

Original bulletins of the International Seismological Summary (ISS) have been obtained thanks to funding provided by the US National Science Foundation through grant EAR-9725140 (Villaseñor et al., 1997) and have been scanned and collected by SGA Storia Geofisica Ambiente (Bologna) thanks to funding provided by the Istituto Nazionale di Geofisica e Vulcanologia (Rome), in the frame of the EUROSEISMOS project.

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## The International Seismological Summary for 1918 (Continued).

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FORMERLY THE BULLETIN OF THE  
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

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The present Number contains the information for April, May, and June, 1918, following on that for January, February, and March, already given. The history of the publication is given in the first few pages of the former Number.

It was intended to print, on the last page of the former Number, the usual copy of Tables in use, for every  $1^\circ$  of distance from the Epicentre. But the matter printed came so near to 40 pages that it was found inconvenient to add this page. As an alternative, the Tables have been expanded, as far as  $\Delta=90^\circ$ , to every  $0^\circ.1$ , and printed in a separate pamphlet, issued herewith. Beyond  $\Delta=90^\circ$  the true P and S begin to fail (though they are occasionally recorded even to large values of  $\Delta$ : see, for instance, the La Paz records on 1918 January 30, in the last Number), so that tabulation to  $1^\circ$  is considered sufficient at present.

The number of Stations which send records has greatly increased, as may be seen, for instance, by a glance at the Earthquake of May 20d. 14h. This earthquake will also serve to show that none of this information is superfluous, if our knowledge is to advance. In spite of the number of stations, the determination of epicentre and time of occurrence present some difficulties, and the residuals cannot be considered satisfactory. Those of stations near the Epicentre are chiefly negative, and those further away chiefly positive. Displacement of the epicentre cannot reconcile them. The hypothesis of a high focus is suggested by the residuals for Batavia and Manila, but was tried and proved unsuccessful. The key to the solution has not yet been found, but this presentation of the residuals may suggest it to some other investigator. In this and many other cases, after spending a reasonable time on them, it was necessary to print some solution, even if obviously faulty, in order to avoid undue delay in catching up the arrears.

H. H. TURNER.

University Observatory, Oxford,  
1928 June 11th.

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## 1918 APRIL, MAY, & JUNE.

April 1d. 10h. 8m. 18s. Epicentre 22°·0N. 123°·5E.

$$A = -\cdot 512, B = +\cdot 773, C = +\cdot 375.$$

	$\Delta$	Az.	P.	O-C.	L.	M.
	°	°	m. s.	s.	m.	m.
Taihoku	3·5	330	0 47	- 8	1·3	—
Manila	7·8	198	2 4	+ 6	5·0	—
Zi-ka-wei	9·4	348	2 21	- 1	—	5·3
De Bilt	88·6	328	—	—	47·6	55·3
Edinburgh	90·0	337	—	—	49·7	—

De Bilt also gives MN = 54·8m.

April 1d. 17h. 44m. 5s. Epicentre 33°·3N. 9°·0W.

$$A = +\cdot 826, B = -\cdot 131, C = +\cdot 549; \quad D = -\cdot 156, E = -\cdot 988; \\ G = +\cdot 542, H = -\cdot 086, K = -\cdot 836.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
San Fernando	3·9	35	0 55	- 6	(1 25)	-22	—	2·7
Coimbra	6·9	4	1 43	- 2	2 25	-42	2·7	2·8
Tortosa	10·7	42	2 46	+ 6	4 8	-40	—	6·0
Barcelona	12·0	44	—	—	e 5 2	-17	—	—
Moncalleri	17·4	43	—	—	e 7 27	0	—	—
Paris	17·8	26	e 7 49	?S	(e 7 49)	+13	9·2	—
Uccle	20·1	26	e 4 43	+ 1	—	—	e 11·2	—
De Bilt	21·4	24	—	—	—	—	10·1	10·8

San Fernando gives MN = +2·2m. Paris eS = +8m.55s. De Bilt MN = +11·3m.

April 1d. Records also at 0h. (San Fernando), 1h. (La Paz), 8h. (Helwan and Zi-ka-wei), 9h. (De Bilt), 14h. (Monte Cassino and La Paz), 18h. (Monte Cassino), 18h. (Marseilles), 20h. (Lick), 22h. (Lick and Batavia).

April 2d. 3h. 33m. 20s. Epicentre 36°·0N. 138°·0E. (as on 1915 Oct. 8d.).

$$A = -\cdot 601, B = +\cdot 541, C = +\cdot 588.$$

	$\Delta$	P.	O-C.	L.	M.E.	M.N.
	°	s.	s.	m.	m.	m.
Nagoya	1·2	17	- 1	—	—	—
Osaka	2·5	63	+43	1·8	2·7	3·6
Kobe	2·7	e 49	+ 7	1·8	—	—
De Bilt	82·7	—	—	e 42·7	50·7	50·4

Tokyo ( $\Delta = 1^{\circ}5$ ) gives P = +2m.0s., S = +3m.52s. It is difficult to reconcile these readings with the others, for it seems clear that if the others are worth anything at all the epicentre must be nearer Nagoya than Osaka and Kobe, and thus must also be within a few degrees of Tokio. If we neglect Nagoya we could get a fair agreement by putting the epicentre at 33°·5N. 128°·5E.

April 2d. Records also at 0h. (San Fernando), 2h. (Zi-ka-wei), 13h. (Paris), 21h. (San Fernando), 22h. (Lick).

April 3d. Records at 1h. (De Bilt, La Paz, and Helwan), 3h. (Manila and Bidston), 5h. (Helwan), 15h. (Batavia).

April 4d. Records at 1h. (Riverview), 12h. (Tortosa), 17h. (Helwan and Manila).

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April 5d., 15h. 38m. 5s. Epicentre 42°-0N. 13°-5E. (as on 1915 Jan. 13d.).

$$A = +.722, B = +.173, C = +.669.$$

	$\Delta$	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Monte Cassino	0.6	0 8	- 1	—	—	—	0.3
Rocca di Papa	0.6	0 12	+ 3	0 22	+ 5	—	0.4
De Bilt	11.5	—	—	—	—	e 7.9	8.9
Eskdalemuir	17.2	4 55	+48	—	—	—	—
Edinburgh	17.6	4 25	+13	—	—	—	—

De Bilt gives MN = +8.8m.

April 5d. Records also at 10h. (Manila), 14h. (De Bilt and Bidston), 15h. (Helwan), 17h. (Honolulu), 21h. (Helwan).

April 6d. Records at 0h. (La Paz), 2h. (Athens and San Fernando), 3h. (Zagreb), 4h. (Colombo, Manila, and Batavia), 13h. (Rocca di Papa), 19h. (Manila), 23h. (San Fernando).

April 7d. 15h. 54m. 10s. Epicentre 42°-0N. 13°-5E. (as on 1918 April 5d.).

$$A = +.722, B = +.173, C = +.669.$$

	$\Delta$	P.	O-C.	S.	O-C.	M.
	°	s.	s.	s.	s.	m.
Monte Cassino	0.6	9	0	—	—	0.3
Rocca di Papa	0.6	i 12	+ 3	i 21	+ 4	0.4
Pompeii	1.5	e 45	?S	(e 45)	+ 2	—

April 7d. Records also at 13h. (Manila).

April 8d. 5h. 14m. 8s. Epicentre 42°-0N. 13°-5E. (as on 1918 April 5d. and 7d.).

$$A = +.722, B = +.173, C = +.669.$$

	$\Delta$	P.	O-C.	S.	O-C.	M.
	°	s.	s.	s.	s.	m.
Monte Cassino	0.6	6	- 3	—	—	0.2
Rocca di Papa	0.6	—	—	i 23	+ 6	0.5

April 8d. Records also at 1h. (San Fernando and Colombo), 13h. (Honolulu), 15h. (De Bilt, Helwan, Paris, and Edinburgh), 17h. (La Paz and Manila), 20h. (La Paz), 21h. (San Fernando), 22h. (Athens).

April 9d. Records at 2h. (Sydney), 8h. (Rio Tinto), 17h. (Rocca di Papa), 21h. (La Paz).

April 10d. 1h. 9m. 0s. Epicentre 38°-3N. 76°-3W.

$$A = +.186, B = -.762, C = +.620.$$

	$\Delta$	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Cheltenham	0.6	0 12	+ 3	—	—	0.5	0.5
Washington	1.0	0 12?	- 3	0 22?	- 6	—	0.6
Georgetown	1.0	i 0 12	- 3	—	—	—	0.5
Ithaca	4.1	e 1 58	?S	(e 1 58)	+ 5	(2.2)	—
Harvard	5.6	2 35	?S	(2 35)	+ 1	(3.3)	3.4
Ann Arbor	6.9	—	—	—	—	—	2.6
Ottawa	7.1	—	—	—	—	e 3.4	—

Additional records: Cheltenham gives MN = +0.6m. Georgetown iZ = +13s., MZ = +0.6m. Ithaca records S as P and L as S. Harvard records S as P and L as S, and gives T<sub>0</sub> = 1h.10m.45s.

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**1918. April 10d. 2h. 3m. 44s. Epicentre 44°0N. 131°0E.**

A = -472, B = +543, C = +695; D = +755, E = +656;  
G = -456, H = +524, K = -719.

The determination of this epicentre does not seem possible without assuming a very deep focus. La Paz, near the anticeentre, supports this quite definitely, and in the following a focal depth 0-070, has been assumed.

Station and Component.	Machine.	Corr. for Focus	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	M. S.	S.	M. S.	S.	M.	M.
Mizusawa	N. E.	-0.6	9.0	119	3 17	+70	4 58	+71	—	—
		-0.6	9.0	119	3 16	+69	4 57	+70	—	—
Kobe		-0.8	9.9	160	2 25	+7	—	—	4.0	5.4
Osaka		-0.8	9.9	158	2 28	+10	—	—	4.2	5.4
Nagoya		-0.8	9.9	151	2 20	+2	—	—	—	—
Tokyo		-1.0	10.7	138	2 31	+5	4 22	+1	—	—
Zi-ka-wei		-1.9	14.9	214	i 3 14	+1	e 5 23	-21	—	5.9
Taihoku		-2.9	20.5	205	4 3	—	—	—	7.2	—
Manila	W.	-4.4	30.6	198	e 5 35	-15	9 54	-32	11.2	11.9
Calcutta	O.E.	-5.5	41.0	255	6 58	-20	12 34	-29	—	—
Simla	O.E.	-5.8	43.7	272	6 46	-51	11 28	-129	16.3	16.9
Bombay	O.E.	-6.6	54.3	263	8 53	+1	—	—	—	23.2
Batavia	W.	-6.7	54.7	210	8 43	-11	i 15 33	-21	—	15.8
Kodaikanal	M.	-6.8	57.1	251	16 34	? S	(16 34)	+11	19.8	20.1
Colombo	M.	-6.8	57.9	246	16 22	? S	(16 22)	-10	—	20.4
Lemberg	B.O.	-7.5	66.7	318	i 10 14	+8	i 18 22	+9	e 26.8	27.0
Victoria	M.	-7.5	67.0	42	17 40	? S	(17 40 ?)	-37	—	18.6
Dyce	Ma.	-7.8	71.5	337	i 10 47	+11	i 19 27	+18	—	—
Edinburgh	M.	-7.9	72.9	335	13 1	? PR <sub>1</sub>	—	—	—	48.1
De Bilt		-7.9	73.2	328	10 51	+4	i 19 35	+6	e 32.3	47.6
Zagreb	W.	-7.9	73.4	319	e 10 48	0	19 34	+3	28.3	29.3
Eskdalemuir	G.	-7.9	73.4	334	e 10 50	+2	20 39	+68	36.0	—
Stonyhurst	M.	-8.0	74.4	332	e 11 34	+40	i 18 16	?	—	18.3
Uccle		-8.0	74.5	328	i 10 56	+1	19 45	+1	e 39.3	—
Berkeley		-8.0	74.7	50	e 10 59	+3	e 19. 54	+8	—	—
Bidston	M.S.	-8.0	75.0	334	12 28	+90	20 4	+14	—	49.9
Pola	W.	-8.0	75.1	320	e 10 53	-6	i 19 52	+1	e 29.0	46.3
Zurich		-8.0	75.6	323	11 1	-1	20 0	+3	—	—
Helwan	M.	-8.0	76.1	299	11 16	+11	—	—	—	—
Milan		-8.0	76.7	322	11 15	+6	20 7	-3	—	20.1
Paris		-8.0	76.8	328	i 11 10	0	i 20 12	0	32.3	36.3
Moncalieri	S.	-8.1	77.8	323	11 10	-5	i 20 19	-3	29.3	32.8
Rocca di Papa	Ag.	-8.1	78.0	319	11 12	-4	—	—	—	14.5
Riverview		-8.2	80.0	164	i 11 17	-11	i 20 32	-16	32.6	33.6
Melbourne	M.	-8.3	82.8	170	—	—	(i 21 10)	-10	21.2	21.3
Barcelona		-8.3	83.0	323	11 34	-13	i 21 3	-19	31.3	34.3
Tortosa		-8.4	84.2	324	11 46	-8	21 14	-21	33.9	34.5
Algiers	B.M.	-8.4	86.5	320	i 11 57	-11	21 26	-35	32.3	35.3
Lawrence	W.	-8.5	87.1	34	i 12 4	-7	e 14 51	? PR <sub>1</sub>	21.6	22.0
Ottawa		-8.5	87.5	17	e 12 3	-10	e 21 58	-14	41.3	—
Coimbra	N. E.	-8.5	88.3	330	14 6	? PR <sub>1</sub>	i 21 38	-43	31.3	35.8
		-8.5	88.3	330	e 15 6	? PR <sub>1</sub>	i 22 6	-15	—	—
Toronto	M.	-8.5	88.3	21	—	—	(22 4)	-17	26.0	26.2?
Ann Arbor	W.	-8.5	88.3	24	(11 16)	-62	—	—	11.3	—
Ithaca	N. E.	-8.6	90.2	20	21 49	?	e 22 16	-26	—	—
		-8.6	90.2	20	21 50	?	e 22 18	-24	—	—
San Fernando	N.	-8.6	90.7	327	11 16	-75	22 1	-46	32.5	56.8
Harvard	M.	-8.6	91.4	16	—	—	i 22 38	-17	25.2	26.5?
Georgetown		-8.6	93.3	22	—	—	22 6?	-70	—	—
La Paz	Bi.	—	148.2	36	i 18 57	[-56]	30 15	?	41.0	43.8
Cipolletti	M.	—	164.9	77	22 40	? PR <sub>1</sub>	—	—	—	43.0

For Notes see next page.

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NOTES TO APRIL 10d. 2h. 3m. 44s.

Additional records: Kobe gives MN = +4.2m., Osaka MN = +5.0m. Manila MN = +12.0m., T<sub>0</sub> = 2h.3m.53s. Colombo M = +28.8m. Lemberg T<sub>0</sub> = 2h.3m.53s. Dyce i = +12m.47s., IS = +19m.53s. Edinburgh M = +19.8m. De Bilt i<sub>s</sub> = +20m.3s., e = +22m.52s. and +27m.16s., m = +29m.12s. and +29m.25s., eLN = +36.3m., MN = +46.4m., T<sub>0</sub> = 2h.3m.51s. Zagreb iP = +10m.50s., MNW = +44.3m., T<sub>0</sub> = 2h.3m.50s. Eskdalemuir T<sub>0</sub> = 2h.2m.43s. Stonyhurst says "Doubtful case. Maximum at S." Uccle i<sub>s</sub> = +12m.54s., i<sub>s</sub> = +13m.55s., T<sub>0</sub> = 2h.3m.51s. Berkeley T<sub>0</sub> = 2h.3m.48s. Pola MN = +30.0m., T<sub>0</sub> = 2h.3m.38s. Zurich T<sub>0</sub> = 2h.3m.46s. Moncalieri T<sub>0</sub> = 2h.3m.38s. Paris T<sub>0</sub> = 3h.3m.52s. Riverview S = +20m.39s., SR<sub>1</sub> = +24m.8s., MN = +37.0m., T<sub>0</sub> = 2h.3m.45s. Barcelona T<sub>0</sub> = 2h.3m.48s. Algiers T<sub>0</sub> = 2h.4m.11s. Lawrence P = +12m.3s., MN = +22.1m. Ottawa eN = +21m.33s. and +23m.4s., eLN = +24.8m., LN = +27.3m., and +36.3m. Coimbra T<sub>0</sub> = 2h.8m.24s. Toronto records S as L, also L = +35.1m. San Fernando T<sub>0</sub> = 2h.2m.13s. Georgetown SE? = +21m.47s. La Paz gives T<sub>0</sub> = 2h.9m.17s., and what may be a subsequent shock, in which P = 2h.43m.18s., L = 3h.37m.36s.

The following determination was originally made for this earthquake (1918 April 10d.) without making any allowance for the depth of the focus. It serves to show how difficult it is to obtain a determination without some assumption of the kind.

1918. April 10d. 2h. 3m. 44s. Epicentre 40°0N. 110°0E.

A = -0.262, B = +0.720, C = +0.643; D = +0.940, E = +0.342;  
G = -0.220, H = +0.604, K = -0.766.

	Δ	Az.	P.		O-C.		S.		O-C.		L.	M.
			m.	s.	m.	s.	m.	s.	m.	m.		
Zi-ka-wei	12.8	130	13	14	+ 4		e 5	23	-16			5.9
Taihoku	17.8	143	4	3	-12						7.2	
Kobe	20.6	97	2	25	-143						4.0	5.4
Osaka	20.8	97	2	28	-143						4.2	5.4
Nagoya	21.8	94	2	20	?							
Tokyo	23.8	91	2	31	-175		4	22	-318			
Mizusawa	23.9	82	3	16	-131		4	57	?			
E. N.	23.9	82	3	17	-130		4	58	?			
Calcutta	25.3	233	6	58	+77		12	34	-51		(12.6)	
Manila	27.2	156	e 5	35	-25		9	54	-1L		11.2	11.9
Stmla	27.9	262	6	46	+39		11	28	+31		16.3	16.9
Bombay	38.3	248	8	53	+73							23.2
Batavia	46.3	184	8	43	+ 1		i 15	33	+ 1			15.8
Lemberg	58.3	311	i 10	14	+13		i 18	22	+19		26.8	27.0
Helwan	63.2	288	11	16	+43							
Zagreb	64.9	310	e 10	48	+ 4		19	34	+10		28.3	29.3
Pola	66.7	310	e 10	53	- 3		i 19	52	+ 6		e 29.0	46.3
De Bilt	67.3	320	10	51	- 9		i 19	35	-19		e 32.3	47.6
Dyce	67.5	327	i 10	47	-14		i 19	27	-29			
Zurich	68.3	314	e 11	1	- 5		20	0	- 6			
Uccle	68.4	319	i 10	56	-11		19	45	-22		e 39.3	
Milan	69.0	312	11	15	+ 4		20	7	- 7			20.1
Eskdalemuir	69.1	326	e 10	50	-22		20	39	+24		36.0	
Rocca di Papa	69.2	308	11	12	0				- 9		29.3	32.8
Moncalieri	70.2	313	11	10	- 8		i 20	19	-21		32.3	36.3
Paris	70.6	318	i 11	10	-11		i 20	12	-35		32.3	35.3
Algiers	78.1	308	i 11	57	-11		21	26	-146		32.6	33.6
Riverview	83.1	147	i 11	17	-80		i 20	32	-120		i 21.2	21.3
Melbourne	84.2	153					(i 21, 10)					
Berkeley	88.5	39	e 10	59	-129		e 19	54	-244			
Ottawa	94.4	4	e 12	3	-97		e 21	58	?		41.3	
Ithaca	E. 97.4	5	21	49	?		e 22	16	-194			
N. 97.4	5	21	50	?			e 22	18	-192			
Harvard	97.6	1							-174		25.2	26.5?
Georgetown	100.8	6					22	6?	?	PR <sub>1</sub>		
La Paz	156.4	355	i 18	57	[-67]		30	15	?		41.0	43.8

April 10d. Records also at 5h. (Riverview and Melbourne), 10h. (Stonyhurst), 15h. (Riverview and Melbourne), 16h. (De Bilt and Edinburgh), 17h. (Riverview and Melbourne), 18h. (De Bilt and Edinburgh), 20h. (Honolulu), 21h. (Colombo and Manila).

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April 11d. Records at 1h. (Colombo), 2h. (Denver), 11h. (Mizusawa), 18h. (Manila).

April 12d. Records at 1h. (Lick and Uccle), 7h. (Rio Tinto (2) ), 8h. (Athens), 9h. (Batavia and Marseilles), 10h. (Manila and Tacubaya), 14h. (Cape-town), 16h. (Manila).

**1918. April 13d. 0h. 51m. 12s. Epicentre 5°0S. 85°0E.**

A = +.087, B = +.992, C = -.087 ; D = +.996, E = -.087 ;  
G = -.008, H = -.087, K = -.996.

