Irregular L waves less than a micro
	F	8–20						in amplitude.
1071					A PRAVI			
1671 Dec. 19	eL	20-14-5	(00)		a house	In the t		S: :11 T 1 : 1 : 1
Dec. 19	F	20-14.5	(20)	******				Sinusoidal L waves lost in heav
	P	20-20					* * * * * * * * * *	micros.
1672								
Dec. 22	0	(9-59-38)					(2940)	
	eP	(10-05-27)						
	eS	10-10-06						
	eL	10-13-00	40	23				
	L	10-21	18	14				
	L	10–25	14	6				
		11 10						
	F	11-10 ca			110			
1673	F					1		
	F eL	18–15						
Dec. 22	F							Faint trace of sinusoidal L waves i micros.
Dec. 22 1674	eL F	18–15 18–24						
Dec. 22 1674	eL F	18–15 18–24 8–09–52						
Dec. 22 1674	eL F i	18–15 18–24 8–09–52 8–10–50						micros.
Dec. 22 1674	eL F i e	18–15 18–24 8–09–52 8–10–50 8–12–22						micros.
Dec. 22	eL F i	18–15 18–24 8–09–52 8–10–50						micros.

TABULAR I	LIST	OF	EARTHQUA	KES-Concluded
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No. and Phase		Time	Period	Amplitude			Distance	Remarks
Date Phase	Filase	Time	1 enou	A _E	A _N	AZ	Distance	Technalas
1675		h m s	S	μ	μ	μ	km.	100
Dec. 27	е	15-03						Micros mask preliminary phases
	е	15-09-4						
	eL	15-28	26	4				in the state of th
	L	15-38	20	3				E. C. ST-TE
1676	F	15-45						
Dec. 28	eL	23-07						Micros mask much.
The state of	L	23-15	22	4				The state of the s
	L	23-26	13	1				
	F	23-45 са						Language and the second

CONSTANTS OF THE SEISMOGRAPHS

 $=45^{\circ} 23' 38'' \text{ N}$, $\lambda = 75^{\circ} 42' 57'' \text{ W}$. h = 83 m.

Lithologic foundation: boulder clay over limestone (Ordovician). Time: Mean Greenwich, midnight to midnight.

Time correction: within .25s.

INSTRUMENTS-FIXED CONSTANTS

Instrument	Symbol	Registration	Damping	Paper Speed	Mass
Bosch	I	Photographic	Air	15 mm. per min.	200 g.
Bosch	II	Photographic	Magnetic	15 mm. per min.	200 g.
Milne Shaw	17	Photographic	Magnetic	8 mm. per min.	1 lb.
Milne-Shaw	23	Photographic	Magnetic	8 mm. per min.	1 lb.
Deformation	D	Photographic	Air	17 mm. per min.	20 g. ca.
Spindler-Hoyer	W	Smoked Sheet	Air	15 mm. per min.	80 kgm.

INSTRUMENTS—DETERMINED CONSTANTS

SEISMOGRAPH I

Determined	То	V	E	Comp.	Remarks
December, 1922	5.5	120	2:1	N-S	
February 7, 1923	5.5	120	2:1	N-S	
April 4, 1923	5.5	120	2:1	N-S	

INSTRUMENTS—DETERMINED CONSTANTS—Continued

SEISMOGRAPH II

Determined	To	V	€	Comp.	Remarks
December, 1922	6.5	120	aper.	E-W	High period and strong damping
February 7, 1923	6.5	120	18:1	E-W	were found to result in a badly
April 4, 1923	5.8	120	18:1	E-W	defined zero. Hence the reduc-
May 3, 1923	5.3	120	18:1	E-W	tion of both.
May 30, 1923	5.3	120	18:1	E-W	
August 21, 1923	5.4	120	15:1	E-W	

SEISMOGRAPH 17

December, 1922	12.0	250	20:1	E-W	a manufacture as and it out the
February 7, 1923	12.0	250	20:1	E-W	
April 4, 1923	12.0	250	20:1	E-W	
May 3, 1923	12.0	250	20:1	E-W	1" tilt =44.5 mm. displacement.
May 30, 1923	12.0	250	20:1	E-W	All warmend saw Jave Inch.
August 21, 1923	12.0	250	20:1	E-W	