Station and Component.	Machine.	Δ	Azimuth.	P.		O-C.		S.		O-C.		L.		M.	
				m.	s.	m.	s.	m.	s.	m.	s.	m.	s.	m.	s.
Colombo	M.	12.9	337	3	12	0	—	—	—	—	—	6.5	9.1	—	—
Kodaikanal	M.	16.9	334	—	—	—	—	—	—	—	—	8.2	12.6	—	—
Batavia	W.	21.8	95	i 4	54	- 9	—	—	—	—	—	—	15.8	—	—
Bombay	O.E.	26.7	334	6	7	+12	—	—	—	—	—	—	17.1	—	—
Calcutta	N.	O.E.	27.8	7	6	30	+24	12	30	?SR <sub>1</sub>	—	21.1	—	—	—
	E.	O.E.	27.8	7	6	24	+18	12	24	?SR <sub>1</sub>	—	20.9	21.5	—	—
Dehra Dun	O.	35.9	350	8	18	?PR <sub>1</sub>	—	—	—	—	—	—	—	—	—
Simla	O.E.	36.9	349	8	18	?PR <sub>1</sub>	—	13	0	-22	—	17.0	17.5	—	—
Perth	M.	39.5	137	2	1	?	—	9	23	?PR <sub>1</sub>	—	15.7	18.7	—	—
Manila	W.	40.7	61	e 8	4	+ 3	—	—	—	—	—	—	—	—	—
Taihoku	O.	46.5	48	—	—	—	—	—	—	—	—	15.6	—	—	—
Zi-ka-Wei	O.	50.2	41	—	—	—	e 16	17	- 4	—	—	27.6	30.9	—	—
Kobe	O.	61.6	46	—	—	—	e 19	0	+17	—	—	—	41.2	—	—
Helwan	M.	62.1	308	11	0	+34	—	—	—	—	—	—	44.9	—	—
Melbourne	M.	63.4	130	18	30	?S	(18	30)	-36	—	—	31.0	34.8	—	—
Riverview	M.	67.5	125	e 12	0?	+59	e 19	30	-26	—	e 26.9	33.7	—	—	—
Sydney	M.	67.5	125	—	—	—	32	6	?L	—	—	35.6	37.0	—	—
Budapest	M.	77.8	321	—	—	—	e 22	48	+50	—	—	—	—	—	—
Zagreb	W.	79.2	318	e 12	16	+ 2	e 22	18?	+ 4	—	—	43.8	54.8	—	—
Pola	W.	80.3	317	e 12	23	+ 2	e 22	30	+ 3	—	e 42.5	50.5	—	—	—
Rocca di Papa	Ag.	80.3	314	—	—	—	—	—	—	—	e 45.4	61.4	—	—	—
Triest	W.	80.7	318	—	—	—	e 20	30	-121	—	—	—	—	—	—
Moncalieri	S.	84.6	316	e 12	48	+ 2	23	10	- 5	—	33.1	50.4	—	—	—
Algiers	B.M.	86.6	307	e 15	40	?	23	38	+ 1	—	—	36.8	42.8	—	—
De Bilt	—	87.7	323	—	—	—	23	37	-12	—	e 45.8	59.3	—	—	—
Barcelona	—	87.9	312	(e 16	22)	?PR <sub>1</sub>	23	49	- 2	—	—	—	66.0	—	—
Paris	—	88.8	319	—	—	—	e 24	1	0	—	—	44.8	—	—	—
Tortosa	—	89.1	311	13	7	- 4	24	3	- 1	—	—	—	57.0	—	—
Kew	M.	90.9	322	—	—	—	—	—	—	—	—	—	62.8	—	—
Stonyhurst	M.	92.5	324	e 22	30	?	i 29	12	?SR <sub>1</sub>	—	—	—	60.3	—	—
Bidston	M.S.	92.8	323	—	—	—	50	6	?	—	—	67.0	—	—	—
Eskdalemuir	G.	93.0	325	e 17	13	?PR <sub>1</sub>	e 24	0	-45	—	—	42.8	56.8	—	—
Edinburgh	M.	93.1	326	23	38	?S	(23	38)	-68	—	—	—	123.3	—	—
San Fernando	—	93.9	306	30	48	?SR <sub>1</sub>	—	—	—	—	—	50.6	60.8	—	—
Rio Tinto	M.	94.2	308	22	48	?	—	—	—	—	—	—	58.8	—	—
Coimbra	E.	95.8	310	e 16	43?	?PR <sub>1</sub>	26	24?	+70	—	—	47.2	58.9	—	—
	N.	95.8	310	e 19	55	?	e 26	11?	+57	—	—	45.3	56.9	—	—
Victoria	M.	130.4	24	—	—	—	—	—	—	—	—	79.4	—	—	—
Ottawa	M.	136.2	340	—	—	—	—	—	—	—	—	76.8	—	—	—
Harvard	M.	137.0	334	—	—	—	—	—	—	—	—	84.6	—	—	—
Toronto	M.	139.0	343	—	—	—	—	—	—	—	—	76.1	90.1?	—	—
La Paz	Bi.	145.8	230	19	39	[-11]	—	—	—	—	—	74.4	80.2	—	—

Additional records: Perth SR = +13m.6s. = S probably. Taihoku records ePS at 0h.50m.49s. Zi-ka-wei PM = +16m.51s. MN = +31.1m. Kobe MN = +38.2m. Riverview MN = +31.2m. Should the Riverview records be diminished by 1m.? this would bring them all into line. Zagreb iP = +12m.24s., iNW = +17m.25s., SNW = +22m.36s. Pola MN = +43.6m., T<sub>1</sub> = 0h.51m.24s. Moncalieri MN = +47.7m., T<sub>2</sub> = 0h.51m.36s. De Bilt PR,E = +16m.45s., SR,E = +29m.57s., SR,N = +30m.6s., MN = +55.9m. Epicentre 0°0S., 86°0E. Eskdalemuir i = +31m.6s. San Fernando MN = +69.3m. The P for this station is given as 0h.22m.0s. Toronto LE = +85.6m., LE = +117.6m. La Paz gives its observations one hour later than those taken for the table.

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April 13d. Records also at 0h. (Rocca di Papa), 1h. (Batavia), 5h. (La Paz), 11h. (Batavia), 15h. (Tacubaya), 16h. (Helwan and Mizusawa), 18h. and 19h. (Manila).

April 14d. Records at 0h. (San Fernando), 1h. (Rocca di Papa, Monte Cassino and Zagreb), 7h. (Manila), 8h. (Manila and Sitka), 23h. (La Paz).

April 15d. 8h. 27m. 40s. Epicentre 59°2N. 151°0W.

A = -0.448, B = -0.248, C = +0.859; D = -0.485, E = +0.875;  
G = -0.751, H = -0.416, K = -0.512.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria		19.4	111	4 11	-23	—	—	8.2	10.1
	Z.	19.4	111	4 48	+14	—	—	8.8	9.7
Berkeley		28.2	126	e 6 10	0	—	—	—	—
Ann Arbor	E.	43.6	82	8 32	+9	—	—	22.3	23.3
	N.	43.6	82	8 26	+3	—	—	23.0	24.9
	E.	43.6	82	8 32	+9	—	—	22.5	23.5
	N.	43.6	82	8 32	+9	15 2	+ 6	21.9	23.3
Toronto		44.8	77	—	—	—	—	19.4	—
Ottawa		45.4	73	8 35	-1	15 20	0	21.9	25.3
Ithaca		47.1	76	8 34	-14	15 42	0 e	24.3	—
Washington		49.5	80	9 9	+5	16 21	+ 8	21.8?	—
Georgetown	E.	49.5	80	i 9 9	+5	16 20	+ 7 e	22.7?	26.1
	N.	49.5	80	i 9 9	+5	16 20	+ 7 e	22.4?	26.0
Harvard		49.8	72	e 9 16	+10	16 38	+22	22.4	—
Osaka		52.6	277	11 38	?PR <sub>1</sub>	—	—	—	19.7
Edinburgh		62.1	20	3 20	?	—	—	—	28.8
Zi-ka-wei		62.4	285	e 9 59	-29	—	—	—	—
Eskdalemuir		62.6	20	10 29	0	18 53	- 3	30.3	—
Bidston		64.5	21	10 44	+ 2	19 14	- 5	—	36.2
De Bilt		67.1	16	—	—	19 46	- 5	—	—
Uccle		68.2	17	i 11 2	-3	e 19 56	- 8	—	—
Rocca di Papa		78.2	12	11 56?	-12	—	—	38.8?	54.8
Rio Tinto		78.6	28	19 20	?	—	—	—	39.3
Helwan		90.9	358	24 20	?S	(24 20)	- 3	—	—
La Paz		100.6	104	e 15 40	+87	26 10	+ 9 e	38.3	—

Additional records: Toronto L = +25.4m. Ottawa PR<sub>1</sub>N = +10m.28s., T<sub>0</sub> = 8h.27m.44s. Ithaca PN = +8m.45s., SN = +15m.43s. Georgetown T<sub>0</sub> = 8h.27m.47s. Washington T<sub>0</sub> = 8h.27m.46s. Harvard T<sub>0</sub> = 8h.27m.41s. Eskdalemuir SR<sub>1</sub> = +24m.2s., T<sub>0</sub> = 8h.27m.47s. De Bilt Epicentre 59°9N. 151°8W. Uccle T<sub>0</sub> = 8h.27m.48s.

April 15d. 18h. 38m. 10s. Epicentre 13°0S., 166°8E. (as on 1914 June 26d.).

A = -0.949, B = +0.223, C = -0.225; D = +0.228, E = +0.974;  
G = +0.219, H = -0.051, K = -0.974.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		20.9	95	e 4 56	+ 4	—	—	11.8	—
Sydney		25.2	212	5 38	- 2	—	—	11.8	12.8
Riverview		25.2	212	e 5 26	-14	19 33	-34 e	12.0	21.1
Melbourne		31.5	214	10 50	?	14 20	?	15.8	17.1
Manila		53.1	300	—	—	e 16 50	- 7	—	—
Victoria		86.9	39	—	—	—	—	—	56.8
Helwan		135.6	300	95 50	?	—	—	—	—
Moncalleri		143.4	335	e 19 30	{-15}	—	—	—	—

Additional records: Apia i = +5m.23s. Riverview iS = +9m.40s., MN = +22.1m.

April 15d. Records also at 0h. (Athens and Rocca di Papa), 2h. (San Fernando), 4h. (La Paz), 8h. (Taihoku and Zi-ka-wei), 11h. (Edinburgh), 14h. (La Paz), 15h. (Monte Cassino), 18h. (Manila), 21h. (La Paz), 23h. (San Fernando).

April 16d. Records at 0h. (Lick), 2h. (La Paz), 7h. (Rio Tinto), 11h. (De Bilt, Colombo, Bidston, Helwan, Paris, and Kodaikanal), 16h. (La Paz), 17h. (Stonyhurst), 20h. (Zi-ka-wei), 23h. (San Fernando).

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April 17d. 2h. 37m. 38s. Epicentre 46°·0N. 130°·0W. (as on 1914 July 21d.).

A = -·447, B = -·532, C = +·719; D = -·766, E = +·643;  
G = -·462, H = -·552, K = -·695.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria		5·2	59	0 55	-25	—	—	—	1·9
Toronto		35·3	75	—	—	—	—	29·3	—
Ottawa		37·1	71	—	—	—	e	26·4	—
Ithaca		37·8	76	—	—	—	e	35·4	—
Harvard		40·6	76	—	—	—	e	33·3	—
Edinburgh		68·8	29	38 37	?L	—	—	(38·6)	48·7
Eskdalemuir		69·2	29	—	—	—	—	—	—
Stonyhurst		70·7	30	—	—	—	—	—	42·4
Bidston		70·8	30	14 40	?PR <sub>1</sub>	22 4	?SR <sub>1</sub>	—	44·0
De Bilt	E.	74·7	27	—	—	e 21 40	+18	e 34·4	47·4
	N.	74·7	27	—	—	e 27 22	?SR <sub>1</sub>	e 36·4	42·4
Uccle		75·5	28	—	—	—	—	e 40·4	—
Paris		76·6	30	—	—	e 22 22	+38	45·4	57·4
Coimbra		79·3	41	—	—	e 22 38	+23	45·4	—
Graz		82·1	23	e 12 30	-1	—	—	—	—
San Fernando		83·2	42	e 46 52	?L	—	—	(46·9)	57·9
Zagreb		83·4	23	e 12 38	0	22 58?	-3	52·4	—
Rocca di Papa		86·2	27	e 12 38	-16	—	—	55·9	13·0
Helwan		102·1	17	62 22	?L	—	—	(62·4)	—

Additional records: Toronto L = +32·3m. and +43·6. Ottawa gives eLN from 3h.8m. to 3h.17m. Paris MN = +49·4m. San Fernando L = +52·9m. Victoria record is given 10m. late.

April 17d. 6h. 43m. 40s. . Epicentre 46°·8N. 131°·3W.

A = -·452, B = -·514, C = +·729; D = -·751, E = +·660;  
G = -·481, H = -·548, K = -·685.

The Victoria records, especially of L and M, suggest an epicentre further from Victoria, but on trial it was found impossible to suit both the European and other American records on this supposition.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria		5·6	70	2 26	?S	(2 26)	-8	4·4	4·9
	Z.	5·6	70	3 0	?S	(3 0)	+26	4·0	4·3
Tucson	N.	21·3	126	5 38	+41	—	—	—	8·7
	E.	21·3	126	5 34	+37	—	—	—	8·8
Lawrence	E.	27·3	93	e 4 17	-104	e 8 22	-144	13·2?	15·2
	N.	27·3	93	e 4 20	-101	e 8 29	-137	11·7	12·8
St. Louis		30·9	90	—	—	i 12 14	+24	e 14·0	—
Ann Arbor	N.	33·6	80	12 20?	?S	(12 20?)	-14	17·5	19·3
	E.	33·6	80	—	—	—	—	17·8	19·3
Toronto		36·0	76	4 14?	-188	(14 20)	+70	i 20·7	21·2
Ottawa		37·9	71	—	—	—	—	e 17·3	—
Ithaca		38·5	76	—	—	—	—	17·6	—
Georgetown		39·7	81	—	—	e 14 0	-2	19·7	—
Northfield		40·3	71	—	—	e 17 55	?SR <sub>1</sub>	21·0	—
Harvard		42·1	73	—	—	e 14 40	+4	e 20·6	—
Edinburgh		68·5	28	21 20	?S	(21 20)	+72	—	41·1
Stonyhurst		70·5	29	—	—	—	—	—	39·3
Bidston		70·6	30	25 20	?SR <sub>1</sub>	—	—	—	38·7
De Bilt		74·3	26	—	—	21 12	-6	e 35·3	41·6
Paris		76·3	29	—	—	e 21 27	-14	37·3	46·3
Coimbra		79·3	41	e 42 16?	?L	—	—	(e 42·3?)	—
Moncalieri		81·4	28	—	—	—	—	(e 41·1)	—
Graz		81·7	22	e 12 32	+3	e 22 32	-11	—	—
Triest		82·6	24	—	—	—	—	e 48·3	—
San Fernando		83·3	42	43 20	?L	—	—	(43·3)	53·8
Rocca di Papa		85·9	26	e 18 50	?PR <sub>1</sub>	—	—	45·3	23·3

Additional records: Berkeley and Lick give a series of records from 6h.43m.43s. onwards. Ottawa gives LN = +19·3m. and +24·3m. Ithaca LN = +21·0m. Harvard SE = +17m.43s. (=SR<sub>1</sub>), T<sub>1</sub> = 6h.50m.7s. De Bilt MN = +37·7m. Coimbra L = +47·3m. Moncalieri L = +47·5m.



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April 17d. 14h. 20m. 25s. Epicentre 40°·5N. 25°·5E.

A = +·686, B = +·327, C = +·649; D = +·430, E = -·903;  
G = +·586, H = +·280, K = -·760.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2·9	208	e 0 45	0	1 20	0	1·6	1·7
Pola	9·6	301	—	—	e 4 23	+ 5	—	4·9
Graz	9·7	316	e 2 12	-14	—	—	—	—
Triest	10·0	305	4 30	?S	(4 30)	+ 1	—	—
Vienna	10·0	323	e 4 41	?S	(e 4 41)	+12	—	—
Moncalieri	13·8	295	—	—	—	—	e 6·6	—
De Bilt	18·1	317	—	—	—	—	9·5	9·8
Paris	18·2	305	—	—	—	—	9·6	—
La Paz	103·4	260	—	—	e 41 35	?	(73·0)	—

Additional records: Athens iP = +53s., M = +1·9m. and +2·0m., T<sub>0</sub> = 14h.20m.25s. Pola MN = +4·7m. It seems improbable that the La Paz record belongs to the above shock.

April 17d. Records also at 0h. (Mizusawa), 2h. (Zagreb and Rocca di Papa), 4h. (Zagreb, Rocca di Papa, and Harvard), 5h. (Osaka), 20h. (Rocca di Papa and Athens), 21h. (Monte Cassino and La Paz), 22h. (San Fernando).

April 18d. 2h. 54m. 45s. Repetition from 42°·0N. 13°·5E. (as on 1918 April 5d.).

A = +·722, B = +·173, C = +·669.

	$\Delta$	P.	O-C.	S.	O-C.	M.
	°	s.	s.	s.	s.	s.
Rocca di Papa	0·6	e 7	- 2	17	0	21
Monte Cassino	0·6	20	?S	(20)	+ 3	—

April 18d. 2h. 28m. 40s. (i) } Epicentre 24°·0N. 121°·0E.  
20h. 3m. 45s. (ii) } (as on 1916 Nov. 14d.).  
22h. 14m. 45s. (iii) }

A = -·470, B = +·783, C = +·407; D = +·857, E = +·515;  
G = -·210, H = +·349, K = -·914.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
II Taihoku	1·1	24	0 18	+ 1	—	—	0·6	0·7
III	1·1	24	0 18	+ 1	—	—	0·6	0·7
III Hokoto	1·4	252	0 19	- 2	—	—	—	—
II Zi-ka-wei	7·2	3	1 46	- 3	e 3 0	-15	—	4·4
III	7·2	3	—	—	2 26	-49	—	4·4
II Manila	9·4	180	e 2 35	+13	—	—	—	—
I Kobe	16·3	46	—	—	7 56	+55	8·9	9·4
III	16·3	46	—	—	8 31	+89	9·2	10·3
I Osaka	16·5	46	8 12	?L	—	—	(8·2)	10·0
III	16·5	46	8 39	?L	—	—	(8·6)	9·9
I Tokyo	20·0	—	6 49	+128	6 57	-86	—	—
III	20·0	—	7 49	+188	8 3	-20	—	—
III Mizusawa	22·8	44	—	—	9 27	+ 6	—	—
I Sydney	64·6	153	6 28?	?	(19 20)	0	19·3	20·3
II De Bilt	85·6	326	—	—	—	—	e 46·3	—
II Edinburgh	87·2	332	48 15	?L	—	—	(48·3)	63·2

Additional records: Osaka gives for (i) L = +9·1m., MN = +9·8m., and for (iii) L = +9·6m., MN = +10·0m. Kobe (i) MN = +10·0m., (iii) MN = +9·3m. Mizusawa E = +10m.7s., N = +10m.6s. The Tokyo records (S closely following P in each case) suggest an origin close to Tokyo; but if so this must be a separate shock. The solution as a whole is, however, far from satisfactory, though nothing better was found.

April 18d. Records also at 9h. (Barcelona), 12h. (Honolulu).

April 19d. Records at 0h. (San Fernando), 3h. (Athens), 6h. (Coimbra), 7h. (Apia), 12h. (Bidston), 13h. (La Paz), 14h. (Taihoku), 15h. (Georgetown), 17h. (Barcelona).

April 20d. Records at 6h. (Toronto), 7h. (Rio Tinto and Victoria), 17h. (Monte Cassino), 21h. (San Fernando).

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**1918. April 21d. 22h. 32m. 20s. Epicentre 33°·6N. 116°·4W.**

A = -·370, B = -·746, C = +·553 ; D = -·896, E = +·445 ;  
G = -·246, H = -·496, K = -·833.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Tucson	N. B.O.	4·8	104	1 30	+16	—	—	2·8	—
	E. B.O.	4·8	104	1 38	+24	—	—	3·0	4·2
Lick	N. W.	5·5	310	e 1 28?	+ 3	e 2 18?	-13	i 2·9	3·3
	E. W.	5·5	310	e 1 25	0	e 2 15?	-16	i 3·0	3·3
	Z. W.	5·5	310	e 1 26	+ 1	—	—	i 3·0	3·0
Berkeley	N. —	6·4	313	1 1 36	- 2	i 3 1	+ 6	e 3·2	4·2
	E.Z. —	6·4	313	e 1 36	- 2	2 59	+ 4	e 3·3	3·8
Denver	W. —	11·0	53	e 1 40	-64	3 40	-74	5·7	5·7
Victoria	M. —	15·7	343	3 37	-11	6 49	+ 1	8·3	11·1
	Z. —	15·7	343	3 56	+ 8	6 53	+ 5	8·9	11·6
Lawrence	W. —	17·8	66	1 4 18	+ 3	7 44	+ 8	9·2	11·5
Tacubaya	—	20·9	129	4 55	+ 3	—	—	—	12·2
St. Louis	W. —	21·6	69	1 5 4	+ 4	9 16	+19	10·9	12·8
St. Boniface	W. —	21·8	35	6 6	+63	10 1	? L	(10·0)	12·8
Sitka	B.O.	26·8	337	e 5 50	- 6	10 38	+ 1	e 13·3	17·4
Ann Arbor	E. W.	27·0	62	5 58	0	10 52	+11	14·7	17·7
	N. W.	27·0	62	6 4	+ 6	10 46	+ 5	14·5	14·8
	E. R.	27·0	62	5 58	0	10 40	- 1	14·9	17·1
	N. B.	27·0	62	6 4	+ 6	10 52	+11	14·1	14·9
Toronto	M. —	30·3	60	6 46	+15	12 4	+25	17·5	19·6
Washington	Mar.	31·9	69	e 6 41	- 5	e 12 5	- 2	15·7?	20·7
Georgetown	E. —	31·9	69	i 6 44	- 2	12 11	+ 4	e 15·5	17·5
	N. —	31·9	69	6 37	- 9	12 5	- 2	e 15·5	17·4
	Z. —	31·9	69	6 42	- 4	12 18	+11	e 15·4	17·2
Cheltenham	B.O.	32·0	69	6 52	+ 5	12 9	+ 1	15·0	18·1
Ithaca	E. B.O.	32·3	62	6 37	-14	12 4	- 9	—	20·1
	N. B.O.	32·3	62	—	—	12 5	- 8	14·9	17·8
Ottawa	—	33·1	57	e 6 52	- 5	12 16	-10	e 15·9	18·7
Northfield	B.O.	35·2	60	6 53	-22	12 10	-48	15·8	21·7
Harvard	M.	36·3	62	7 25	+ 1	e 13 14	0	e 16·8	22·7
Vieques	E. B.O.	47·8	94	e 8 57	+ 4	—	—	e 29·0	36·8
	N. B.O.	47·8	94	e 10 52	? P R	—	—	e 28·3	31·6
La Paz	Bi.	68·0	130	e 11 17	+13	20 20	+18	30·7	31·9
Dyce	Ma.	73·7	31	e 12 0	+20	e 21 30	+20	33·7?	41·7
Edinburgh	M.	74·1	32	11 40	- 3	—	—	—	43·7
Eskdalemuir	G.	74·4	33	11 48	+ 3	21 25	+ 6	35·7	40·1
Bidston	M.S.	75·6	34	11 46	- 7	21 40	+ 7	—	41·5
Stonyhurst	M.	75·7	34	—	—	19 4	?	—	41·5
West Bromwich	M.S.	78·7	35	12 4	+ 5	21 53	+ 8	—	47·7
Shide	—	78·2	36	12 23	+15	22 4	+ 2	32·6	35·7
De Bilt	—	80·3	32	12 22	+ 1	22 33	+ 6	e 37·7	46·4
Coimbra	—	80·8	47	12 20	- 4	22 37	+ 4	e 39·3	40·7
Uccle	—	80·8	33	e 12 23	- 1	e 22 35	+ 2	e 36·7	49·3
Paris	—	81·3	36	e 12 29	+ 2	e 22 48	+10	35·7	44·7
Rio Tinto	M.	83·3	48	23 40	? S	(23 40)	+40	—	52·7
Besaçon	—	84·1	35	23 9	? S	(23 9)	0	—	41·7
Osaka	O.	84·2	308	12 51	+ 8	23 13	+ 3	33·4	41·0
San Fernando	—	84·4	49	22 40	? S	(22 40)	-32	39·7	48·7
Cipolletti	M.	85·2	144	42 10	? L	44 28	?	(42·2)	46·5
Zurich	—	85·2	34	e 12 47	- 2	e 23 29	+ 8	—	—
Tortosa	—	85·6	43	12 50	- 1	23 33	+ 7	39·5	57·5
Barcelona	—	86·1	41	e 12 53	- 1	23 37	+ 6	36·9	52·7
Moncalieri	S.	86·5	36	i 23 33	? S	(i 23 33)	- 3	42·7	48·0
Marselles	Ma.	86·6	38	—	—	e 35 57	?	41·7	48·7
Milan	—	86·8	35	—	—	22 53	-46	44·7	—
Graz	W.	88·5	30	e 13 24	+16	—	—	—	—
Triest	W.	88·8	32	—	—	23 38	-23	—	—
Lemberg	B.O.	89·5	24	e 23 58?	? S	(e 23 58?)	-11	40·2	51·6

Continued on next page.

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Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. s.	s.	M. s.	s.	M.	M.
Pola	W.	89.5	33	—	—	e 23 28	-41	e 46.5	49.8
Budapest	—	89.6	28	14 10	+56	—	—	—	—
Rio di Janeiro	M.	89.6	118	—	—	e 23 52	-18	46.7	—
Zagreb	W.	81.7	31	—	—	e 23 40	-31	38.7	48.7
Algiers	B.M.	89.8	44	e 13 10	-5	24 0	-12	38.7	47.7
Rocca di Papa	A.g.	91.3	35	23 52	?S	(23 52)	-35	e 42.0	58.3
Zi-ka-wei	—	95.3	313	e 14 38	+53	e 24 20	-49	—	50.3
Athens	—	99.5	31	—	—	e 24 40	-71	e 47.9	52.0
Taihoku	O.	99.7	309	—	—	—	—	e 40.4	—
Manila	W.	107.2	302	19 20	?PR <sub>1</sub>	—	—	—	54.2
Acra	M.	108.3	70	29 40	?S	(29 40)	+147	—	66.7
Helwan	M.	109.5	29	24 52	?	—	—	—	73.4
Sydney	M.	109.7	242	—	—	—	—	57.1	58.0
Riverview	—	109.8	242	e 14 34?	-22	e 26 52	-34	e 50.9	52.4
Melbourne	M.	116.0	240	—	—	29 46	+88	61.4	63.5
Cape Town	M.	142.8	103	52 58	?	—	—	—	97.0
Mauritius	—	165.6	22	57 40	?	—	—	—	98.8

Additional records: Berkeley gives  $T_0 = 22h.32m.14s.$  Victoria  $T_0 = 22h.32m.0s.$  Lawrence SN? = +7m.23s., LN? = +9.6m. = LE?, MN = +10.0m.,  $T_0 = 22h.32m.22s.$  Ann Arbor  $T_0 = 22h.32m.24s.$  Toronto IS = +13m.22s., IL = +19.3m.,  $T_0 = 22h.32m.24s.$  Washington MN = +17.7m.,  $T_0 = 22h.32m.13s.$  St. Louis  $T_0 = 22h.32m.8s.$  Georgetown  $T_0 = 22h.32m.4s.$  Sitka  $T_0 = 22h.32m.7s.$  Cheltenham  $T_0 = 22h.32m.32s.$  Ithaca  $T_0 = 22h.32m.4s.$  Ottawa SR<sub>1</sub>N = +13m.54s.,  $T_0 = 22h.32m.24s.$  Northfield MN = +20.2m.,  $T_0 = 22h.32m.33s.$  Point Loma records 22h.33m. Harvard L = +19.2m. and  $T_0 = 2h.32m.24s.$  La Paz  $T_0 = 22h.32m.24s.$  Dyce eS = +22m.18s., M = +44.9m. De Bilt MN = +44.2m.,  $T_0 = 22h.32m.29s.$  Coimbra LN = +38.5m.,  $T_0 = 22h.32m.21s.$  Uccle MN<sub>2</sub> = +44.4m., MZ<sub>2</sub> = +43.4m.,  $T_0 = 22h.32m.29s.$  Paris MN = +39.7m.,  $T_0 = 22h.32m.28s.$  Osaka MN = +39.7m.,  $T_0 = 22h.32m.47s.$  San Fernando MN = +49.2m. Zurich  $T_0 = 22h.32m.22s.$  Barcelona  $T_0 = 22h.32m.27s.$  Moncalieri S = +34m.46s., MN<sub>1</sub> = +47.2m. Pola MN = +48.7m. Algiers  $T_0 = 22h.32m.37s.$  Athens MN = +57.0m. Riverview PS = +28m.36s., eSR<sub>1</sub> = +34m.34s., and +36m.16s., MN = +55.4m. Melbourne SR<sub>1</sub> = +36m.34s., SR<sub>2</sub> = +41m.40s. Mauritius NM = +98.0m.

April 21d. 23h. 23m. 0s. Epicentre 47° 0N. 98° 0E.

A = -095, B = +675, C = +731.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	22.5	233	5 18	+7	—	—	—	14.5
Bombay	34.8	227	12 49	?S	(12 49)	-3	—	—
Kodalkanal	40.7	214	8 0	-1	—	—	23.9	27.7
Colombo	43.0	210	14 6	?S	(14 6)	-42	27.3	34.5
Apia	100.2	100	—	—	(26 0)	+2	26.0	—

Simla gives MN = +13.3m. Colombo M = +43.5m.

April 21d. Records also at 4h. (Kodalkanal), 8h. (Rio Tinto and Kodalkanal), 20h. (Zi-ka-wei), 23h. (Cipolletti and Fordham).

April 22d. Records at 1h. (Uccle, Triest, Graz, Osaka, Zi-ka-wei, and De Bilt), 4h. (Vieques), 5h. (Helwan), 7h. (La Paz), 17h. (Helwan), 22h. (Denver).

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April 23d. 15h. 27m. 0s. Epicentre 4°0S. 122°6E. (Celebes). Epicentre adopted from De Bilt. It does not suit Manila records unless S is one minute in error.

$$A = -.538, B = +.840, C = -.070.$$

	$\Delta$		P.		O-C.		S.		O-C.		L.		M.	
	°	'	m.	s.	s.	m.	s.	m.	s.	m.	m.	m.	m.	m.
Batavia	15.8	261												
Manila	18.7	355	e 4	24		1	7	0	-55		7.9			11.0
Perth	28.7	191	11	0	?S		(11 0)		-12					8.5
Melbourne	39.5	152					21	12	?		25.4			27.1
Riverview	40.0	143	e 13	36	?S		(e 13 36)		-31	e	21.4			25.9
Colombo	44.1	282	18	0	?									30.0
Kodaikanal	47.3	287	28	54	?L						(28.9)			
Helwan	93.2	300	25	0	?S		(25 0)		+13					
De Bilt	109.8	325									e 58.0			62.9
Eskdalemuir	113.0	329									58.0			

Additional records: Manila gives  $T_0 = 15h.23m.12s.$  Melbourne  $SR_1 = +23m.18s.$  Riverview  $MN = +25.3m.$  De Bilt  $eLN = +57.0m.$

April 23d. Records also at 0h. (Monte Cassino), 3h. (San Fernando), 12h. (Monte Cassino), 13h. (Rio Tinto), 18h. (Monte Cassino), 19h. (La Paz), 20h. and 21h. (Monte Cassino), 23h. (San Fernando).

April 24d. 14h. 21m. 20s. Epicentre 46.4N. 10.0E.

$$A = +.679, B = +.120, C = +.724; \quad D = +.174, E = -.985; \\ G = +.713, H = +.126, K = -.690.$$

	$\Delta$		P.		O-C.		S.		O-C.		L.		M.	
	°	'	m.	s.	s.	m.	s.	m.	s.	m.	m.	m.	m.	m.
Milan	1.1	211	0	15	-2		0	23	-8					0.8
Zurich	1.4	314	i 0	23	+2		0	36	-3	i	1.0			1.0
Moncalieri	2.1	229	0	29	-4		0	52	-6					1.2
Hohenheim	2.4	347	e 0	48	+11									
Triest	2.7	106	e 1	1	+19									
Pola	3.1	120									e 1.6			1.9
Graz	3.8	78	1	11	+12									
Zagreb	4.2	96	e 1	13	+8		2	29	+34					2.5
Marselles	4.5	228	1	23	+13		1	49	-15					
Rocca di Papa	5.0	156	e 1	26	+9									3.5
Paris	5.6	299	e 1	26	-1						3.1			3.7
Uccle	5.8	322	(e 1	34)	+4		e 3	15	+36					
Budapest	6.2	77									3.5			
Potsdam	6.3	17	e 2	16	+40									
De Bilt	6.5	332									e 3.5			4.8
Tortosa	8.8	235	3	40	?S		(3 40)		-18		(4.9)			6.3

Additional records: Zurich gives a number of observations, two Ps and an S on each of the three components in addition to those recorded above. Also  $T_0 = 14h.21m.18s.$  Moncalieri  $MN = +1.1m.$ ,  $T_0 = 14h.21m.17s.$  Besancon ( $\Delta = 2^\circ.9$ ),  $P = 14h.21m.0s.$ ,  $S? = 14h.22m.0s.$  Zagreb  $i = +1m.16s.$  Vienna ( $\Delta = 5^\circ.4$ ), records 14h.23m. to 14h.35m. De Bilt  $L = +4.6m.$ ,  $MN = +4.7m.$

April 24d. Records also at 2h. (Manila), 3h. (De Bilt and Eskdalemuir), 4h. (Mizusawa (2) and Helwan), 16h. (Barcelona and Honolulu), 20h. (Manila).

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**1918. April 25d. 2h. 22m. 35s. Epicentre 34°5N. 41°8E.**

A = +.614, B = +.549, C = +.566; D = +.667, E = -.746;  
G = +.422, H = +.378, K = -.824.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	10.0	245	2 31	+ 1	6 25	?L	(6.4)	8.8
Athens	E. 15.0	289	4 6	+27	—	—	e 7.3	11.2
	N. 15.0	289	4 10	+31	—	—	e 7.2	11.0
Lemberg	20.1	325	4 42?	0	i 8 7	-18	e 12.9	15.3
Zagreb	N.W. 22.6	308	e 5 10	- 2	e 9 17	0	14.4	14.8
	N.E. 22.6	308	i 5 20	+ 8	19 22?	+ 5	—	15.2
Vienna	23.3	314	e 5 19	- 1	—	—	—	—
Pola	23.7	304	e 5 29	+ 4	e 9 45	+ 7	e 15.3	15.7
Rocca di Papa	23.9	297	5 41	+14	10 13?	+31	16.5	—
	23.9	297	e 5 41	+14	9 56?	+14	15.4	16.4
	27.9	308	e 6 5	- 2	e 11 7?	+10	—	—
Zurich	28.0	302	6 10	+ 2	i 13 24	?L	(i 13.4)	20.4
Moncalieri	31.4	315	6 37	- 5	11 52	- 6	e 18.4	24.2
De Bilt	31.5	313	e 6 25	-18	—	—	—	—
Uccle	31.7	294	—	—	—	—	e 14.4	22.8
Barcelona	32.2	309	—	—	e 11 41	-30	—	—
Paris	33.0	294	6 53	- 3	12 12	-12	14.5	23.5
Tortosa	36.3	316	—	—	—	—	(23.2)	26.4
Stonyhurst	36.6	315	23 13	?L	—	—	—	—
Bidston	37.1	317	7 21	-10	—	—	—	—
Eskdalemuir	37.2	319	13 25	?S	(13 25)	- 2	—	27.4
Edinburgh	38.7	287	18 25	?L	—	—	(18.4)	—
San Fernando	39.8	294	—	—	e 11 51?	?	17.8	—
Coimbra	71.8	200	41 1	?L	—	—	(41.0)	43.0
Capetown	115.4	267	53 49	?L	62 49	?	(53.8)	—
La Paz								

Additional records: Athens LE = +9.3m., LE = +5.5m., M = +5.6m., Zagreb T<sub>0</sub> = 2h.22m.52s. Pola T<sub>0</sub> = 2h.22m.43s. Moncalieri L = +17.1m., MN = +19.3m. De Bilt eN = +12m.9s., m = +12m.16s., MN = +20.0m., T<sub>0</sub> = 2h.22m.34s. The La Paz records probably belong to a subsequent shock much nearer La Paz, but have been included for comparison.

April 25d. Records also at 2h. (Monte Cassino), 8h. (Stonyhurst and Riverview), 16h. (La Paz (2) and Manila), 17h. (Riverview), 18h. (Batavia), 21h. (La Paz, Balboa Heights, and Athens), 22h. (Helwan, Riverview, Manila, Marseilles, La Paz, and Batavia), 23h. (Melbourne).

April 26d. 13h. 14m. 52s. Epicentre 21°1N. 121°7E. (as on 1913 Jan 9d. 2h.).

A = -.490, B = +.794, C = +.360; D = +.851, E = +.526;  
G = -.189, H = +.306, K = -.933.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	3.9	0	—	—	1 54	+ 7	3.0	—
Manila	6.5	186	e 2 46	?S	(e 2 46)	-11	—	—
Zi-ka-wei	10.1	359	e 2 36	+5	—	—	e 49.1	52.2
De Bilt	88.4	327	—	—	—	—	—	49.1
Uccle	89.5	326	—	—	—	—	—	—

Zi-ka-wei gives its record under 14h. instead of 13h. De Bilt gives also MN = +50.6m.

April 26d. Records also at 18h. (Rocca di Papa), 19h. (La Paz).

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April 27d. 10h. 53m. 0s. Epicentre 40°-0N. 20°-0E. (as on 1917 April 26d. 13h.).

A = +.720, B = +.262, C = +.643; D = +.342, E = -.940;  
G = +.604, H = +.220, K = -.766.

	$\Delta$	Az.	P.		O-C.		S.	O-C.		L.	M.
			m. s.	s.	m. s.	s.		m.	m.		
Athens	3.6	123	e 0 55	- 1	1 29	-10	1.8	2.0			
Pompeii	4.2	281	e 1 13	+ 8	e 2 18	+23		3.3			
Rocca di Papa	5.8	291	e 1 46	+16	2 52?	+13		3.8			
Zagreb	6.5	335	e 1 38	- 1				4.1			
Pola	6.6	319					e 3.1	5.0			
Budapest	7.5	355					e 3.8				
Graz	7.8	337	e 2 21	+23							
Milan	9.6	308	4 18	?S	(4 18)	0	(e 5.2)	8.0			
Lemberg	10.2	15					e 5.8	6.2			
Moncalleri	10.3	303			1 42?	?	5.3	8.3			
Helwan	13.7	134	14 0	?							
Paris	15.2	311			e 6 0	-37	9.0	9.0			
Uccle	15.3	320					e 8.0	10.0			
De Bilt	15.8	325					8.2	10.5			
Bidston	20.6	318	9 6	?S	(9 6)	+30		19.4			
Edinburgh	22.0	324	9 0	?S	(9 0)	- 5					

Additional records: Athens gives  $T_0=10h.53m.9s.$  Rocca di Papa e = +1m.5s., M = +3.4m., M = +6.1m. Zagreb M = +4.4m. and M = +5.2m. The record is given one hour late. Milan records S as P and L as S, also S ten seconds early. Moncalleri MN = +7.9m. De Bilt MN = +10.6m.

April 27d. 14h. 43m. 45s. Epicentre 8°-7N. 83°-0W.

A = +.120, B = -.981, C = +.151; D = -.993, E = -.122;  
G = +.018, H = -.150, K = -.989.

	$\Delta$	Az.	P.		O-C.		S.	O-C.		L.	M.
			m. s.	s.	m. s.	s.		m.	m.		
La Paz	29.1	150	e 11 22	?S	(e 11 22)	+ 3	28.2	29.8			
Washington	30.7	9					e 18.1				
Georgetown	30.7	9			13 40?	?SR <sub>1</sub>	e 17.5				
Ann Arbor	33.6	359	7 15	+14	13 3	+29	17.8	20.2			
Ithaca	34.2	8					e 18.6				
Tucson	34.9	316	13 0	?S	(13 0)	+ 6		18.2			
Toronto	35.1	4					18.4	24.0			
Harvard	35.3	15	e 8 15?	?PR <sub>1</sub>	12 57	- 3	e 17.3				
Ottawa	37.3	9	e 7 30?	- 2	e 13 23?	- 5	18.2				
Victoria	52.2	327			23 33	?	25.8	28.0			
Edinburgh	77.1	34	23 45	?S	(23 45)	+115		48.6			
Eskdalemuir	77.1	35					e 44.2				
Bidston	77.1	37	34 51	?L			(34.8)	47.8			
Stonyhurst	77.4	37						47.6			
Kew	78.7	39						49.2			
Paris	80.5	42			e 22 15	-14	e 41.2	50.2			
De Bilt	E. 82.0	38			e 22 38	- 8	e 41.2	49.6			
N. 82.0	38						e 43.2	50.2			
Moncalleri	84.4	45	e 48 43	?			52.3				
Helwan	106.2	55	70 15	?							