SEISMOGRAPH 23

December, 1922	12.0	250	20:1	E-W	In parallel with 17.
February 7, 1923	12.0	250	20:1	E-W	" 17.
March 9, 1923	12.0	250	15:1	E-W	17.
March 17, 1923	12.0	250	10:1	E-W	" 17.
April 4, 1923	12.0	250	10:1	E-W	" 17.
May 3, 1923	12.0	250	5:1	E-W	1" tilt = 42.0 mm. displacement.
May 30, 1923	12.0	250	20:1	E-W	
July 21, 1923	12.0	250	20:1	E-W	At Shirley bay, Ont.
October 21, 1923	12.0	250	20:1	E-W	At Kemptville, Ont.
November 25, 1923					. Out of service for rest of year.

SEISMOGRAPH W

December, 1922	6.0	160	20:1	Vert.	
February 7, 1923	6.0	160	20:1	Vert.	r = .6 mm.
. April 4, 1923	6.0	160	20:1	Vert.	$r = \cdot 6 \text{ mm}.$
May 3, 1923	6.0	160	20:1	Vert.	r = .6 mm.
May 30, 1923	6.0	160	20:1	Vert.	$r = \cdot 6 \text{ mm}.$
August 22, 1923	5.5	160	4:1	Vert.	

The Deformation instrument was tested as to periods only with the following results.

Numbers are values for T_o

Determined for

	$D_1(E-W)$	$D_2(N-S)$
December, 1922	37.2	36.1
February 7, 1923	37.2	36.1

The time as recorded on the seismograph sheets is correct to within $\pm .25$ sec.

As the time is impressed on the record line itself there are no corrections for parallax to be applied.

82671-5

MICROSEISMS

During the year the microseisms were read four times each day, on both components. The periods and trace amplitudes were tabulated. The reductions of the trace amplitudes to true earth movement were not made. The tabulated values were not reported on in our bulletins, nor are they compiled for this report but they are on record here if desired. A notable microseism storm occurred on November 19-20, 1923. The records at Ottawa indicated a true earth movement (half-amplitude) of 6.5μ with a period of 7 sec.

EXPERIMENTAL WORK WITH THE MILNE-SHAW SEISMOGRAPHS

Milne-Shaw seismograph No. 17 was received in December, 1921, and records from it have been obtained regularly since June, 1922. In October, 1922, Milne-Shaw seismograph No. 23 arrived. It was placed in operation early in 1923 and on March 9 experimental work was begun with this instrument. It was first set up side by side with No. 17, of which it is the counterpart. Set on the same pier, with the same constants, and recording the same component, the records were practically identical for a number of earthquakes, some of them large ones.

The conditions were then kept constant except for the variation in the damping ratio. This was changed for No. 23 from 20:1 to 15:1 and later to 10:1 and then 5:1. Each time the instrument was kept long enough with the given damping ratio to get several earthquakes recorded both on No. 23 and on No. 17. It was found that the damping ratio began to seriously affect the record when set at 10:1 and that the seismograph was practically useless at 5:1 for the damping ratio. The records seemed to be practically identical when No. 17 was set at 20:1 and No. 23 at 15:1.

This series of experiments was interrupted to take No. 23 out to Shirley bay, Ont.—about eight miles approximately west of the Observatory. Here it was given the standard constants of No. 17 which remained in the vault at Ottawa. The magnification was set at 250 fold; the damping ratio was made 20:1; the undamped period adjusted to 12.0 sec. It was mounted to record the E-W component, in the same way as the Ottawa instrument, *i.e.* with the pillar at the south edge of the pier.

Shirley bay is a cove in the south bank of Ottawa river, near the Connaught Rifle Ranges. The shore is rocky and the soil a few feet inland is very shallow. A small grove of poplar is the only natural shelter. These are young trees a few inches in diameter. To the north of the site chosen, lake Deschenes, an expansion of the Ottawa, stretches, unbroken by islands, for a width of over two miles. It was found later that this was a distinct disadvantage as the winds off the lake were practically constant.