Additional records: Tacubaya ( $\Delta=19^\circ-0$ ) gives P = +1m.33s., M = +3.7m. This would indicate a distance  $\Delta=6^\circ$  about, but it may be another and more local shock. La Paz gives  $T_0=14h.44m.51s.$ , S<sub>1</sub>? = +19m.40s. Georgetown eLN = +17.8m. Ann Arbor Bosche record LN = +17.8m., MN = +21.2m. Harvard L = +20.4m., T<sub>0</sub> = +14h.43m.43s. Ottawa SR<sub>1</sub>N = +15m.39s., LN = +21.2m. and +26.2m., T<sub>0</sub>? = 14h.43m.50s.

April 27d. Records also at 3h. (Manila), 7h. (Pompeii and Berkeley), 8h. (Barcelona), 11h. (La Paz), 14h. (Helwan), 20h. (Harvard and La Paz).

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April 28d. 11h. 12m. 40s. Epicentre 30°-5N. 82°-0E. (as on 1916 Oct. 14d.).

A = +.120, B = +.854, C = +.508; D = +.990, E = -.139;  
G = +.071, H = +.503, K = -.862.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	43.4	283	8 26	+ 5	14 50	- 4	—	16.4
Zagreb	52.6	307	e 9 17	- 7	—	—	21.3	23.0
Graz	52.7	308	e 9 22	- 2	—	—	—	—
Triest	54.1	307	—	—	—	—	e 22.3	—
Rocca di Papa	55.6	302	—	—	—	—	e 18.4	24.2
Moncalieri	58.5	307	e 11 38	?PR <sub>1</sub>	17 59?	- 6	e 23.9	27.6
De Bilt	58.6	316	—	—	e 16 47	?	e 25.3	31.9
Paris	61.0	312	—	—	—	—	e 27.3	28.3
Edinburgh	62.6	321	21 20	?	—	—	—	—
Eskdalemuir	62.8	320	—	—	—	—	—	—
Bidston	63.2	318	26 2	?SR <sub>1</sub>	—	—	(36.3)	36.6
Capetown	88.0	228	36 20	?L	—	—	—	40.8

Additional records: Moncalieri MN = +28.4m. De Bilt eLN = +23.3m., MN = +27.1m.

April 28d. Records also at 0h. (Helwan, 3h. (San Fernando), 9h. (Rio Tinto), 10h. (San Fernando, Rio Tinto, and Tortosa), 15h. (Mizusawa).

April 29d. Records at 1h. (Pa Paz), 5h. (Mizusawa), 7h. (Rio Tinto), 9h. (Batavia), 11h. (Helwan), 15h. (Edinburgh), 17h. (Marseilles), 23h. (Athens).

April 30d. Records at 7h. (Rio Tinto and Manila), 8h. (Monte Cassino), 11h. (La Paz), 13h. (Colombo), 14h. (La Paz), 17h. (Taihoku, Kobe, and Osaka).

May 1d. 4h. 33m. 12s. Epicentre 35°-0N. 110°-0W.

A = -.280, B = -.770, C = +.574.

	$\Delta$	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	N.	2.8	0 38	- 6	—	—	1.7
	E.	2.8	1 0	+16	—	—	1.6
Lick		9.7	e 2 33	+ 7	—	—	—
Berkeley		10.3	2 31	- 3	—	—	—
Lawrence	E.	12.4	5 33	?S	(5 33)	+ 4	e 7.8
	N.	12.4	—	—	—	—	e 7.9
Victoria		16.6	—	—	—	—	7.5
Toronto		25.0	—	—	—	—	12.4

Point Loma records P at 4h.32m.

May 1d. 4h. 48m. 5s. Epicentre 41°-0N. 77°-0W.

A = +.170, B = -.735, C = +.656.

	$\Delta$	P.	O-C.	S.	O-C.	L.
	°	m. s.	s.	m. s.	s.	m.
Ithaca		1.4	—	—	e 0 47	+ 8
Georgetown	E.	2.1	e 0 28	- 5	—	e 1.2
	N.	2.1	e 0 26	- 7	—	4.1
Toronto		3.2	—	—	—	4.2
Ottawa		4.5	e 1 6?	- 4	e 1 55?	1.5
Harvard		4.6	—	—	e 2 26	2.4
					+ 20	3.1

Additional records: Ottawa gives L = +6.9m., T<sub>0</sub> = 4h.48m.10s. Harvard gives eE = +2m.55s., SN? = +2m.56s., LN = +3.4m., LE = +6.8m. Washington gives these observations, but fails to record seconds: eP = 4h.48m., eS? = 4h.49m., L = 4h.50m.

May 1d. Records also at 0h. (San Fernando), 5h. (La Paz (2)), 6h. and 13h. (Helwan), 14h. (Toronto), 22h. (Lick).

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May 2d. 0h. 0m. 45s. Epicentre 14° 0S., 174° 0W. (as on 1917 July 11d. 22h.).  
 A = -0.965, B = -0.101, C = -0.242; D = -0.105, E = +0.995;  
 G = +0.241, H = +0.025, K = -0.970.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Apia	2.2	86	10 33	-1	—	—	0.9	1.2
Riverview	37.2	232	(e 7 33)	+1	e 7 33	?P	e 16.0	22.3
Melbourne	43.4	229	—	—	—	—	22.8	26.4
La Paz	100.7	110	45 49	?	—	—	47.4	48.1
Helwan	151.7	309	109 15	?L	—	—	(109.2)	—
Tortosa	152.8	9	55 29	?	—	—	55.6	55.6
	152.8	9	56 13	?	—	—	56.6	56.7

Riverview records MN at +20.8m. Probably the records given by Tortosa and Helwan have no connection with this shock.

May 2d. Records also at 2h. (Washington, Harvard, Taihoku, Georgetown, and Ottawa), 4h. (Ottawa and San Fernando), 7h. (La Paz), 10h. (Zi-ka-wei, Taihoku, and Riverview), 21h. (Rocca di Papa), 23h. (Lick).

May 3d. Records at 0h. (Rio de Janeiro), 10h. (Taihoku (2) and Rocca di Papa), 17h. (Bidston, De Bilt, and Eskdalemuir), 19h. (La Paz).

1918. May 4d. 6h. 6m. 5s. Epicentre 21° 0N. 120° 0E.  
 (as on 1917 Aug. 14d. 23h.).

A = -0.467, B = +0.810, C = +0.358; D = +0.866, E = +0.500;  
 G = -0.179, H = +0.310, K = -0.934.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
Taihoku	O.	4.3	19	M. s.	s.	M. s.	s.	M.	M.
Manila	W.	6.4	171	e 1 39	+1	3 48	+53	4.4	5.2
Zi-ka-wei	—	10.3	7	e 2 19	-15	e 5 5	?L	(5.1)	10.4
Kobe	O.	19.2	41	e 4 18	-13	(8 3)	-3	8.0	16.4
Osaka	O.	19.3	42	e 4 19	-14	(8 0)	-8	8.0	16.4
Tokyo	O.	22.7	45	e 6 30	+77	—	—	—	—
Mizusawa	E.	25.7	40	e 5 32	-13	9 58	-18	—	—
	N.	25.7	40	e 5 36	-9	10 21	+5	—	—
Batavia	W.	30.1	208	e 5 55	-34	—	—	—	—
Colombo	M.	41.3	257	27 25	?L	—	—	(27.4)	13.9
Kodaikanal	M.	42.3	262	17 1	?SR <sub>1</sub>	—	—	—	—
Riverview	—	62.4	151	—	—	(19 7?)	—	24.7	29.8
Melbourne	M.	63.3	158	—	—	e 32 13	+14	e 31.2	37.5
Helwan	M.	78.7	297	10 55	?	—	?L	(e 32.2)	41.4
Zagreb	W.	84.4	318	e 12 44	0	e 23 3?	-9	47.9	50.9
	W.	84.4	318	i 12 51	+7	i 23 13	+1	—	59.9
Triest	W.	85.9	319	—	—	23 27	-2	—	—
Pola	W.	86.1	318	e 12 58	+4	e 23 14	-17	e 49.9	54.9
Hohenheim	—	87.2	322	—	—	—	—	e 43.9	—
De Bilt	N.	87.7	326	—	—	23 27	-22	e 43.9	51.3
	E.	87.7	326	—	—	—	—	e 43.9	57.4
Rocca di Papa	Ag.	88.3	315	e 12 57	-10	(e 23 47)	-8	e 23.8	23.9
Ucle	—	88.8	326	e 13 13	+4	e 23 31	-30	e 46.9	48.9
Eskdalemuir	G.	89.9	332	13 6	-9	e 23 34	-39	41.4	50.0
Moncalieri	S.	89.9	320	—	—	e 23 28	-45	50.0	53.2
Stonyhurst	M.	90.5	329	—	—	i 20 25	?	—	53.4
Victoria	M.	90.7	37	—	—	—	—	—	87.1?
Paris	—	90.9	325	—	—	—	—	—	—
Bidston	M.S.	91.0	329	21 55	?	e 23 46	-37	45.9	49.9
Barcelona	—	95.2	319	—	—	31 7	?SR <sub>1</sub>	—	60.3
Tortosa	—	96.9	319	24 16	?S	(24 16)	-69	e 52.3	64.4
Algiers	—	97.2	314	—	—	—	—	54.6	64.7
Coimbra	B.M.	102.4	323	e 24 55?	?	32 55?	?SR <sub>1</sub>	e 51.4	59.9
Rio Tinto	M.	102.8	320	30 55	?SR <sub>1</sub>	—	—	—	—
La Paz	Bi.	171.1	61	20 18	[+3]	34 55?	?	e 86.9	96.2

Additional records : Manila gives MN = +4.7m., T<sub>1</sub> = 6h.5m.6s. Kobe MN = +18.0m. Osaka MN = +18.8m. Riverview gives S as SR<sub>1</sub>, e = +24m.25s., MN = +36.9m. Melbourne L = +40.4m. Pola MN = +57.6m., T<sub>1</sub> = 6h.6m.45s. Eskdalemuir PR<sub>1</sub> = +16m.46s., T<sub>1</sub> = 6h.8m.41s. Moncalieri MN = +55.1m. Barcelona MN = +57.4m.



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May 4d. Records also at 4h. (Kobe), 5h. (De Bilt), 7h. (San Fernando), 11h. (Mizusawa), 13h. (Osaka, Rio Tinto, and Mizusawa (2)), 14h. and 15h. (De Bilt), 21h. (Taihoku), 22h. (La Paz).

May 5d. Records at 0h. (San Fernando), 1h. (Helwan), 8h. (Uccle), 12h. (Taihoku), 14h. (Zi-ka-wei), 23h. (La Paz and Mizusawa).

May 6d. 4h. 56m. 55s. Epicentre 36°·8N. 114°·3W. (as on 1915 Oct. 3d. 1h.).

A = -·330, B = -·730, C = +·599; D = -·911, E = +·412;  
G = -·246, H = -·546, K = -·801.

Washington and some other stations suggest an origin out in the Pacific. Possibly there were two shocks.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	m. s.	s.	m. s.	s.	m.	m.
Tucson	N.	5·3	147	e 2 15	?S	(2 15)	-10	—	3·7
	E.	5·3	147	—	—	—	—	2·9	3·6
Lick		5·9	279	—	—	—	—	e 5·4	—
Berkeley		6·4	280	—	—	e 2 5	-50	—	10·0
Lawrence		15·2	76	e 3 37	- 5	6 26	-11	8·9	9·6
Ann Arbor	E.	24·1	67	—	—	13 29	?L	(13·5)	14·7
Toronto		27·3	64	—	—	—	—	i 15·5	16·0
Georgetown	E.	29·3	74	—	—	e 15 31	?	17·8	—
	N.	29·3	74	—	—	e 15 32	?	16·3	—
Washington		29·3	74	8 5?	?	14 5?	—	19·1?	—
Ithaca	N.	29·4	67	—	—	e 11 25	+ 1	16·3	—
Ottawa		30·0	61	e 9 19?	?	13 33	?SR <sub>1</sub>	16·1	19·1
Northfield		32·1	62	—	—	e 17 45	?	18·8	—
Harvard		35·4	68	—	—	e 18 14	?	19·2	—
Edinburgh		70·5	34	37 35?	?L	—	—	(37·6?)	46·1
Eskdalemuir		70·8	34	—	—	—	—	33·1	—
Bidston		72·1	36	29 47	?	38 35	?L	(38·6)	43·8
Kew		74·9	37	—	—	—	—	—	46·1
Rocca di Papa		87·8	37	—	—	i 23 59?	+ 9	—	—
Helwan		106·0	31	70 5	?L	—	—	(70·1)	—

Additional records: Lawrence gives iP? = +3m.19s. Ann Arbor SN = +13m.23s. (?L), L = +15·5m. Ithaca LE = +16·5m. Ottawa Ls from +22·1m. to +46·1m.

May 6d. 8h. 3m. 47s. Epicentre 41°·7N. 8°·5E.

A = +·738, B = +·110, C = +·665.

		$\Delta$	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		3·1	2 5	?L	—	—	(2·1)	4·0
Moncalieri		3·3	0 52	0	1 28	- 3	—	1·8
Milan		3·8	1 1	+ 2	1 52	+ 8	—	2·3
Monte Cassino		4·0	2 25	?L	—	—	(2·4)	—
Zurich	E.	5·6	e 2 2	+35	i 2 42	+ 8	—	3·0
	N.	5·6	e 2 3	+36	i 2 45	+11	—	—
Zagreb		6·8	e 2 17	+33	i 3 3	- 2	i 3·3	3·6
Batavia		100·3	—	—	—	—	e 45·2	—

Additional records: Rocca di Papa MN = +3·5m. Moncalieri MN = +2·1m. Zurich ePV = +2m.5s. Zagreb P = +2m.26s., SNE = +3m.14s.

May 6d. Records also at 0h. (San Fernando and Monte Cassino), 1h. (Monte Cassino and Rocca di Papa), 6h. (Stonyhurst), 7h. (Zurich and Zagreb), 13h. (La Paz), 14h. (Mizusawa and La Quiaca), 15h. (Ann Arbor), 20h. (Tortosa), 23h. (San Fernando).

May 7d. 6h. 28m. 46s. Epicentre 36°·0N. 139°·0E. (as on 1916 Aug. 8d. 4h.).

A = -·611, B = +·531, C = +·588.

		$\Delta$	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		0·7	0 12	+ 1	0 23	+ 3	—	0·6
Osaka		3·2	—	—	1 28	- 0	2·4	3·2
Kobe		3·4	—	—	1 31	- 3	2·6	2·7
Mizusawa	N.	3·5	0 56	+ 1	1 40	+ 3	—	—
	E.	3·5	0 53	- 2	1 34	- 3	—	—

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May 7d. Records also at 0h. (Colombo), 4h. (Athens), 5h. (St. Louis), 7h. (Rio Tinto), 12h. (La Paz), 13h. (Mizusawa), 14h. (Edinburgh), 15h. (Helwan and La Paz), 18h. (Taihoku), 19h. (La Paz), 22h. (San Fernando).

May 8d. Records at 1h. (Rocca di Papa and Monte Cassino (2) ), 2h. (Colombo), 4h. (Zagreb), 6h. (Rio Tinto), 7h. (Mizusawa), 13h. (Zi-ka-wei), 16h. (Batavia), 17h. (Monte Cassino), 21h. (Colombo), 22h. (Taihoku).

May 9d. Records at 3h. (San Fernando), 9h. (Washington and Ottawa), 11h. (La Paz), 16h. (Tortosa and Barcelona), 19h. (Stonyhurst).

May 10d. Records at 6h. (Rio Tinto), 13h. (De Bilt and Cipolletti), 14h. (La Quiaca), 15h. (De Bilt and Edinburgh), 16h. (Eskdalemuir), 17h. (Manila), 18h. (Kew), 19h. (La Paz).

May 11d. 21h. 23m. 4s. Epicentre 27° 8S. 113° 4W.

$$A = -351, B = -812, C = -466; D = -918, E = +397; \\ G = +185, H = +428, K = -885.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
La Paz	43.1	84	8 19	0	i 14 51	+ 2	18.1	19.9
Berkeley	66.1	354	—	—	—	—	e 28.9	—
Washington	74.8	30	e 10 56?	-52	e 20 56?	-28	e 40.9	—
Toronto	77.9	25	—	—	—	—	40.4	—
Sydney	79.0	239	33 26?	?	—	—	38.4	40.2
Riverview	79.1	239	e 15 20?	?PR <sub>1</sub>	e 22 14	+ 1	e 32.7	40.4
Harvard	80.2	30	—	—	18 6	?PR <sub>1</sub>	38.2	—
Ottawa	80.8	26	e 12 24	0	e 22 33	0	e 39.9	—
Northfield	81.0	29	—	—	—	—	e 33.9	—
Melbourne	81.7	232	—	—	37 14	?	44.9	47.7
Capetown	103.2	141	55 14	?L	—	—	(55.2)	57.7
Coimbra	118.5	57	—	—	—	—	e 53.9	—
San Fernando	119.1	62	63 56	?L	—	—	(63.9)	—
Eskdalemuir	123.8	40	—	—	e 27 57	-81	58.1	—
Edinburgh	123.9	39	—	—	27 56	-82	—	73.3
Stonyhurst	124.2	43	e 28 8	?S	(28 8)	-72	—	42.4
	124.2	43	54 38	?	e 61 26	?L	(e 61.4)	70.9
Paris	127.2	48	—	—	e 53 56	?	73.9	—
De Bilt	E. 128.9	43	—	—	e 27 32	-141	e 60.9	63.6
	N. 128.9	43	—	—	e 38 38	?SR <sub>1</sub>	e 54.9	65.5
Moncalieri	130.8	51	—	—	—	—	74.2	—
Mauritius	131.4	171	64 32	?L	—	—	(64.5)	67.6
Helwan	149.1	79	47 56	?	—	—	—	—
Colombo	155.6	211	86 56	?L	—	—	(86.9)	—

Additional records: Riverview gives MN = +44.5m. Harvard T<sub>1</sub>? = 21h.23m.27s. Ottawa L = +46.9m., +51.9m., T<sub>1</sub>? = 21h.23m.16s. Melbourne SR<sub>1</sub> = +41m.32s. Eskdalemuir e = +30m.43s. S<sub>1</sub>? = +37m.47s. De Bilt eE = +39m.2s. ?SR<sub>1</sub>E. Epicentre 27° 7S, 113° 6W.

May 11d. Records also at 1h. (San Fernando), 2h. (Helwan), 4h. (Mizusawa), 9h. (Cipolletti), 11h. (Taihoku), 13h. (Rio Tinto), 20h. (Mizusawa, Harvard, Osaka, and Kew), 23h. (Stonyhurst and Rio Tinto).

May 12d. Records at 5h. (Taihoku and Zi-ka-wei), 11h. (Cipolletti), 13h. (De Bilt (2) and Athens).

May 13d. 13h. 58m. 3s. Epicentre 42° 8N. 12° 3E. (as on 1917 May 19d. 15h.).

$$A = +717, B = +156, C = +679.$$

	$\Delta$	P.	O-C.	S.	O-C.	M.
	°	m. s.	s.	m. s.	s.	m.
Rocca di Papa	1.1	10 18	+ 1	0 31	0	1.0
Monte Cassino	1.8	0 27	- 1	—	—	1.1
Pola	2.4	—	—	e 1 3	- 3	1.7
Pompeii	2.6	e 0 52	+11	—	—	1.8

Rocca di Papa gives MN = +0.8m.

May 13d. Records also at 1h. (De Bilt), 2h. (San Fernando), 3h. (Manila and Batavia), 5h. (Zagreb), 8h. (Helwan and Cipolletti), 9h. (Edinburgh), 11h. (Andalgala), 14h. (Manila), 16h. (Rocca di Papa), 23h. (Zi-ka-wei).

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May 14d. Records at 0h. (Zagreb), 2h. (San Fernando and Zi-ka-wei), 4h. (Rocca di Papa), 5h. (Lick), 15h. (Helwan), 16h. (La Paz), 19h. (La Paz, Uccle, Edinburgh, Manila, and Riverview), 21h. (Helwan, Lick, and De Bilt (2)).

May 15d. Records at 1h. (San Fernando), 4h. (Manila), 7h. and 8h. (La Paz), 9h. (Kew), 16h. (Manila), 23h. (La Paz).

May 16d. 21h. 25m. 35s. Epicentre 18°-0N. 100°-0W. (as on 1917 Oct. 19d.).