The seismograph was mounted on a cement pier, 6 feet long by 3 feet wide, built into the ground and about a huge boulder resting on the rock. The pier projected only about eight inches above the surface, and was sheltered by a tent. A cook tent, sleeping tent and an instrument tent were also pitched. A wireless mast, 55 feet high was rigged by Mr. J. P. Henderson, in charge of the observatory wireless work. Mr. Henderson's

efforts to assist in the work of the station by giving wireless time service from the observatory were indefatigable. Sending and receiving apparatus enabled the operator to communicate with the home station. The signals were sent out from the sidereal clock, two or three times a day. The same signals were impressed on the records at the observatory as were transmitted to Shirley bay and impressed on the records there. The different human link at each end would not, in all probability, cause an error on any sheet of more than half a second. Averaged over the whole time the time recorded would be comparable at will to a much closer approximation than that—well within the possibility of reading time on the record. A good box chronometer with a very even rate of about a second a day was used to impress the time on the seismograph sheet. When the sidereal check signals came in they were tapped with a telegraph key into the same electric circuit, superimposing the check times on the ordinary mean time signals, or, by throwing a switch, the mean time signals could be cut off while the others were being impressed on the record.

Mr. W. W. Doxsee, assistant seismologist, occupied this station from July 21 to September 7. The station was in operation at the time of the Japanese earthquake and good records were obtained from both No. 17 and No. 23.

After the instrument was partially dismounted for the return to Ottawa and after most of the camp equipment had been returned, it was found that conditions which had obtained while the seismograph was operating were such that the records may not have represented very accurately the ground movements. A fine spider thread, attached to the boom and from it directly to the pier about four inches below, was found to have interfered with any extended excursions of the boom. How long this thread was there could not be determined, although deflection tests had been made every time the instrument had a fresh paper sheet put on. However, as the operation of the instrument in its exposed position had not been satisfactory it was decided to return to Ottawa.

After the preliminary investigations had been carried out and arrangements made, piers built, etc., No. 23 was moved to a basement room of the dormitory of the Kemptville Agricultural School, about 35 miles approximately south of the home station. The principal, Mr. W. J. Bell, was most helpful in putting suitable quarters at our disposal. Again it was mounted with standard constants and exactly parallel with No. 17 at Ottawa, i.e. with the pillar at the south end of the pier. The instrument began to record on October 21 and continued to register till November 27. During this time some twenty earthquakes were recorded and also the great microseism storm of November 19-20. Mr. Doxsee was again in charge. Special precautions were taken to get time corrections by wireless.

So far as the work of examining the sheets has gone, there seems to be no possibility of correlating the microseisms, but the earthquake records show phases of similar nature for which the times can be rigorously compared.

THE GREAT EARTHOUAKES OF 1923

To the general public the Japanese catastrophe of September 1 looms up as the greatest earthquake of this or of many years past. But on February 3, last, an earthquake (No. 1387) was registered, which is the greatest record ever made at Ottawa. This seems to have occurred in the north Pacific. The exact location has not yet been fixed. The preliminary location from the records of Ottawa, Honolulu and Georgetown place it at a point $\varphi=51^{\circ}\text{N.}$, $\lambda=170^{\circ}\text{E.}$ This point is approximately 3,000 miles from Hawaii. In seven hours the tidal wave, travelling over 400 miles an hour, reached the shores of that island and, washing high up the bank, destroyed much of the shipping and caused quite extended damage to property along the shore as well as some loss of life.

The Japanese earthquake was well recorded at Ottawa on five instruments and at Shirley bay on Milne-Shaw No. 23.

EXHIBITS PREPARED

The Seismologic division prepared exhibits for the Canadian exhibition train to France and for the Canadian section at the British Empire exhibition. These consisted of transparencies from photographs of the seismographs and of the records registered at the Dominion Observatory.

THE NEW SEISMOGRAPH MOUNTING

A special mounting was devised for the Milne-Shaw seismograph No. 23, to enable the instrument to be readily turned into any azimuth from N-S component to E-W component registration, i.e. through 90°. The fact that the essential parts of the instrument can be supported on a disc of cast iron 3 inches thick and 2 feet in diameter, floating on the surface of mercury, made this possible. The recording apparatus can be moved over and adjusted rapidly by gauge. The mounting was designed by the seismologist and made at the Observatory machine shop by Mr. L. Christensen.

THE GENERAL OFFICE SYSTEM

Considerable time has been devoted to devising a system of office management which would define the routine work to be attempted, enable it to be done without needless repetition or copying of records and render the data readily accessible.

The new system was put into effect on December 1, 1923. It will be described in the monograph mentioned in the introduction to this present volume (page 2). It depended for its possibility of existence on a comparatively simple reproducing outfit for making accurate forms cheaply. On November 20, 1923, a new Edison-Dick Mimeograph, No. 78, was obtained, complete with full electrical equipment, arranged for hand or machine feed, together with a Mimeoscope, No. 1, completely equipped with tools. With this outfit, forms devised for the particular needs of this division were made out and reproduced. This equipment is also used in making bulletins sent out each month, and is invaluable for the work of the division. This system has now been in operation for some months. Notes are being kept of suggestions for improvement and simplification. Those which seem worth while will be incorporated in the forms for next year, 1925, as changes in the system will be made only at the ends of years.

Dominion Obsevatory, Ottawa, February, 1924

APPENDIX A

SEISMOLOGIC PUBLICATIONS OF DR. OTTO KLOTZ

Not appearing in the series, Publications of the Dominion Observatory

- 1. Report of the Chief Astronomer, 1906.—Appendix I.
- 2. EARTHQUAKES.

Trans. of the the Ottawa Lit. and Scien. Soc., 1906-07.

3. THE SURVEYOR AND EARTHQUAKES.

Association of Ontario Land Surveyors, 1907.

- 4. Report of the Chief Astronomer, 1907.—Appendix II.
- 5. Earthquakes and the Interior of the Earth. Jour., R.A.S.C., Vol. II, No. 2, 1908.
- 6. MICROSEISMS.

Jour., R.A.S.C., Vol. II, No. 4, 1908.

- 7. Report of the Chief Astronomer, 1908.—Appendix I.
- 8. THE PERSIAN EARTHQUAKE OF JANUARY 23, 1909. Jour., R.A.S.C., Vol. III, No. 2, 1909.
- 9. Report of the Chief Astronomer, 1909.—Appendix I.
- 10. MICROSEISMS.

Trans. Roy. Soc. of Can., Third Series, Vol. III, 1909.

- Some Scientific Crumbs from Europe. Jour., R.A.S.C., Vol. IV., No. 1, 1910.
- 12. THE SEISMOGRAPH.

Jour., R.A.S.C., Vol. IV. No. 2, 1910.

13. EARTHQUAKE EPICENTRES.

Jour., R.A.S.C., Vol. IV. No. 3, 1910.

- 14. Report of the Chief Astronomer, 1910.—Appendix I.
- 15. Stereographic Projection Tables.

Jour., R.A.S.C., Vol. V. No. 3, 1911.

- 16. Auxiliary Instruments for Interpretation of Seismograms.

 Comptes Rendus, Inter. Seis. Assoc. Manchester, 1911.
- 17. Report of the Chief Astronomer, 1911.—Appendix I.
- 18. EARTHQUAKE EPICENTRES.

Bul. Seis. Soc. of Amer., Vol. I. No. 4, 1911.

19. LOCATION OF EPICENTRES, 1911.

Jour., R.A.S.C., Vol. VI. No. 1, 1912.

- 20: MOVEMENT OF AN EARTH PARTICLE DURING MICROSEISMS.

 Trans. Roy. Soc. of Can., Third Series, Vol. VI, 1912.
- 21. THE UNDAGRAPH.

Bul., Seis. Soc. of Amer., Vol. III. No. 1, 1913.

22. LOCATION OF EPICENTRES FOR 1912.

Jour., R.A.S.C., Vol. VII. No. 3, 1913.

23. THE UNDAGRAPH.

Jour., R.A.S.C., Vol. VII. No. 6, 1913.

24. THE SEISMOGRAPH AND EARTHQUAKES.

Report of Dominion Land Surveyors' Association, 1914.

- 25. Location of Epicentres for 1913. Jour., R.A.S.C., Vol. VIII. No. 3, 1914.
- 26. EARTHQUAKES, PHASES OF THE MOON.

Jour., R.A.S.C., Vol. VIII. No. 4, 1914.

- 27. DEFORMATION OF THE EARTH BY THE MOON. Jour., R.A.S.C., Vol. VIII. No. 6, 1914.
- 28. Location of Epicentres, January-June, 1914. Jour., R.A.S.C., Vol. IX. No. 5, 1915.
- THE EARTHQUAKE OF FEBRUARY 18, 1911.
 Jour., R.A.S.C., Vol. IX. No. 9, 1915.