A = -.165, B = -.937, C = +.309; D = -.985, E = +.174;  
G = -.054, H = -.304, K = -.951.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	N.	28.0	27	6 43	+35	10 25	-34	—	16.6
	E.	28.0	27	6 37	+29	9 37?	-82	16.2	16.4
Georgetown		28.8	39	e 12 48	?SR <sub>1</sub>	—	—	e 20.0	—
Washington		28.8	39	—	—	e 16 42	?	e 20.4	—
Toronto		31.0	30	—	—	—	—	e 21.6	24.6
Ottawa		34.0	31	e 7 59?	+54	e 12 37?	-3	e 15.1?	—
Harvard		34.6	39	19 59	?	21 7	?	e 23.9	24.4
Northfield		34.8	35	—	—	—	—	e 23.4	—
Victoria		35.8	333	16 14?	?SR <sub>1</sub>	—	—	18.2	19.7
La Paz		46.6	136	e 8 48	+4	e 15 48	+12	23.9	26.9
Edinburgh		79.0	35	23 25	?S	(23 25)	+73	—	52.9
Eskdalemuir		79.0	35	12 5?	-8	—	—	34.4	—
Bidston		79.9	37	36 37	?L	44 1	?	(36.6)	52.5
Kew		81.9	38	—	—	—	—	—	51.4
Paris		84.5	40	—	—	—	—	e 52.4	—
De Bilt	E.	84.8	37	12 45	-2	e 23 5	-12	e 48.4	57.2
	N.	84.8	37	—	—	e 23 29	+12	e 49.4	56.0
Helwan		113.0	45	75 25	?L	—	—	(75.4)	—

Additional records: Ann Arbor gives LN = +15.9m., ME = +18.5m. Berkeley ( $\Delta = 27^\circ 8'$ ) gives e at 21h.16m. ± Georgetown SN? SE? = +17m.46s., LE = +20.8m. Ottawa Ls at +21.4m. and 24.4m., +28.4m. and +34.4m. T. = 21h.27m.44s.

May 16d. Records also at 1h. and 4h. (Manila), 6h. (Kobe and Osaka), 11h. (Taihoku and Zi-ka-wei), 16h. (Tacubaya), 20h. and 22h. (La Paz), 23h. (Lick).

May 17d. Records at 3h. (Zagreb), 4h. (Colombo), 5h. (La Paz), 15h. (La Paz), 18h. (Edinburgh (2)), 19h. (La Paz), 22h. (Stonyhurst), 23h. (Lick).

May 18d. Records at 0h. (San Fernando), 1h. (Stonyhurst), 2h. (Monte Cassino and Rocca di Papa), 3h. (Riverview), 9h. (Tacubaya), 15h. (Mizusawa), 16h. (Helwan), 18h. (Colombo).

May 19d. 0h. 25m. 22s. Epicentre 15°-9N. 83°-7E.

A = +.105, B = +.956, C = +.274; D = +.994, E = -.110;  
C = +.030, H = +.272, K = -.962.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta		7.9	30	2 2	+2	3 38	+4	—	—
Kodaikanal		8.4	233	—	—	—	—	4.0	7.4
Colombo		9.8	206	—	—	—	—	3.6	6.1
Bombay		10.9	290	3 1	+18	—	—	—	9.5
Simla		16.3	341	e 3 56	0	e 7 2	0	e 9.8	10.0
Batavia		31.8	134	e 12 38	?S	(e 12 38)	+33	—	—
Manila		35.9	88	e 6 52	-29	—	—	—	—
Helwan		49.8	297	17 44	?S	(17 44)	+88	—	37.2
De Bilt	E.	70.6	321	—	—	e 29 6	?	e 38.6	44.4
	N.	70.6	321	—	—	e 29 28	?	e 36.6	39.0
Kew		73.9	321	—	—	—	—	—	50.6
Edinburgh		75.2	326	46 18	?L	—	—	(46.3)	53.6
Eskdalemuir		75.3	325	—	—	—	—	34.6	—
Bidston		75.4	322	34 26	?L	38 50	?L	(34.4)	46.6

No additional records.

May 19d. Records also at 0h. (Apia), 3h. (Zagreb and La Paz), 10h. (Rio Tinto), 11h. (Eskdalemuir, Kew, and De Bilt), 13h. (Batavia), 17h. (Rocca di Papa, Manila, Zagreb, Mizusawa (2), and Osaka), 20h. (La Paz), 22h. (Taihoku).

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**1918. May 20d. 14h. 35m. 51s. Epicentre 7°4N. 35°2W.**

A = +.810, B = -.572, C = +.129; D = -.576, E = -.817;  
G = +.105, H = -.074, K = -.992.

Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
Rio de Janeiro	B.O.	31.2	194	M. S.	s.	M. S.	s.	M.	M.
Vieques	N. B.O.	31.3	295	e 6 33	- 7	(11 57)	+ 3	11.9	17.2
	E. B.O.	31.3	295	e 6 40	- 1	e 11 47	- 9	e 13.8	14.1
Acera	M.	34.9	90	e 6 39	- 2	e 11 39	- 17	e 13.4	16.6
San Fernando	—	39.3	37	13 49	? L	21 49	?	(13.8)	—
	—	39.3	37	7 39	- 10	13 51	- 5	19.6	24.6
La Paz	Bi.	40.4	233	6 21	- 88	13 39	- 17	19.2	26.2
Coimbra	M.	42.0	224	i 7 57	- 1	i 14 5	- 8	20.8	21.8
La Quiaca	N. M.	40.6	31	7 52	- 8	i 14 6	- 9	16.8	18.4
	E. M.	42.0	224	7 27	- 44	9 27	? PR <sub>1</sub>	—	—
Balboa Hts.	N. B.O.	43.9	276	7 57	- 14	9 57	? PR <sub>1</sub>	—	—
	E. B.O.	43.9	276	7 57	- 28	—	—	18.0?	18.2
Algiers	B.M.	45.5	46	i 8 30	- 7	15 11	- 10	20.1	18.4
Andalgala	N. M.	46.1	219	7 57	- 44	11 45	? PR <sub>1</sub>	—	26.8
	E. M.	46.1	219	8 27	- 14	11 27	? PR <sub>1</sub>	—	—
Tortosa	—	46.1	38	8 35	- 6	15 24	- 5	21.0	23.8
Harvard	N. B.O.	47.1	324	8 28	- 20	15 17	- 25	—	—
	E. B.O.	47.1	324	8 50	+ 2	15 31	- 11	—	—
Chacarita	M.	47.4	208	7 57	- 53	11 27	? PR <sub>1</sub>	25.0	—
Barcelona	—	47.5	38	8 46	- 5	i 15 39	- 9	19.0	25.3
Pilar	N. M.	47.7	214	8 27	- 25	10 27	?	—	16.4
	E. M.	47.7	214	8 33	- 19	13 57	- 113	—	28.0
Fordham	N. W.	47.9	320	4 21	?	i 11 16	? PR <sub>1</sub>	15.0?	—
	E. W.	47.9	320	—	—	i 11 19	? PR <sub>1</sub>	15.0?	—
Cheltenham	N. B.O.	48.8	316	9 3	+ 4	16 4	0	e 22.8	24.0
	E. B.O.	48.8	316	—	—	16 4	0	e 23.0	26.2
Georgetown	E. —	49.0	318	i 9 2	+ 2	i 16 8	+ 2	22.7	23.8
	N. —	49.0	318	i 9 3	+ 3	i 16 8	+ 2	22.7	24.0
Washington	Mar.	49.0	318	9 0	0	16 4	- 2	22.7	—
Northfield	B.O.	49.1	325	e 8 59	- 2	16 9	+ 2	21.2	—
Ithaca	E. B.O.	50.5	322	9 2	- 8	i 16 23	- 2	21.6	—
	N. B.O.	50.5	322	—	—	i 16 24	- 1	21.1	—
Marseilles	Ma.	50.5	37	i 9 14	+ 4	16 26	+ 1	—	16.6
Ottawa	—	51.6	326	i 9 19	+ 2	i 16 41	+ 2	e 22.2	—
Shide	M.S.	51.6	27	9 17	0	16 41	+ 2	20.7?	25.6
	M.B.	51.6	27	9 1?	- 16	16 18?	- 21	—	—
Paris	—	52.2	31	i 9 22	+ 1	i 16 45	- 1	23.2	25.2
Kew	M.	52.6	27	7 9	?	?	—	—	24.2
West Bromwich	M.S.	52.7	25	9 25	+ 1	16 54	+ 2	—	—
Bidston	M.S.	52.8	24	9 27	+ 2	16 45	- 9	—	25.2
Moncalieri	S.	52.8	38	i 9 26	+ 1	i 16 48	- 6	22.9	31.7
Toronto	M.	52.9	321	e 9 21	- 4	17 15	+ 20	e 22.6	29.8
Besançon	—	53.0	34	9 30	+ 4	17 3	+ 7	24.2	—
Stonyhurst	M.	53.1	24	i 6 21	?	i 15 45	?	i 21.8	28.4
Milan	—	53.9	37	9 43	+ 11	—	—	—	18.0
Eskdalemuir	G.	54.2	22	9 34	0	17 5	- 6	—	—
Zurich	—	54.2	36	i 9 41	+ 7	i 17 21	+ 10	—	—
Uecla	—	54.3	30	i 9 38	+ 3	i 17 15	+ 2	24.0	24.4
Rocca di Papa	Ag.	54.4	42	i 9 39	+ 4	i 17 20	+ 6	e 25.8	34.6
Edinburgh	M.	54.7	21	9 39	+ 2	—	—	—	24.8
Ann Arbor	E. B.	55.0	318	9 27	- 12	17 21	0	25.8	29.8
	N. B.	55.0	318	9 45	+ 6	17 33	+ 12	26.0	30.1
	E. B.	55.0	318	9 51	+ 12	—	—	26.0	27.6
	N. W.	55.0	318	—	—	—	—	25.8	27.2
Monte Cassino	Ag.	55.1	43	9 43	+ 3	—	—	—	10.1
Pompeii	N. O.A.	55.3	45	i 9 55	+ 14	i 17 45	+ 20	e 31.3	35.3
	E. O.A.	55.3	45	i 9 58	+ 15	i 17 38	+ 13	—	36.4
De Bilt	E. —	55.5	30	i 9 49	+ 6	i 17 33	+ 5	24.2	27.4
	N. —	55.5	30	—	—	i 17 34	+ 6	—	28.4
Cipolletti	M.	55.5	211	7 57	- 106	13 29	? PR <sub>1</sub>	—	16.6
Dyce	N. Ma.	56.1	21	i 9 53	+ 6	17 41	+ 6	23.0	29.3
	E. Ma.	56.1	21	9 53	+ 6	17 39	+ 4	23.0	29.6

Continued on next page.

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Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. s.	s.	M. s.	s.	M.	M.
Pola	W.	56.5	39	i 9 53	+ 4	(e 17 16)	-24	e 17.3	17.9
St. Louis	W.	58.3	311	i 10 15	+14	18 15	+12	27.4	33.0
Zagreb	W.	58.3	40	e 10 7	+ 6	e 18 5	+ 2	32.2	34.1
Athens	M.	61.2	51	10 26	+ 6	18 46	+ 8	e 24.2	30.6
Tacubaya	—	63.1	288	10 46	+13	—	—	—	—
Lemberg	B.O.	64.8	38	i 10 52?	+ 8	e 14 57	? PR <sub>1</sub>	e 35.2	39.0
Cape Town	M.	65.5	132	11 9	+21	20 9	+38	20.4	20.6
Helwan	M.	66.0	61	11 9	+18	13 27	? PR <sub>1</sub>	—	45.4
Tucson	E. B.O.	73.9	302	e 10 9	-92	e 21 9	- 4	e 35.2	43.2
Berkeley	B.O.	83.2	308	e 12 40	+ 3	e 23 4	+ 5	—	43.6
Victoria	M.	83.2	319	13 14	+37	23 18	+19	40.4	49.4
	Z.	83.2	319	13 3	+26	24 9	+70	40.6	46.6
Sitka	B.O.	89.2	328	e 24 10	? S	(e 24 10)	+ 5	e 36.9	43.2
Mauritius	N.	95.4	110	24 9	? S	(24 9)	-61	38.0	41.0
	E.	95.4	110	24 9	? S	(24 9)	-61	39.8	51.4
Bombay	O.E.	104.4	68	18 27	? PR <sub>1</sub>	—	—	—	61.1
Simla	O.E.	104.9	56	—	—	—	—	—	59.0
Kodaikanal	M.	110.7	76	28 39	? S	(28 39)	+65	57.2	67.6
Colombo	M.	113.6	79	—	—	21 45?	? PR <sub>1</sub>	36.2	73.4
Honolulu	M.	116.9	298	20 33	? PR <sub>1</sub>	26 9	?	30.2	36.8
Zi-ka-wei	—	135.4	29	e 21 57	? PR <sub>1</sub>	—	—	e 55.8	62.4
Apia	W.	136.9	258	e 23 54	? PR <sub>1</sub>	40 39	? SR <sub>1</sub>	75.2	82.2
Osaka	O.	137.0	12	22 42	? PR <sub>1</sub>	40 35	? SR <sub>1</sub>	61.1	79.0
Taihoku	O.	140.4	34	—	—	e 35 46	?	—	—
Batavia	W.	142.4	90	e 19 55	[+11]	—	—	e 72.2	88.2
Perth	M.	143.6	136	21 51	?	—	—	—	—
Manila	W.	147.7	46	e 20 6	[+14]	—	—	76.3	77.0
Melbourne	M.	149.6	181	—	—	42 51	? SR <sub>1</sub>	52.4	52.6
	M.	149.6	181	—	—	78 33	? L	82.6	86.6
Riverview	—	152.9	193	e 17 39	?	e 32 21	?	e 63.2	66.2
Sydney	M.	152.9	193	39 39	?	—	—	43.6	45.8

Additional records : Rio de Janeiro S = +10m.9s., M = +16.6m., M = +18.6m. San Fernando LE = +20.2m. La Paz PR<sub>1</sub> = +9m.30s., SR<sub>1</sub> = +17m.15s., M = +24.9m., T<sub>0</sub> = 14h.36m.3s. Coimbra PR<sub>1</sub>E = +9m.20s., PR<sub>1</sub>N = +9m.22s., S? = +13m.56s., LN = +16.9m., MN = +17.8m., T<sub>0</sub> = 14h.36m.4s. Barcelona PR<sub>1</sub> = +10m.31s., MN = +28.1m., T<sub>0</sub> = 14h.35m.57s. Pilar PE = +10m.39s. (?PR<sub>1</sub>). Fordham iPR<sub>1</sub>E = +6m.9s. Records given as 15h.— Harvard T<sub>0</sub> = 14h.35m.43s. Washington PR<sub>1</sub> = +13m.40s., L = +30.5m., +37.8m., and +54.8m., T<sub>0</sub> = 14h.35m.57s. Northfield L = +24.2m. Ottawa L = +29.2m., +32.2m., T<sub>0</sub> = 14h.35m.55s. Moncalieri MN = +30.2m., T<sub>0</sub> = 14h.36m.3s. Toronto iP = +16m.33s., L = +25.2m., T<sub>0</sub> = 14h.35m.24s. Eskdalemuir PR<sub>1</sub> = +11m.54s., T<sub>0</sub> = 14h.36m.0s. Uccle PR<sub>1</sub> = +12m.33s., M<sub>2</sub> = +25.9m., T<sub>0</sub> = 14h.35m.58s. Rocca di Papa M = +63.0m. Edinburgh M = +25.8m. De Bilt PR<sub>1</sub> = 11m.47s., m = +17m.43s., T<sub>0</sub> = 14h.36m.1s. Epicentre 8° 9'N., 37° 3'W. Pola MN = +29.8m. Zagreb i = +10m.17s. and +10m.29s., eS = +17m.26s., iS = +18m.14s., M = +37.2m. Athens MN = +42.6m., T<sub>0</sub> = 14h.35m.59s. Berkeley MN = +43.9m., T<sub>0</sub> = 14h.36m.5s. Mauritius, recrudescence PN = 16h.47m.54s., MN = 16h.50m.42s., PE = 16h.47m.42s., ME = 16h.50m.48s. Simla gives e = 14h.34m.48s. Possibly a mistake. Zi-ka-wei MN = +70.8m. Apia S? = +57m.9s. and +66m.9s. Osaka MN = +75.7m. Batavia M = +28.2m. ML<sub>2</sub> = +116.2m. Manila MN = +81.9m. Melbourne SR<sub>1</sub> = +47m.9s., SR<sub>2</sub> = +48m.27s., S = +78m.33s., SR<sub>1</sub> = +80m.27s. Riverview e = +43m.15s., +43m.37s., +44m.32s., and +44m.57s., MN<sub>1</sub> = +67.1m. The residuals [+13] and [+14] for Batavia and Manila suggest a "high focus," and this would suit some other features of the records, but not all. The La Paz records could not be reconciled with those of Europe on this supposition.

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**1918. May 20d. 17h. 55m. 5s. Epicentre 29°-6S. 71°-5W.**

$A = +.276, B = -.823, C = -.494; D = -.948, E = -.317;$   
 $G = -.157, H = +.468, K = -.870.$

The few antiecentric observations suggest a deep focus, which would account for the negative residuals in the azimuth of La Paz, but the evidence is scarcely sufficient to warrant a definitive solution.

Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
Andalgalá	M.	5.0	67	2 19	?S	(2 19)	+ 2	—	6.7
Pilar	N. M.	6.9	110	1 43	- 2	—	—	—	5.2
	E. M.	6.9	110	1 49	+ 4	—	—	—	5.2
La Quiaca	N. M.	9.1	36	3 7	+49	4 55	+49	—	—
	E. M.	9.1	36	3 13	+55	5 1	+55	—	—
Cipolletti	M.	9.8	164	0 43	-104	—	—	—	—
Chacareta	M.	12.1	118	2 43	-17	—	—	—	6.9
La Paz	Bi.	13.4	14	3 20	+ 2	5 56	+ 3	—	—
Rio de Janeiro	N. B.O.	26.2	82	15 43	- 7	10 13	-13	12.9	15.0
	E. B.O.	26.2	82	15 43	- 7	10 7	-19	12.9	16.7
Balboa Hts.	N. B.O.	39.3	347	7 5	-44	—	—	17.0?	17.1
	E. B.O.	39.3	347	6 59	-50	—	—	17.0?	—
Vieques	N. B.O.	48.2	8	10 50	+115	—	—	18.9	—
	E. B.O.	48.2	8	—	—	—	—	18.4	19.6
Cheltenham	N. B.O.	68.5	356	10 58	-10	—	—	—	20.3
	E. B.O.	68.5	356	11 16	+ 8	—	—	—	20.6
Georgetown	E. —	68.7	355	e 10 59	-10	i 19 57	-13	e 31.2	—
	N. —	68.7	355	i 10 57	-12	e 19 57	-13	e 31.2	—
Washington	Mar.	68.7	355	11 13	+ 4	19 57	-13	e 35.5	—
St. Louis	N. W.	70.4	345	i 11 13	- 6	(20 19)	-12	20.3	20.9
Harvard	M.	71.9	0	11 23	- 6	20 41	- 8	e 34.6	—
Ithaca	N. B.O.	72.1	356	11 17	-14	20 33	-18	—	—
	E. B.O.	72.1	356	—	—	i 20 31	-20	e 32.2	—
Ann Arbor	N. B.	72.8	351	11 43	+ 8	20 55	- 5	—	—
	N. W.	72.8	351	11 19	-16	—	—	32.8	33.9
	E. W.	72.8	351	11 25	-10	—	—	33.6	38.7
Toronto	M.	73.6	354	—	—	20 43	-26	—	21.4
Northfield	B.O.	73.8	359	e 11 32	- 9	20 55	-17	—	—
Cape Town	M.	74.0	121	11 43	+ 1	20 55	-19	40.9	42.9
Ottawa	—	75.1	357	11 37	-13	21 3	-24	e 34.9	—
Lick	W.	81.5	322	e 12 19	- 9	e 22 27	-14	—	—
Berkeley	E. —	82.4	322	i 12 18	-14	e 22 31	-19	—	53.6
	N. —	82.4	322	i 12 19	-13	i 22 32	-18	—	—
San Fernando	—	90.1	47	13 25	+ 8	23 25	-50	51.9	57.4
Victoria	M. W.	90.8	328	13 17	- 3	23 36	-46	39.8	52.3
	Z. W.	90.8	328	12 25	-55	25 7	+45	—	46.4
Coimbra	—	91.1	43	12 55	-27	23 25	-60	42.9	49.4
Apia	W.	91.8	253	e 12 55	-31	e 16 55	?PR <sub>1</sub>	19.9	27.9
Granada	C.	92.2	48	13 48	+20	24 54	+17	—	—
Algiers	B.M.	96.4	52	e 13 41	-10	23 55	-85	42.9	48.9
Tortosa	—	96.9	46	13 44	-10	23 59	-86	40.6	58.5
Barcelona	—	98.3	47	e 13 49	-13	24 3	-96	45.7	53.9
Paris	—	102.4	40	—	—	i 24 24	-115	46.9	55.9
Stonyhurst	M.	102.5	35	—	—	—	—	—	80.5
Moncalieri	S.	103.6	46	13 59	-29	24 21	-128	32.6	63.8
Uccle	—	104.4	39	e 14 1	-31	e 24 25	-132	45.9	61.9
Zurich	—	105.2	43	e 14 24	-11	24 39?	-125	—	—
Rocca di Papa	Ag.	105.3	50	e 14 25	-11	e 27 34?	+49	e 51.6	—
De Bilt	E. —	105.4	39	(e 18 53)	—	e 24 41	-125	50.9	52.6
	N. —	105.4	39	—	—	e 24 42	-124	55.9	56.6
Pompeii	—	106.1	52	i 19 42	?PR <sub>1</sub>	i 28 2	+89	e 54.0	62.0
Pola	W.	107.4	47	e 18 50	?PR <sub>1</sub>	e 24 48	?	e 52.0	64.9
Zagreb	W.	109.2	48	e 14 39	-15	e 24 56	?	57.9	67.9
Athens	M.	111.7	58	—	—	e 41 13	?	e 57.6	63.2
Colombo	M.	144.8	124	(19 31)	[-17]	—	—	19.5	47.2
Kodaikanal	M.	145.1	115	19 19	[-29]	—	—	76.5	87.2
Bombay	O.E.	145.9	98	19 36	[-14]	—	—	—	74.6
Simla	O.E.	153.0	77	—	—	e 39 7	?	—	—
Calcutta	O.E.	160.6	106	18 49	[-80]	—	—	—	—

Notes continued on next page.

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NOTES TO MAY 20d. 17h. 55m. 5s.

Additional records: Pilar gives MN = +10.7m. St. Louis iPE = +9m.55s., SN = +15m.37s. (?PR<sub>1</sub>). Ithaca iE = iN = +21m.7s. Ann Arbor T<sub>0</sub> = 17h.55m.24s. Ottawa PR<sub>1</sub> = +14m.41s., PR<sub>2</sub> = +16m.25s., SR<sub>1</sub> = +26m.10s. L = +39.9m., +44.9m., T<sub>0</sub> = 17h.55m.15s. Lick T<sub>0</sub> = 17h.55m.14s. Berkeley T<sub>0</sub> = 17h.55m.9s. San Fernando MN = +57.9m. Coimbra iN = +23m.54s., MN = +48.4m. Granada gives epicentre 27°-0S., 72°-0W. Barcelona LN = +38.4m., M = +58.9m. Paris i<sub>1</sub> = +24m.53s. Moncalieri MN = +60.1m. Pola MN = +63.4m. Zagreb iNW = +18m.57s., iNE = +19m.12s., iNE = +25m.29s., MNW = +62.9m.

May 20d. 18h. 3m. 39s. Epicentre 0°-5S. 152°-0E.

A = -883, B = +470, C = -009; D = +470, E = +883;  
G = +008, H = -004, K = -1000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Sydney	33°3	181	7 51	+52	12 51	+22	16.0	19.0
Riverview	33.3	181	e 6 24	-35	e 11 27	-62	e 14.2	17.0
Manila	34.1	298	e 6 2	-64	11 59	-43	17.0	20.8
Adelaide	36.6	198	11 39	?				
Melbourne	37.9	190			15 21	?SR <sub>1</sub>	19.8	20.4
Osaka	38.4	339	7 31	-10	(13 33)	-11	13.6	16.7
Taihuo	39.0	314	7 42	-4				
Mizusawa	E. 40.9	349	7 58	-4	14 21	+ 1		
	N. 40.9	349	7 59	-3	14 15	- 5		
Zi-ka-wei	43.0	321	7 43	-35	12 49	?	e 17.6	22.2
Batavia	45.4	262	(8 31)	-5	8 31	?P		9.6
Perth	46.4	225	(9 15)	+32	13 52	-101	21.2	25.0
Honolulu	53.4	61	e 9 21	- 8	(15 33)	-88	15.6	19.6
Colombo	72.4	277					58.8	84.2
Mauritius	N. 93.6	250	11 39	?			43.0	48.2
	E. 93.6	250	13 33	- 3			42.2	47.4
Lemberg	113.8	327	e 11 21	?	i 16 44	?P	e 52.6	90.2
Toronto	117.3	40					e 62.8	77.0
Ottawa	118.6	37					e 58.4	
Athens	119.5	316			e 32 39	?SR <sub>1</sub>	e 49.0	58.8
Dyce	N. 119.6	345	i 16 37	+57	28 51	+ 5	35.8	40.2
	E. 119.6	345	i 16 39	+59				53.2
Ithaca	N. 119.7	39					60.8	
	E. 119.7	39					62.0	
Edinburgh	121.1	343						55.7
De Bilt	121.4	337					e 59.8	60.3
Fordham	E. 122.2	40	e 58 10	?L	i 67 13	?	(e 58.2)	
	N. 122.2	40	e 58 4	?L	i 67 19	?	(e 58.1)	
Bidston	123.2	343	15 45	-13	24 9	?		31.4
West Bromwich	123.6	343	15 41?	-18	25 51?	?		
Kew	123.9	342	14 21	-100				51.4
Rocca di Papa	124.8	325					62.7	
Shide	124.9	341	15 44	-22	28 58?	-27		51.0
Rio Tinto	137.9	336	29 21	?S	(29 21)	-90		42.4

Additional records: Manila gives MN = +18.1m. Adelaide PR<sub>1</sub> = +16m.51s. Melbourne SR<sub>1</sub> = +17m.15s., SR<sub>2</sub> = +17m.57s. Zi-ka-wei MN = +30.2m. Batavia P = +7m.11s. Perth P = +7m.34s., the real P is recorded as PR<sub>1</sub>. PS = +13m.30s., SR<sub>1</sub> = +17m.37s., SR<sub>2</sub> = +19m.7s. Lemberg records M an hour too soon. Toronto eL = +67.6m. Ottawa L = +66.4m. and +71.4m. Dyce PR<sub>1</sub>N = +20m.35s., PR<sub>1</sub>E = +20m.37s., ME = +54.2m. Rocca di Papa L = +57.2m.

May 20d. Records also at 14h. (Toronto), 15h. (Melbourne and Sydney), 16h. (Lawrence), 20h. (Riverview), 21h. (Harvard), 23h. (La Paz).

May 21d. 11h. 15m. 10s. Epicentre 11°-7N. 176°-0E.

A = -977, B = +068, C = +203; D = +070, E = +998;  
G = -202, H = +014, K = -979.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	51°3	206	e 9 14	- 1 (e 22 14?)	?SR <sub>1</sub>	e 26.2	29.0	
Sydney	51.3	206	20 8	?SR <sub>1</sub>		27.3	29.1	
Manila	53.6	280			e 17 5	+ 1		
Melbourne	57.4	209					29.0	30.5
Perth, W.A.	72.2	230					31.1	
Kodalkanal	96.2	282	68 56	?				
Edinburgh	112.4	0	69 50	?L			(69.8)	
De Bilt	115.7	353			e 40 24	?SR <sub>1</sub>	e 69.8	73.8

Additional records: Riverview gives MN = +30.5m., and eSR<sub>1</sub> = +22m.14s., as in the table.

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May 21d. Records also at 0h. (Kodaikanal (2)), 1h. (Kodaikanal), 2h. (San Fernando), 5h. (Calcutta), 6h. (La Paz), 8h. (Helwan and De Bilt), 9h. (Colombo), 13h. (Moncalieri and Kodaikanal (2)), 14h. (Perth and Kodaikanal (2)), 15h. (Rocca di Papa and Kodaikanal), 17h. (Kodaikanal), 19h. (Manila) 20h. (Kodaikanal), 21h. (La Paz), 22h. (Granada and Edinburgh), 23h. (Moncalieri).

**1918. May 22d. 6h. 31m. 20s. Epicentre 17°0S. 177°5W.**

A = - 955, B = - 042, C = - 292 ; D = - 044, E = + 999 ;  
G = + 292, H = + 013, K = - 956.

A focal depth 0.050 has been assumed for this epicentre, as suggested by the observations near the anticentre.

Station and Component.	Machine.	Corr. for Focus	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	M. s.	s.	M. s.	s.	M.	M.
Apia	W.	+0.1	6.3	61	i 1 38	0	—	—	2.8	3.2
Riverview	—	-3.4	32.7	232	i 6 7	-14	i 10 53	-29	e 12.7	14.3
Melbourne	M.	-3.9	38.9	230	6 52	-21	—	—	e 16.3	16.4
Perth	M.	-5.5	61.6	242	9 53	+ 6	—	—	—	—
Mizusawa	N. O.	-5.8	68.1	328	10 32	+ 5	12 47	? PR <sub>1</sub>	—	—
	E. O.	-5.8	68.1	328	10 27	0	12 46	? PR <sub>1</sub>	—	—
Osaka	O.	-5.8	68.3	320	10 27	- 2	19 0	+ 5	26.5	30.0
Manila	W.	-5.9	68.4	295	e 10 37	+ 8	—	—	15.8	16.3
Taihoku	O.	-6.0	72.7	306	11 1	+ 5	(19 54)	+ 8	19.9	20.1
Batavia	W.	-6.1	74.5	269	i 11 8	+ 1	—	—	—	21.7
Berkeley	—	-6.1	75.4	41	e 12 45	+92	—	—	—	—
Victoria	—	-6.2	81.2	33	—	—	—	—	—	—
La Paz	Bi.	-6.8	102.7	112	15 45	+117	23 32	-103	36.7	45.1
Ann Arbor	B.	-6.9	104.0	50	—	—	25 16	-11	33.7	33.7
Colombo	M.	-6.9	104.1	271	17 40	? PR <sub>1</sub>	—	—	—	23.2
Kodaikanal	M.	-7.0	107.3	274	23 52	?	—	—	—	—
Toronto	M.	-7.0	107.3	49	—	—	(24 4)	-115	24.1	—
Georgetown	E. —	-7.0	108.5	53	—	—	e 23 48	-142	33.1	—
	N. —	-7.0	108.5	53	—	—	e 25 27	-43	33.2	—
Washington	Mar.	-7.0	108.5	53	—	—	—	—	e 32.7	—
Ithaca	B.O.	-7.0	109.3	48	—	—	e 23 32	-166	e 33.0	—
Ottawa	—	-7.1	110.1	46	e 18 42	?	i 25 40	-44	e 32.5	—
Harvard	M.	-7.2	113.3	50	e 18 48?	?	25 22?	-91	e 33.7?	—
Mauritius	M.	-7.2	114.2	237	25 46?	?	(27 16)	+15	—	29.9
Edinburgh	M.	—	140.9	6	25 40	? PR <sub>1</sub>	—	—	—	42.9
Eskdalemuir	G.	—	141.4	6	e 18 49	[-53]	e 25 32	? PR <sub>1</sub>	—	40.3
Lemberg	B.O.	—	142.8	358	e 18 46	[-59]	—	—	—	27.6
De Bilt	—	—	144.8	337	i 19 3	[-45]	—	—	—	—
Shide	M.S.	—	146.1	4	19 6	[-44]	—	—	40.4	—
Uccle	—	—	146.2	358	i 19 3	[-47]	—	—	—	—
Paris	—	—	148.2	1	i 19 10	[-43]	—	—	40.7	—
Zagreb	W.	—	149.1	342	i 19 15	[-39]	—	—	50.7	—
Zurich	—	—	149.2	351	e 19 8	[-46]	—	—	—	—
Moncalieri	S.	—	151.6	352	19 9	[-49]	28 23?	?	36.1	—
Rocca di Papa	Ag.	—	153.7	343	19 15	[-46]	23 18?	? PR <sub>1</sub>	e 42.4	—
Monte Cassino	Ag.	—	153.7	341	19 14	[-47]	—	—	—	—
Pompeii	O.A.	—	154.1	339	19 35	[-26]	—	—	—	—
Coimbra	—	—	154.9	21	e 20 16	[-14]	31 55	—	42.4	—
Barcelona	—	—	155.5	0	18 30	[-92]	—	—	—	43.5
Tortosa	—	—	156.1	5	19 12	[-51]	—	—	42.7	42.7
Rio Tinto	M.	—	157.7	20	30 10	? S	(30 10)	?	—	45.2

Additional records: Riverview gives ePR<sub>1</sub> = +7m.22s. and +7m.39s., MN = +14.2. Osaka MN = +31.5m. Georgetown iE = +24m.40s. Ithaca eN = +25.4m., eE = +27.6m. Ottawa eL = +40.7m., L = +68.7m., T<sub>0</sub> = 6h.41m.15s. Harvard L = +37.8m., T<sub>0</sub> = 6h.41m.0s. Mauritius MN = +30.3m. The record, taken as S, is given as PE. Zagreb ePNW = +19m.7s.

May 22d. Records also at 0h. (Rocca di Papa), 2h. (Taihoku), 3h. (Mizusawa and Kodaikanal), 6h. (Riverview and San Fernando), 7h. (Kodaikanal (2)), 10h. (La Paz), 16h. (Kodaikanal and Uccle), 17h. (La Paz), 23h. (Kodaikanal, Rocca di Papa, and Monte Cassino).



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**1918. May 23d. 11h. 57m. 32s. Epicentre 27°0N. 109°5W.**

A = -297, B = -840, C = +454; D = -943, E = +334;  
G = -152, H = -428, K = -891.

Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Tucson	N. B.O.	5.4	348	e 1 20	- 3	—	—	e 2.7	—
	E. B.O.	5.4	348	e 1 40	+17	—	—	e 2.8	—
Tacubaya	—	12.1	127	3 6	+ 6	—	—	—	7.9
Denver	W.	13.2	16	3 28	+12	7 28?	? L	(7.5?)	8.5
Lick	W.	14.4	317	e 3 17	-15	e 6 2	-16	e 7.1	8.0
Berkeley	—	15.3	318	i 3 22	-21	e 6 20	-19	e 7.3	8.2
Lawrence	W.	16.9	41	4 8	+ 4	7 21	+ 5	9.5	—
St. Louis	W.	19.8	49	i 4 46	+ 7	8 34	+15	9.6	12.5
Victoria	M.	23.9	337	4 59	-28	9 37	- 5	12.6	16.1
	Z. —	23.9	337	5 18	- 9	9 45	+ 3	13.4	15.0
Ann Arbor	E. B.	26.0	47	6 16	+28	11 4	+42	14.3	16.9
	N. B.	26.0	47	6 22	+34	11 10	+48	14.0	16.0
	E. W.	26.0	47	6 16	+28	10 40	+18	14.4	15.7
	N. W.	26.0	47	6 22	+34	11 10	+48	14.2	16.9
	M.	29.4	48	—	—	12 4	+40	17.0	19.5
Toronto	—	29.5	58	e 6 25	+ 2	e 12 8	+42	e 15.8	16.7
Georgetown	N. —	29.5	58	6 13	-10	12 33	+67	15.9	17.0
Washington	Mar.	29.6	58	e 11 42	? S	(11 42)	+15	e 15.6	19.6
Cheltenham	B.O.	30.9	49	e 6 24	-13	e 11 36	-14	e 14.2	19.9
Ithaca	B.O.	32.5	46	e 6 34	-19	e 12 1	-15	e 15.5	—
Ottawa	—	34.1	50	e 7 18	+12	—	—	e 15.0	—
Northfield	B.O.	34.7	54	e 7 16	+ 5	13 9	+18	e 17.6	20.5
Harvard	B.O.	35.2	336	7 31	+16	12 34	-24	e 17.5	22.7
Sitka	M.	44.4	274	e 7 28	-61	—	—	17.5	19.7
Honolulu	Bi.	59.2	132	10 15	+ 9	19 25	+72	27.0	28.2
La Paz	W.	72.9	244	e 20 28?	? S	(e 20 28?)	-33	33.5	36.5
Apia	Ma.	76.2	32	12 0	+ 4	21 46	+ 7	32.4	44.8
Dyce	N. Ma.	76.2	32	11 58	+ 2	—	—	40.5	50.5
	E. M.	76.4	148	39 16	? L	—	—	(39.3)	—
Cipolletti	M.	76.4	34	21 28	? S	(21 28)	-16	—	51.0
Edinburgh	G.	76.6	34	11 57	- 2	21 51	+ 7	35.5	38.0
Eskdalemuir	M.S.	77.6	37	11 58	- 7	21 58	+ 2	—	45.9
Bidston	M.	77.8	35	i 25 34	? S	i 31 58	? S	37.3?	44.2
Stonyhurst	—	79.9	38	12 21?	+ 3	22 27?	+ 5	32.8	50.6
Shide	M.	80.1	37	36 28	? L	—	—	(36.5)	49.5
Kew	—	80.7	49	12 28	+ 5	22 25	- 6	38.4	42.0
Coimbra	—	82.5	35	12 36	+ 3	22 56	+ 4	e 35.5	48.4
De Bilt	—	82.8	36	e 12 28	- 7	e 22 28	-27	e 36.5	44.9
Uccle	—	83.0	38	e 12 36	0	e 22 58	+ 1	34.5	41.5
Paris	—	84.0	52	12 58	+16	21 43	-85	41.5	48.0
San Fernando	—	85.3	46	13 8	+18	23 34	+12	38.8	44.2
Tortosa	—	85.8	39	—	—	—	—	43.5	—
Besaçon	—	86.9	44	13 42	+44	23 37	- 3	41.5	48.6
Barcelona /	—	87.1	38	e 12 58	- 2	—	—	—	—
Zurich	—	87.8	43	—	—	—	—	e 41.4	—
Marseilles	S.	88.1	39	23 36	? S	(23 36)	-17	38.9	49.0
Moncalieri	—	88.6	39	23 29	? S	(23 29)	-30	44.5	—
Milan	B.M.	90.1	48	e 13 38	+21	24 3	-12	37.5	41.5
Algiers	W.	91.5	37	—	—	e 24 46	+17	e 43.8	52.4
Pola	W.	92.0	35	e 13 10	-17	e 23 53	-42	46.5	48.5
Zagreb	B.O.	92.8	29	e 38 16	? S	—	—	e 45.6	59.6
Lemberg	O.	93.0	312	13 46	+14	27 12	? S	40.3	50.5
Osaka	Ag.	93.0	40	e 20 50	? PR <sub>1</sub>	—	—	i 44.2	61.1
Rocca di Papa	—	104.2	317	—	—	23 48	? S	—	69.4
Zi-ka-wei	O.	108.5	312	—	—	—	—	e 44.7	—
Taihoku	—	111.9	242	—	—	—	—	51.5	57.6
Sydney	—	112.0	242	e 15 52	+45	e 29 4	+78	e 51.0	52.7
Riverview	M.	112.2	36	15 28	+20	—	—	—	—
Helwan	W.	115.8	304	—	—	e 29 37	+81	54.0	57.7
Manila	M.	117.9	239	29 40	? S	(29 40)	+67	73.1	74.6
Melbourne	O.E.	121.5	353	—	—	—	—	e 59.2	71.2
Simla	O.E.	134.0	357	64 54	? L	—	—	(64.9)	—
Bombay	M.	135.1	112	37 16	? S	—	—	—	—
Cape Town	M.	142.2	349	20 28	[+45]	—	—	87.1	92.8
Kodaikanal	M.	145.0	344	62 28	? S	—	—	34.5	90.5
Colombo	N. M.	166.5	62	39 46	? S	—	—	—	96.1
Mauritius	E. M.	166.5	62	38 58	? S	—	—	—	95.6

For Notes see next page.

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NOTES TO MAY 23d. 11h. 57m. 32s.

Additional records: Denver gives LEN = +11.5m. All records from Denver are 1hr. wrong. Lick MN = +8.9m., MV = +9.0m., T<sub>0</sub> = 11h.57m.26s. Berkeley eSN = +6m.14s., MN = +8.0m., T<sub>0</sub> = 11h.57m.21s. Lawrence SE? = +7m.27s., T<sub>0</sub> = 11h.57m.40s. St. Louis SE = +8m.40s., T<sub>0</sub> = 11h.57m.37s. Toronto i = +16m.4s. Cheltenham MN = +17.9m. Ithaca eN = +11m.33s., MN = +18.6m. Ottawa L = +34.5m. and +47.5m., T<sub>0</sub> = 11h.57m.13s. Harvard L = +19.0m., T<sub>0</sub> = 11h.57m.22s. La Paz PR<sub>1</sub> = +13m.35s., T<sub>0</sub> = 11h.56m.37s. Apia eS? = 29m.58s. and +30m.58s. Eskdalemuir SR? = +26m.42s., T<sub>0</sub> = 11h.57m.33s. Coimbra MN = +40.8m. De Bilt eSR<sub>1</sub> = +28m.10s., M = +42.6m., T<sub>0</sub> = 11h.57m.46s. Barcelona PS = +25m.24s., MN = +53.6m. Moncalieri S = +32m.10s., MN = +45.0m. Pola MN = +50.1m. Zagreb e = +34m.25s. Osaka MN = +45.2m. Zi-ka-wei MN = +69.7m. These records have been corrected by +1h. Riverview PS = +30m.52s., SR<sub>1</sub> = +35m.24s., MN = +59.0m. Helwan records a shock earlier than T<sub>0</sub>, which has been corrected by +1h. Manila S = +39m.9s. (=SR<sub>1</sub>?). Melbourne PR<sub>1</sub> = +36m.40s., S = +44m.16s., SR<sub>2</sub> = +56m.52s. Kodaikanal the P has been corrected by -1h.