30. The Earthquake of February 18, 1911.

Bul., Seis. Soc. of Amer., Vol. V. No. 4, 1915.

- Location of Epicentres, July, 1914-December, 1915.
 Jour., R.A.S.C., Vol. X. No. 6, 1916.
- 32. PRINCE BORIS GALITZIN.

Jour., R.A.S.C., Vol. X. No. 7, 1916.

33. THE SCIENTIFIC WORK OF THE GOVERNMENT.

Nat. Assembly of Civil Service Commissions, 1917.

34. The Earthquake of January 30, 1917.

Bul., Seis. Soc. of Amer., Vol. VII. No. 1, 1917.

35. PRINCE BORIS GALITZIN.

Bul., Seis. Soc. of Amer., Vol. VII. No. 2, 1917.

36. VELOCITY OF L WAVES.

Bul., Seis. Soc. of Amer., Vol. VII. No. 2, 1917.

37. Memoranda from the Chairman of the Scientific Committee. Bul., Seis. Soc. of Amer., Vol. VII. No. 3, 1917.

38. LOCATING SUBMARINE FAULTS.

Bul., Seis. Soc. of Amer., Vol. VII. No. 4, 1917.

39. SYMBOLS.

Science, October 12, 1917.

40. LOCATING SUBMARINE FAULTS.

Jour., R.A.S.C., Vol. XII. No. 2, 1918.

41. OBSERVATORIES IN CANADA.

Jour., R.A.S.C., Vol. XII. No. 5, 1918.

42. Analysis of Earthquake Waves.

Bul., Seis. Soc. of Amer., Vol. VIII. No.2-3, 1918.

43. THE TRANSMISSION OF EARTHQUAKE WAVES.

Trans. Roy. Soc. of Can., Third Series, Vol. XII, 1918.

44. The Dominion Astronomical Observatory at Ottawa. Jour., R.A.S.C., Vol. XIII. No. 1, 1919.

45. OBSERVATORIES IN CANADA.

Jour., R.A.S.C., Vol. XIII. No. 7, 1919.

46. Analysis of Earthquake Waves.

Trans. Roy. Soc. of Can., Third Series, Vol. XIV, 1920.

47. An Astronomical Observatory for Upper Canada. Jour., R.A.S.C., Vol. XIV. No. 9, 1920.

48. STATUS OF SEISMOLOGICAL WORK IN THE PACIFIC.

Special Pub., Bernice P. Bishop Museum. No. 7, 1921.

49. ASTRONOMY IN CANADA.

Scientific Monthly, Vol. XV. No. 3, 1922.

APPENDIX B

SEISMOLOGIC PUBLICATIONS OF ERNEST A. HODGSON

Not appearing in the series, Publications of the Dominion Observatory

1. LOCATION OF EPICENTRES, 1916.

Jour., R.A.S.C., Vol. XII. No. 6, 1918.

2. Moving the Earth (Microseisms).

Motor Boating, June, 1918.

3. CHART TO ACCOMPANY KLOTZ' STEREOGRAPHIC PROJECTION TABLES.

Special Issue, Dominion Observatory, 1920.

4. VARIABLE VELOCITY OF L. WAVES.

Bul., Seis. Soc. of Amer., Vol. XI. No. 1, 1921.

 TEMPERATURE CONTROL. VERTICAL SEISMOGRAPH, OTTAWA. Bul., Seis, Soc. of Amer., Vol. XI. No. 2, 1921.

6. THREE REMARKABLE EARTHQUAKES IN 1918.

Bul., Seis. Soc. of Amer., Vol. XI. No. 2, 1921.

7. THE GREAT PACIFIC EARTHQUAKE OF FEBRUARY 4, 1923.

Natural Resources, Canada, Vol. II. No. 4, 1923.

8. A Proposed Research into the Possibilities of Earthquake Prediction.

Bul., Seis. Soc. of Amer., Vol. XIII. No. 3, 1923.

9. RECORDING RECENT GREAT EARTHQUAKE THAT SHOOK JAPAN.

Natural Resources, Canada, Vol. II. No. 10, 1923.

10. SEISMOLOGY IN CANADA.

Canada Year Book, 1922-23.