May 23d. Records also at 1h. (Kodaikanal), 2h. (Colombo and Kodaikanal), 6h. (Helwan), 9h. (Sydney, Apia, and Riverview), 10h. (Melbourne, La Paz, and Kodaikanal), 14h. (Toronto), 16h. (Taihoku), 20h. (Edinburgh).

May 24d. Records at 0h. (San Fernando), 2h. (Kodaikanal), 3h. (Rocca di Papa), 15h. (Zurich and Stonyhurst), 16h. (Taihoku and Zi-ka-wei), 17h. (Melbourne and Riverview), 18h. (Perth and Riverview), 19h. (La Paz (2) and Helwan), 23h. (Riverview).

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**1918. May 25d. 19h. 29m. 25s. Epicentre 31°0S. 91°0W.**

A = -0.015, B = -0.857, C = -0.515; D = -1.000, E = +0.017;  
G = +0.009, H = +0.515, K = -0.857.

In making this determination it has been found necessary to assume a depth of focus 0.015; without taking such a measure it was found impossible to bring the North American observations into line with those of Riverview, La Paz, and South American stations.

Station and Component.	Machine.	Corr. for Focus	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	M. s.	s.	M. s.	s.	M.	M.
Cipolletti	M.	-0.6	20.3	119	2 11	?	—	—	—	2.9
Andalgala	N. E.	-0.6	21.8	87	4 47	- 8	—	—	—	10.6
	M.	-0.6	21.8	87	4 41	-14	—	—	—	11.4
Pilar	N. E.	-0.7	23.1	99	5 11	+ 1	—	—	—	11.4
	M.	-0.7	23.1	99	5 5	- 5	—	—	—	9.6
La Quiaca	N. E.	-0.8	24.2	75	5 29	+ 8	5 53	? PR <sub>1</sub>	—	11.2
	M.	-0.8	24.2	75	5 23	+ 2	5 59	? PR <sub>1</sub>	—	10.9
La Paz	Bi.	-0.8	25.3	60	i 5 27	- 6	i 10 0	+ 6	12.7	13.7
Ralboa Hts.	E. N.	-1.3	41.5	17	7 8	-49	—	—	16.3	16.7
	B.O.	-1.3	41.5	17	7 10	-47	—	—	13.4	13.7
Rio de Janeiro	E. N.	-1.4	43.1	91	e 8 11	+ 2	14 29	- 2	21.2	22.6
Vieques	N. E.	-1.7	55.0	30	e 9 29	+ 1	(17 0)	0	17.0	—
Cheltenham	B.O.	-2.0	71.0	11	11 14	+ 3	19 10	-64	28.6	32.9
Washington	Mar.	-2.0	71.1	10	11 9	- 3	20 13	- 2	e 28.6	—
Georgetown	—	-2.0	71.1	10	11 10	- 2	(20 30)	+15	20.5	—
Ann Arbor	E. E. N. E.	-2.0	73.6	5	—	—	20 47	+ 2	33.6	34.6
	W. B.	-2.0	73.6	5	12 41	+74	21 23	+38	34.3	—
	B.O.	-2.0	73.6	5	11 59	+32	21 29	+44	34.9	37.3
Ithaca	N. E.	-2.0	74.5	10	e 11 13	-20	e 20 49	- 7	—	—
	B.O.	-2.0	74.5	10	e 11 18	-15	e 20 54	- 2	31.4	—
Berkeley	—	-2.0	74.8	334	e 11 20	-15	—	—	—	—
Toronto	M.	-2.0	75.4	8	—	—	(22 5)	+58	e 31.4	33.4
Harvard	E. N.	-2.0	75.6	13	e 11 33	- 7	20 55	-14	e 34.5	—
	B.O.	-2.0	75.6	13	11 34	- 6	21 8	- 1	34.8	—
Northfield	B.O.	-2.0	77.0	12	—	—	e 21 23	- 3	34.6	—
Ottawa	—	-2.1	77.6	10	i 11 49	- 3	21 35	+ 3	e 36.6	—
Honolulu	M.	-2.1	82.9	301	e 12 47	+23	23 23	+50	35.4	37.2
Victoria	M.	-2.1	84.5	339	11 0?	-92	22 0?	-50	35.5	47.0
Cape Town	M.	-2.1	87.1	129	12 41	- 7	22 53	-26	45.2	47.2
Sydney	—	-2.2	92.5	228	25 35?	? S	(25 35?)	+78	31.0	32.0
Riverview	—	-2.2	92.7	228	e 13 5	-14	e 23 41	-38	e 43.2	45.1
Melbourne	M.	-2.2	93.7	222	—	—	(23 23)	-66	31.0	31.4
San Fernando	—	-2.2	104.1	55	17 35	?	—	—	28.1	35.6
Coimbra	—	-2.2	104.3	51	e 17 11	?	i 27 25	+69	48.2	54.1
Tortosa	—	-2.2	110.8	51	19 2	? PR <sub>1</sub>	28 17	+62	38.7	38.8
Algiers	B.M.	-2.2	111.0	59	e 18 48	? PR <sub>1</sub>	28 5	+48	51.6	57.6
Barcelona	—	-2.2	112.1	51	e 19 4	? PR <sub>1</sub>	i 28 43	+76	39.1	59.8
Bldston	M.S.	-2.2	113.3	40	19 35	? PR <sub>1</sub>	26 47	-51	—	40.9
Stonyhurst	M.	-2.2	113.8	40	i 17 35	?	i 26 59	-43	—	59.8
Eskdalemuir	G.	-2.2	113.9	38	19 20	? PR <sub>1</sub>	28 47	+64	43.6	—
Edinburgh	M.	-2.2	114.1	37	19 5	? PR <sub>1</sub>	—	—	—	38.1
Kew	M.	-2.2	114.2	41	18 35	? PR <sub>1</sub>	—	—	—	60.6
Paris	—	-2.2	115.0	44	i 19 44	? PR <sub>1</sub>	e 29 9	+77	49.6	55.6
Uccle	—	-2.2	116.7	43	e 19 41	? PR <sub>1</sub>	e 29 23	+77	e 55.6	—
Moncalieri	S.	-2.2	117.1	50	19 50	? PR <sub>1</sub>	29 20	+71	35.7	—
De Bilt	—	-2.2	117.1	42	e 14 57	-23	29 36	+87	57.6	59.9
Zurich	—	-2.2	118.4	47	e 19 5	? PR <sub>1</sub>	—	—	—	—
Rocca di Papa	Ag.	-2.2	119.6	54	e 20 10	? PR <sub>1</sub>	—	—	—	41.7
Mauritius	M.	-2.3	120.9	142	36 11	? SR <sub>1</sub>	—	—	—	62.2
Pola	W.	-2.3	121.3	51	e 20 23	? PR <sub>1</sub>	e 30 5	+82	e 44.8	65.9
Zagreb	W.	-2.3	123.0	51	i 20 30	? PR <sub>1</sub>	e 22 51?	?	—	55.6
Lemberg	B.O.	-2.3	128.9	46	21 5	? PR <sub>1</sub>	—	—	—	31.3
Helwan	M.	-2.4	130.8	73	(16 11)	- 9	16 11	? P	—	20.1
Batavia	W.	—	139.3	206	e 20 35	[+57]	—	—	—	26.9
Manila	W.	—	146.5	246	e 19 47	[- 3]	23 35	? PR <sub>1</sub>	25.8	—
Zi-ka-wei	—	—	152.3	280	e 19 4	[-55]	—	—	—	—
Colombo	M.	—	154.4	159	48 35	?	—	—	85.1	94.0
Kodalkanal	M.	—	156.6	150	41 53	?	—	—	85.4	87.4

For Notes see next page.

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### NOTES TO MAY 25d. 19h. 29m. 25s.

Additional records: La Quiaca records MN as +1.2m. Comparing this with ME this is probably a misprint for 10m. later. La Paz  $i = +10m.50s.$  and  $+11m.47s.$ ,  $T_0 = 19h.29m.9s.$  Rio de Janeiro SE = +14m.35s. Vieques, eLE = +16.9m. Washington L = +31.6m.,  $T_0 = 19h.29m.30s.$  Georgetown records S as L for both components, and gives as SE and SN respectively, +15m.59s. and +15m.55s. Toronto gives S as L. Harvard  $T_0 = 19h.29m.34s.$  Northfield eL = +28.4m. Ottawa  $i = +26.4m.$  L = +43.6m., and +53.6m.,  $T_0 = 19h.29m.26s.$  Sydney M = +47.6m. Riverview eS = +25m.46s., eSR<sub>2</sub> = +30m.17s. and +30m.52s.,  $T_0 = 19h.29m.24s.$  Melbourne S is given as SR<sub>1</sub>. PR<sub>1</sub>, given as S, = 19m.35s., SR<sub>2</sub> = +25m.41s. San Fernando MN = +34.6m. Coimbra SN = +27m.27s., iSR<sub>1</sub> = +33m.23s., LN = +46.3m., MN = +54.0m. Barcelona  $i_2 = +34m.4s.$  Eskdalemuir SR<sub>1</sub> = +34m.24s. Paris e = +18m.35s. Uccle SR<sub>1</sub> = +35m.35s. De Bilt PR<sub>1</sub> = +19m.48s., mE = +29m.48s., mN = +29m.49s., LN = +59.6m., MN = +60.2m. Epicentre 30° 0S., 92° 0W. Zagreb eNW = +18m.54s., MNW = +66.6m. Lemberg  $i = +22m.23s.$  Helwan gives P = +15m.41s.

May 25d. Records also at 1h. (San Fernando), 3h. (Taihoku), 11h. (Denver, Helwan, and La Paz), 14h. (Riverview), 16h. (Helwan), 18h. (La Paz), 20h, and 22h. (Mizusawa), 23h. (De Bilt).

May 26d. Records at 2h. (Colombo), 5h. (San Fernando), 10h. (Ottawa), 19h. (Batavia (2), Manila, and Pompeii), 20h. (Helwan, Riverview, and Colombo).

May 27d. 16h. 8m. 41s. Epicentre close to Uccle, which records iP at the above time. De Bilt ( $\Delta = 1^\circ.4$ ) gives P = +23s., L = +50s., ME = +1.0m. Paris ( $\Delta = 2^\circ.2$ ) gives eP = +43s., eS = +1m.17s., L = +1.6m.

May 27d. Records also at 0h. (San Fernando), 10h. (Helwan), 12h. (Denver), 13h. (Batavia), 14h. (Osaka).

May 28d. 8h. 21m. 9s. Epicentre near Uccle (as on May 27d.). De Bilt ( $\Delta = 1^\circ.4$ ) gives P = +25s.

May 28d. Records also at 0h. (San Fernando), 5h. (Rocca di Papa), 14h. (Tacubaya), 16h. (Denver and Mizusawa), 21h. (San Fernando).

May 29d. Records at 0h. (La Paz), 2h. (Zagreb), 12h. (Zagreb (2)), 13h. (Denver), 16h. (Moncalieri).

May 30d. Records at 0h. (Manila), 1h. (San Fernando), 5h. (Helwan and Kodai-kanal), 8h. (La Paz), 16h. (Helwan), 19h. (San Fernando), 22h. (Ottawa), 23h. (De Bilt).

May 31d. 5h. 5m. 40s. (I) } Epicentre 37° 0N. 143° 0E. (as on 1915 Nov. 18d.).  
5h. 19m. 0s. (II)

An epicentre at about 40° 5N. 143° 5E. would suit the recorded Tokyo observations (P = +1m.27s., S = +2m.40s.) in each case, as also Mizusawa and De Bilt, but would not suit Osaka and Kobe, and would make the negative residual for Zi-ka-wei still larger.

$$A = -.638, B = +.481, C = +.602; \quad D = +.602, E = +.799;$$

$$G = -.481, H = +.362, K = -.799.$$

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
(I)	Mizusawa	E.	2.6	327	0 37	- 4	1 10	- 2	—
(I)		N.	2.6	327	0 38	- 3	1 18	+ 6	—
(II)			2.6	327	0 43	+ 2	1 17	+ 5	—
(I)	Tokyo		2.9	243	1 27	?S	(1 27)	+ 7	(2.7)
(II)			2.9	243	1 28	?S	(1 28)	+ 8	(2.7)
(I)	Osaka		6.5	252	—	—	3 0	+ 3	4.4
(II)			6.5	252	—	—	3 0	+ 3	4.3
(II)	Kobe		6.8	253	—	—	e 3 4	+ 7	4.2
(I)	Zi-ka-wei		18.7	258	e 2 52	-93	—	—	—
(II)	Eskdalemuir		83.2	340	—	—	—	—	45.0
(II)	De Bilt		83.7	336	—	—	e 22 36	-30 e 46.0	47.2

Additional records: Mizusawa (II) gives SN = +1m.23s. Tokyo (I) and (II). It has been assumed above that the recorded P is S, and S is L, but see note at head. Osaka (I) MN = +5.2m., (II) MN = +5.3m. De Bilt e = +32m.12s.

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**1918. May 31d. 8h. 46m. 21s. Epicentre 45°·1N. 147°·2E.**

A = -·593, B = +·382, C = +·708 ; D = +·542, E = +·841 ;  
G = -·595, H = +·384, K = -·706.

Station and Component.	Machine.	Δ	Azimuth.	P.		O-C.		S.		O-C.		L.		M.	
				m.	s.	s.	m.	s.	m.	s.	m.	s.			
Mizusawa	N.	7·5	219	1	53	- 1	3	16	- 8	—	—	—	—	—	—
	E.	7·5	219	1	54	0	3	14	-10	—	—	—	—	—	—
Tokyo	O.	11·0	213	2	33	-11	4	35	-19	—	—	—	—	—	—
Osaka	O.	13·8	225	3	33	+10	—	—	—	—	—	6·5	10·0	—	—
Kobe	O.	13·9	226	e 3	30	+ 5	(6	3)	- 3	—	—	6·0	6·8	—	—
Zi-ka-wei	—	24·4	244	5	32	0	9	53	+ 1	—	—	12·2	13·0	—	—
Taihoku	O.	28·8	235	—	—	—	e 11	29	+16	—	—	—	—	—	—
Manila	W.	37·7	224	e 7	27	- 9	(13	25)	- 9	—	—	13·4	—	—	—
Honolulu	M.	50·4	98	e 14	51	?	—	—	—	—	—	e 19·4	22·2	—	—
Eskdalemuir	G.	76·5	342	e 12	1	+ 3	i 21	45	+ 2	—	—	40·3	—	—	—
De Bilt	—	77·5	337	12	6	+ 2	21	56	+ 1	—	—	e 35·6	40·8	—	—
Bidston	M.S.	78·2	341	12	3	- 5	23	21	+79	—	—	—	52·2	—	—
Uocle	—	78·8	337.	e 12	9	- 3	e 22	3	- 7	—	—	—	46·6	—	—
Zagreb	W.	79·4	327	e 12	15	0	i 22	17	+ 1	—	—	41·6	—	—	—
Shide	M.S.	80·3	340	—	—	—	i 22	27	0	—	—	—	—	—	—
Zurich	—	80·6	332	e 12	22	- 1	22	31	+ 1	—	—	—	—	—	—
Pola	W.	80·9	329	—	—	—	e 22	21	-13	—	—	—	—	—	—
Paris	—	81·1	337	i 12	25	- 1	i 22	35	- 1	—	—	40·6	50·6	—	—
Moncalieri	S.	83·0	332	—	—	—	e 23	56	+59	—	—	—	—	—	—
Rocca di Papa	Ag.	84·1	328	i 12	38	- 5	—	—	—	—	—	—	—	—	—

Additional records : Osaka gives MN = +7·5m. Zi-ka-wei SR<sub>1</sub>N = +10m.11s., SR<sub>2</sub>E = +10m.21s., SR<sub>2</sub>N = +10m.35s. De Bilt eLN = +37·6m., MN = +47·4m., T<sub>1</sub> = 8h.46m.35s. Zagreb iNE = +15m.55s. Rocca di Papa e = +12m.59s., eL? = +22·8m., M = +23·8m. This appears to be a record on a different instrument.

May 31d. Records also at 2h. (Helwan and Mizusawa), 4h. (Manila), 9h. (Mizusawa), 10h. (Taihoku and La Paz), 11h. (Kobe, Mizusawa, and Osaka), 15h. (La Paz), 17h. (Mizusawa (2)), 19h. (La Paz), 20h. (San Fernando), 21h. (De Bilt, Melbourne, Eskdalemuir, Edinburgh, and Helwan), 22h. (La Paz).

**June 1d. 5h. 30m. 30s. Epicentre 39°·0S. 64°·0W.**

A = +·341, B = -·698, C = -·629 ; D = -·899, E = -·438 ;  
G = -·276, H = +·566, K = -·777.

	Δ	Az.	P.		O-C.		S.		O-C.		L.		M.	
			m.	s.	s.	m.	s.	m.	s.					
Cipolletti	3·2	270	0	48	- 2	—	—	—	—	—	—	—	—	—
Chacarita	6·2	47	6	48	?L	—	—	—	—	—	—	(6·8)	—	—
Andalgala	11·5	350	5	24	?S	(5	24)	+17	(5·3)	—	—	—	7·8	—
La Paz	22·8	350	5	18	+ 3	8	23	-58	13·3	—	—	14·2	—	—
Paris	105·6	39	—	—	—	—	—	—	e 60·5	—	—	62·5	—	—
Kew	106·1	36	—	—	—	—	—	—	—	—	—	73·5	—	—
Rocca di Papa	106·5	49	—	—	—	e 29	48	+171	(e 58·8?)	—	—	—	—	—
Eskdalemuir	107·5	32	—	—	—	—	—	—	—	—	—	61·5	—	—
Edinburgh	107·9	31	62	30	?L	—	—	—	—	—	—	62·5	—	—
De Bilt	109·0	37	—	—	—	—	—	—	e 60·5	—	—	62·6	—	—
Helwan	112·1	69	6	30	?	—	—	—	—	—	—	—	—	—

Additional records : Andalgala gives S as P and L as S. La Paz T<sub>1</sub> = 5h.30m.40s. Rocca di Papa L given as eP? and L = +71·6m. De Bilt eLN = +61·5m.

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June 1d. 8h. 23m. 40s. Epicentre 33°·5N. 146°·0E. (as 1916 July 16d.).

A = -·649, B = +·438, C = +·622;    D = +·559, E = +·829;  
G = -·516, H = +·348, K = -·783.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	3·8	274	—	—	1 39	- 5	2·3	—
	N.	3·8	274	—	—	1 42	- 2	2·3	—
Tokyo		5·7	243	1 51	+23	3 4	?L	(3·1)	—
Osaka		9·3	249	—	—	3 10	-60	4·5	5·3
Zi-ka-wei		21·3	259	e 4 59	+ 2	8 51	+ 1	—	12·9
Eskdalemuir		82·6	343	—	—	—	—	44·3	—
De Bilt		83·8	337	—	—	e 22 50	-17	43·3	49·3
Bidston		84·3	342	51 38	? L	—	—	(51·6)	56·5
Zagreb		84·5	329	—	—	—	—	46·7	54·3
Uccle		84·6	337	—	—	—	—	—	54·3
Rocca di Papa		89·1	327	—	—	e 25 38	+94	e 45·2?	50·6

Additional records: Osaka gives MN = +5·5m.    Zi-ka-wei MN = +12·1m.  
Zagreb MNW = +51·3m.

June 1d. 14h. 17m. 30s. Epicentre 10°·5S. 161°·0E. (as on 1917 November 30d.).