APPENDIX C

SEISMOLOGIC NUMBERS

Appearing previous to 1924 in the series, Publications of the Dominion Observatory

1. Stereographic Projection Tables, Otto Klotz, LL.D.

Pub. Dom. Obs., Vol. I. No. 1, 1913.

2. EARTHQUAKE OF APRIL 28, 1913, Otto Klotz, LL.D.

Pub. Dom. Obs., Vol. I. No. 5, 1913.

3. Earthquake of February 10, 1914, Otto Klotz, LL.D.

Pub. Dom. Obs., Vol. III. No. 1, 1915.

4. SEISMOLOGICAL TABLES, Otto Klotz, LL.D.

Pub. Dom. Obs., Vol. III. No. 2, 1916.

- THE EFFECT OF COOLING ON A CEMENT PIER, Ernest A. Hodgson, M.A. Pub. Dom. Obs., Vol. V. No. 2, 1921.
- 6. The Location of Epicentres, 1917-18. Ernest A. Hodgson, M.A. Pub. Dom. Obs., Vol. V. No. 4, 1921.
- 7. The Location of Epicentres, 1919. W. W. Doxsee, M.A. Pub. Dom. Obs., Vol. V. No. 9, 1922.
- 8. The Location of Epicentres, 1920. W. W. Doxsee, M.A. Pub. Dom. Obs., Vol. VIII. No. 2, 1922.

APPENDIX D

SYMBOLS USED

O=Time of shock at the epicentre or origin.

P=Preliminary, longitudinal waves, and time of arrival.

PR₁=P waves, once reflected, and time of arrival.

PR2=P waves, twice reflected, and time of arrival.

etc.

S=Secondary, transverse waves, and time of arrival.

SR_i = S waves, once reflected, and time of arrival.

SR₂=S waves, twice reflected, and time of arrival.

etc.

- e = Emersio, emergence of a phase not sharply defined and time of arrival, or may be used to qualify the nature of other phases.
- i=Impetus, a sharply defined phase and time of arrival, or may be used to qualify the nature of other phases.

L=Long or surface waves, and time of arrival.

- LR₁ = L waves reaching the station through the antipodes of that station, i.e. by a path 40,000 km. $-\Delta$ LR₂ = L waves reaching the station by a path 40,000 km. $+\Delta$
 - Δ = The distance, measured about the surface of the earth from the epicentre to the station.

M = Maximum of L waves and time of arrival.

M₁, M₂, etc. = Successive maxima where these occur.

N-S Component = that seismograph which registers the earth movement in a north-south line. Similarly the E-W Component and the Vert. Component.

M-S=Refers to the Milne-Shaw seismographs.

A, A, AZ = True earth movement (half amplitude), measured in microns. (Subscripts indicate the components east-west, north-south or vertical)

 $\varphi = \text{Latitude}.$

 $\lambda = Longitude.$

 $\mu = \text{Micron} = .001 \text{ mm}.$

h = Height above sea-level.

ca. = approximately.

To = Oscillation time (complete), of undamped seismograph.

h.m.s. = Hours, minutes, and seconds, in Greenwich Mean Time, midnight to midnight.

I = Bosch, photographic seismograph, N-S Component.

II = Bosch, photographic seismograph, E-W Component.

17 = Milne-Shaw seismograph, at present an E-W Component.

23 = Milne-Shaw seismograph, used experimentally in 1923.

D₁=E-W Component of Deformation Instrument.

D₂ = N-S Component of Deformation Instrument.

W = Wiechert, vertical seismograph.

e=Damping ratio.

V = Magnification.

 $V_L = Velocity of L waves.$

g = grammes.

lb. = pounds avoirdupois.

Kgm. = kilogrammes.

mm. = millimeters.

m. = meters.

Where the interpretation of a phase is doubtful, though the time may be accurately known, a question mark follows the symbol for the phase, as P?.

Where the exact time is not known, though confidence in the interpretation of the phase exists, brackets surround the figures. Similar brackets indicate the doubtful figures in other parts of the report.

Subscripted letters after the symbol for phase indicate the component or the instrument from which the phase was read, as P_{E} , L_{I7} , etc.

"Small" in the amplitude column, indicates a true earth amplitude, smaller than 1 micron.

"HALIFAX RECORD" and "SASKATOON RECORD" indicate the Ottawa readings from the Mainka seismographs at Dalhousie University and at the University of Saskatchewan, respectively.