A = -·930, B = +·320, C = -·182;    D = +·326, E = +·946;  
G = +·172, H = -·059, K = -·983.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview		25·0	200	e 5 48	+10	e 10 18?	+15	12·8	13·7
Sydney		25·1	199	e 5 42	+ 3	—	—	12·8	15·0
Melbourne		30·9	205	(6 24)	-13	11 30	-20	15·9	18·7
Colombo		82·7	278	32 30	?L	—	—	(32·5)	—
Kodaikanal		85·7	281	64 36	?L	—	—	(64·6)	—
Mauritius	N.	98·4	248	50 54	?L	—	—	(50·9)	52·6
	E.	98·4	248	50 6	?L	—	—	(50·1)	53·0
Ithaca		120·9	47	—	—	e 36 0	?SR <sub>1</sub>	—	—
Helwan		129·4	300	27 30	?	—	—	—	—
Eskdalemuir		133·5	348	19 30	[+ 4]	—	—	—	—
Zagreb		133·8	326	20 30	[+62]	—	—	82·5	100·5
De Bilt		134·0	340	—	—	e 24 30	?	e 77·5	85·2
Stonyhurst		134·7	346	39 48	?SR <sub>1</sub>	—	—	—	85·8
Uccle		135·4	339	e 20 30	[+59]	—	—	—	88·5
Paris		137·6	339	—	—	—	—	e 88·5	92·5
San Fernando		151·6	338	82 30	?L	—	—	93·5	121·0

Additional records: Riverview gives MZ = +15·1m.    Melbourne gives its P as PR<sub>1</sub>.    Zagreb MNW = +99·9m.    Stonyhurst M = +98·2m.    San Fernando MN = +111·5m.

June 1d. Records also at 4h. (Mizusawa), 8h. (La Paz), 9h. (Tortosa), 13h. (Mizusawa), 14h. (Taihoku), 15h. (Colombo), 17h. (Mizusawa and Tokyo), 21h. (De Bilt), 23h. (San Fernando, Mizusawa, Tokyo, Taihoku, and Osaka.).

June 2d. Records at 0h. (Stonyhurst), 1h. (Taihoku), 5h. (Osaka, Tokyo, Mizusawa, and La Paz), 13h. (Victoria, La Paz, De Bilt, and Toronto), 16h. (Monte Cassino), 19h. (Taihoku), 21h. (Mizusawa), 22h. (La Paz), 23h. (Rio de Janeiro and Tokyo).

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1918. June 3d. Oh. 3m. 12s. Epicentre 0°4S. 20°0W.

A = +.940, B = -.342, C = -.007; D = -.342, E = -.940;  
G = -.007, H = +.002, K = -1.000.

Station and Component.	Machine.	Δ	Azimuth.	P.		O-C.		S.		O-C.		L.		M.	
				M.	s.	s.	M.	s.	s.	M.	s.	M.	s.		
San Fernando	—	39.0	18	7	36	-10	13	48	-4	22.8	24.8				
Colimbra	W.	42.0	13	8	0	-11	14	21	-14	20.5	22.0				
Algiers	B.M.	42.5	27	18	4	-11	14	28	-14	21.8	23.3				
Tortosa	—	45.1	22	8	23	-11	15	6	-10	20.2	29.4				
Barcelona	—	46.0	23	18	35	-5	i 15	22	-4	21.5	29.1				
Marseilles	Ma.	47.3	24	19	0	+11	e 10	51	? PR <sub>1</sub>	27.8	—				
Cape Town	M.	49.1	137	—	—	—	15	48	-19	23.8	26.8				
La Quiaca	M.	49.5	241	17	12	? S	(17 12)	+59	26.6	—	—				
Chacarita	B.O.	49.6	222	—	—	—	17	18	+64	27.6	32.0				
La Paz	Bi.	50.1	292	9	8	0	i 16	21	+1	22.8	25.6				
Rocca di Papa	Ag.	51.5	31	19	11	-6	i 16	33	-5	e 26.0	29.6				
Moncalieri	S.	51.6	25	9	14	-3	i 16	40	+1	25.1	36.9				
Pompeii	O.A.	51.7	33	19	33	+15	e 17	2	+22	e 27.0	33.0				
Milan	—	52.6	25	9	30	+6	—	—	—	—	12.7				
Paris	—	52.9	18	19	26	+1	i 16	52	-3	26.8	27.8				
Shide	M.	53.6	15	9	28	-2	17	0	-4	30.0	33.1				
Zurich	—	53.9	24	e 9	31	-1	17	5	-3	—	—				
Pola	W.	54.3	29	19	34	-1	i 17	8	-5	27.4	30.7				
Kew	M.	54.5	15	16	48	? S	(16 48)	-27	—	—	35.8				
Uccle	—	55.2	18	19	41	+1	i 17	25	+1	e 26.8	34.8				
Zagreb	W.	55.3	30	19	46	+5	i 17	33	+8	28.8	37.8				
Athens	—	55.6	41	9	49	+6	17	35	+6	e 23.6	34.0				
Bidston	M.S.	55.6	12	9	42	-1	17	12	-17	—	28.5				
Stonyhurst	M.	56.2	12	e 9	48	+1	i 17	12	-24	23.6?	24.0				
De Bilt	—	56.6	18	9	54	+4	17	47	+6	e 29.8	30.7				
Helwan	M.	57.4	53	9	48	-7	18	6	+15	—	34.5				
Eskdalemuir	G.	57.4	11	9	55	0	17	54	+3	27.3	28.7				
Edinburgh	M.	57.9	11	9	48	-10	—	—	—	—	28.3				
Cipolletti	M.	58.5	223	17	36	? S	(17 36)	-29	—	28.1	46.6				
Dyce	Ma.	58.4	11	i 10	18	+10	18	26	+10	26.8?	29.0				
Harvard	E. B.O.	62.7	320	i 10	29	-1	19	4	+7	e 25.8	—				
Lemberg	N. B.O.	62.7	320	10	33	+3	19	7	+10	e 26.5	27.9				
Washington	B.O.	62.7	30	i 15	44?	? ?	19	24	+27	39.5	45.7				
Georgetown	Mar.	65.3	314	10	52	+5	19	36	+7	31.8	—				
Ithaca	N. B.O.	65.3	314	e 10	53	+6	19	39	+10	e 27.1	—				
Ottawa	E. B.O.	66.3	318	e 10	50	-4	19	48	+7	27.1	—				
Toronto	—	67.0	321	—	—	—	e 19	54	+4	e 26.8	—				
Ann Arbor	M.	68.7	318	—	—	—	20	30?	+20	36.7	41.0				
Mauritius	E. M.	71.2	316	21	6	? S	(21 6)	+26	—	26.0	—				
Kodaikanal	M.	78.5	111	21	42	? S	(21 42)	-24	—	40.8	43.4				
Victoria	M.	97.4	80	—	—	—	—	—	—	53.2	57.3				
Colombo	M.	99.2	319	28	22	? ?	—	—	—	46.1	54.4				
Berkeley	M.	99.8	83	23	48	? ?	50	48	? L	(50.8)	—				
Batavia	W.	100.0	308	—	—	—	—	—	—	e 47.8	—				
Zi-ka-wei	—	126.5	98	—	—	—	—	—	—	e 65.8	—				
Melbourne	M.	132.3	46	—	—	—	—	—	—	e 71.4	78.5				
Riverview	—	139.4	162	—	—	—	—	—	—	82.1	87.8				
Riverview	—	144.9	167	e 19	48	[0]	e 27	12?	? ?	e 60.5?	83.3				

Additional records: San Fernando gives also P = +7m.48s. (O-C. = +2s.).  
 Colimbra PR<sub>1</sub>N = +9m.35s., SR<sub>1</sub>E = +17m.25s., SR<sub>1</sub>N = +17m.31s., LN = +19.6m., MN = +21.0m., T<sub>0</sub> = 0h.3m.10s. Algiers T<sub>0</sub> = 0h.3m.11s.  
 Barcelona PR<sub>1</sub> = +10m.21s., SR<sub>1</sub> = +18m.49s., MN = +30.6m. La Quiaca SN = +26m.6s. La Paz PR<sub>1</sub> = +11m.13s., T<sub>0</sub> = 0h.3m.16s.  
 Moncalieri MN = +28.0m. Paris T<sub>0</sub> = 0h.3m.19s. Pola MN = +30.3m. Zagreb iNE = +13m.3s. and iNW = +13m.9s., MNW = +31.8m. Athens eLN = +24.4m., MN = +41.5m., T<sub>0</sub> = 0h.3m.19s. Stonyhurst M = +32.0m. De Bilt mE = +17m.56s., mN = +17m.57s., MN = +34.3m., T<sub>0</sub> = 0h.3m.17s., Epicentre 0°7S. 19°8W. Graz T<sub>0</sub> = 0h.3m.17s., Epicentre 6°0N. 30°0W. Eskdalemuir MN = +38.5m. Dyce M = +29.9m. and +37.0m. Harvard T<sub>0</sub> = 0h.3m.7s. Lemberg eS = +22m.42s. Washington L = +27.1m. Toronto LE = +28.6m. Mauritius PN = +20m.36s. Colombo P? = +44.8m. Zi-ka-wei MN = +75.3m. Riverview e? = +30m.18s., eL? = +42.3m., M = +48.3m., eS? = +60m.48s., MN = +81.7m.

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June 3d. Records also at 2h. (La Paz, Tokyo, and Zagreb), 3h. (Calcutta and Riverview), 6h. and 9h. (Taihoku), 11h. (Apia), 15h. (Tortosa and Barcelona), 17h. (Stonyhurst), 21h. (Rocca di Papa).

**1918. June 4d. 4h. 3m. 23s. Epicentre 7°0S. 145°0E.**

A = -·813, B = +·569, C = -·122; D = +·574, E = +·819;  
G = +·100, H = -·070, K = -·993.

Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
Riverview	—	27·4	169	e 5 57	- 5	(i 10 41)	- 7	e 12·6	17·4
Sydney	M.	27·4	169	6 13	+11	10 49	+ 1	13·4	15·9
Adelaide	M.	28·5	191	7 19	? PR <sub>1</sub>	(11 7)	- 1	—	18·3
Melbourne	M.	30·7	180	11 31	? S	15 43	? L	18·0	21·4
Manila	W.	32·2	312	e 6 57	+ 7	—	—	14·4	—
Perth	M.	36·9	224	9 9	? PR <sub>1</sub>	(13 54)	+32	13·9	—
Batavia	W.	37·9	269	e 7 37	0	—	—	—	17·6
Taihoku	O.	39·5	325	e 7 53	+ 2	14 2	+ 3	17·2	—
Osaka	O.	42·7	348	8 5	-11	14 22	-22	20·6	25·5
Kobe	O.	42·7	348	8 3	-13	(14 19)	-25	14·3	15·0
Tokyo	O.	42·9	354	9 1	+44	—	—	—	—
Zi-ka-wei	—	44·3	331	e 8 23	- 5	15 40	+34	—	23·4
Mizusawa	O.	46·9	356	8 29	-13	15 8	-24*	—	—
	O.	46·3	356	8 27	-15	15 2	-30	—	—
Honolulu	M.	62·6	62	10 49	+20	—	—	26·4	30·8
Kodaikanal	M.	69·4	284	52 13	? L	—	—	(52·2)	—
Victoria	M.	96·4	42	26 1	? S	(26 1)	+41	48·5	55·8
Berkeley	—	96·4	52	—	—	—	—	41·8	—
Helwan	M.	114·0	300	19 37	? PR <sub>1</sub>	—	—	—	—
Vienna	—	120·2	323	—	—	—	—	e 61·6	—
Graz	W.	121·3	322	e 19 19	? PR <sub>1</sub>	—	—	—	—
Zagreb	W.	121·6	321	e 20 53	? PR <sub>1</sub>	e 30 27	?	61·6	—
De Bilt	—	124·2	331	—	—	e 30 54	+94	e 62·6	65·9
Edinburgh	M.	125·1	339	45 37	? L	—	—	(45·6)	78·1
Rocca di Papa	Ag.	125·4	318	e 20 55	? PR <sub>1</sub>	e 30 33?	+64	e 68·5	—
Uccle	—	125·4	331	23 37	?	—	—	e 62·6	67·6
Eskdalemuir	G.	125·5	338	e 20 47	? PR <sub>1</sub>	31 4 ?	+94	46·6	—
Toronto	M.	126·6	39	—	—	—	—	56·3	75·5
Bidston	M.S.	126·9	337	21 13	? PR <sub>1</sub>	31 49	+130	—	70·8
Moncalieri	S.	127·0	323	e 21 23	? PR <sub>1</sub>	33 21?	?	61·9	78·0
Paris	—	127·6	330	e 21 24	? RR <sub>1</sub>	—	—	e 63·6	66·6
Ottawa	—	128·0	36	e 20 13	?	e 30 19	+32	e 58·6	—
Washington	Mar.	130·5	43	—	—	—	—	e 69·3	—
Barcelona	—	132·4	322	—	—	e 57 59	?	e 67·4	82·6
Harvard	B.O.	132·4	36	—	—	—	—	e 67·8	—
Algiers	B.M.	134·3	316	—	—	—	—	e 78·6	85·6
Coimbra	—	139·3	329	e 23 37?	? PR <sub>1</sub>	e 34 37	?	70·4	—
La Paz	Bi.	139·5	126	19 45	[+ 6]	—	—	80·6	83·2

Additional records: Riverview 1PS is taken as S, PR<sub>1</sub> = +6m.47s., eS = +10m.31s., iS = +10m.38s., MN = +18·2m., T<sub>0</sub> = 4h.3m.35s. Adelaide PR<sub>1</sub> is given as P and S as PR<sub>1</sub>. Melbourne SR<sub>1</sub> = +16m.37s. Osaka MN = +24·4m., T<sub>0</sub> = 4h.3m.31s. Tokyo record one hour wrong? Zi-ka-wei MN = +24·4m. De Bilt e(PR<sub>1</sub>) = +20m.56s., e(SR<sub>1</sub>) = +37m.52s., eLN = +63·6m., MN = +75·4m. Toronto LE = +68·0m. and +72·1m. Moncalieri MN = +78·6m. Paris ME = +70·6m. Ottawa e = +40m.25s., e = +56m.37s. Harvard eN = +56m.47s., LN? = +66·3m., LN = +72·2m. La Paz PR<sub>1</sub> = +23m.14s.



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**1918. June 4d. 17h. 11m. 36s. Epicentre 19°0S. 177°0W.**

A = -0.944, B = -0.049, C = -0.326 ; D = -0.052, E = +0.999 ;  
G = +0.325, H = +0.017, K = -0.946.

The median residual for the antipodal stations is [+12], which seems to be partly due to error in  $T_0$  and partly to the focus being rather higher than usual. But the quantities are small and no correction has been ventured.

Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Apia	W.	7.3	45	i 1 58	+ 7	3 24?	+ 6	3.9	4.6
Riverview	—	31.9	236	i 6 55	+ 9	i 12 14	+ 7	14.1	15.9
Sydney	M.	31.9	236	i 6 48	+ 2	i 12 24	+17	16.7	18.0
Melbourne	M.	38.5	232	7 36	- 6	13 54	+ 9	20.3	23.4
Adelaide	M.	42.2	238	9 54	? PR <sub>1</sub>	(14 36)	- 2	—	26.0
Honolulu	M.	44.4	26	15 0	? S	(15 0)	- 7	17.8	—
Perth	M.	60.7	243	14 18	? PR <sub>1</sub>	(18 34)	+ 2	32.5	21.0
Manila	W.	69.7	294	e 11 22	+ 7	—	—	—	—
Mizusawa	E. N. O.	70.1	327	e 11 15	- 3	20 7	-20	—	—
Osaka	O.	70.1	327	e 11 17	- 1	20 6	-21	—	—
Kobe	O.	70.2	320	e 11 25	+ 7	20 51	+23	30.4	39.2
Batavia	O.	70.3	320	e 11 12	- 7	—	—	37.2	39.3
Berkeley	W.	74.9	269	e 11 24	-24	—	—	—	—
Lick	W.	76.6	41	—	—	e 21 49	+ 5	—	—
Zi-ka-wei	W.	77.5	310	e 28 24	? SR <sub>1</sub>	—	—	—	—
Victoria	M.	82.7	33	e 12 4	0	—	—	—	36.7
Cipolletti	M.	91.9	133	22 59	? S	(22 59)	+ 5	38.0	48.6
La Paz	Bi.	91.9	133	23 42	? S	(23 42)	-52	(50.2)	63.0
Colombo	M.	101.6	112	e 18 49	?	e 29 3	?	44.4	51.8
Ann Arbor	B.	104.7	272	32 24	? SR <sub>1</sub>	40 24	?	54.4	70.4
Toronto	M.	105.0	50	28 24	? S	(28 24)	+92	53.4	—
Georgetown	—	108.4	49	—	—	—	—	50.7	61.1
Washington	Mar.	109.4	54	—	—	e 28 31	+68	54.6	—
Ithaca	B.O.	110.3	51	—	—	—	—	52.9	—
Ottawa	—	111.0	48	—	—	28 24	+53	52.5	—
Mauritius	M.	113.5	235	e 18 8	? PR <sub>1</sub>	e 28 54	+77	56.4	—
Harvard	B.O.	114.3	51	e 9 2?	?	(29 30)	+92	56.2	63.4
Edinburgh	M.	143.0	6	37 39	? SR <sub>1</sub>	16 15?	? P	e 57.9	—
Eskdalemuir	G.	143.3	6	e 20 4	[+18]	e 41 15	?	76.4	—
Lemberg	B.O.	144.9	336	—	—	—	—	e 75.0	86.7
Bidston	M.S.	145.3	6	23 42	? PR <sub>1</sub>	—	—	—	85.1
De Bilt	—	146.9	358	20 0	[+ 9]	—	—	e 82.4	—
Kew	M.	147.5	4	—	—	—	—	—	95.4
Shide	—	148.1	6	19 24	[- 29]	—	—	70.4	—
Uccle	—	148.2	358	19 57	[+ 4]	e 30 24	-84	—	78.4
Vienna	—	149.0	343	i 20 2	[+ 8]	—	—	—	—
Hohenheim	—	149.9	352	i 20 8	[+12]	—	—	—	—
Graz	W.	150.0	343	20 10	[+14]	—	—	—	—
Paris	—	150.3	1	i 20 8	[+12]	—	—	76.4	80.4
Zagreb	W.	151.1	341	20 3	[+ 6]	—	—	64.4	77.4
Zurich	—	151.4	352	e 20 9	[+12]	—	—	—	—
Helwan	M.	152.1	298	23 24	? PR <sub>1</sub>	—	—	—	—
Pola	W.	152.6	343	e 20 12	[+12]	—	—	79.7	83.7
Milan	—	153.0	350	e 21 34	[+94]	—	—	—	—
Moccalieri	S.	153.6	352	20 32	[+31]	38 49?	?	75.6	88.4
Rocca di Papa	Ag.	153.9	342	e 20 4	[+ 1]	—	—	—	80.6
Coimbra	—	155.9	342	e 20 18	[+15]	—	—	e 87.6	88.6
Barcelona	—	156.7	23	20 30	[+26]	—	—	87.0	82.4
Tortosa	—	157.6	0	20 24	[+18]	—	—	84.8	90.9
San Fernando	—	158.2	5	20 16	[+10]	—	—	85.4	85.6
Algiers	B.M.	160.8	23	45 54	? SR <sub>1</sub>	61 54	?	84.4	92.9
		182.3	0	21 6	[+57]	—	—	e 78.4	85.4

For Notes see next page.

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NOTES TO JUNE 4d. 17h. 11m. 36s.

Additional records: Apia M = +5.6m. Riverview gives iP = +7m.2s., iPR<sub>1</sub> = +8m.15s. and +9m.59s., PS = +12m.36s., MN = +15.5m., MZ = +19.5m., T<sub>0</sub> = 17h.12m.11s. Melbourne PR<sub>1</sub> = +9m.24s., SR<sub>1</sub> = +17m.30s. Adelaide gives PR<sub>1</sub> as P and S as PR<sub>1</sub>. Mauritius MN = +57.6m. Perth S = +23m.4s., SR<sub>1</sub> = +27m.12s., PR<sub>1</sub> is given as P and the true S is given as PR<sub>1</sub>. Mizusawa T<sub>0</sub> = 17h.12m.1s. Osaka MN = +39.0m., T<sub>0</sub> = 17h.11m.34s. Zi-ka-wei MN = +36.4m. Cipolletti records L as S. Toronto LE = +56.4m. Georgetown eN = +28m.48s. Ithaca eE = 34m.56s., LN = +53.6m. Ottawa e = +53m.24s., L = +63.4m. and +85.4m. Harvard LN = +63.5m., T<sub>0</sub> = 17h.5m.? Eskdalemuir eL = +59.4m. and L = +73.4m. Paris MN = +86.4m. Zagreb i = +20m.10s., iNW = +20m.28s., MNW = +78.4m. Pola MN = +82.7m. Moncalieri MN = +86.6m. Rocca di Papa gives one of its M's an hour too soon. Coimbra LN = +74.4m., MN = +85.3m. Barcelona LN = +80.8m. San Fernando MN = +91.9m.

June 4d. Records also at 0h. (La Paz), 1h. (San Fernando), 3h. (La Paz), 18h. (La Paz, Kodaikanal, and Capetown), 19h. (Mauritius), 20h. (Mizusawa), 23h. (Moncalieri and Rocca di Papa).

June 5d. 22h. 29m. 25s. Epicentre 22° 0S., 174° 0E. (as on 1915 Feb. 25d.).

A = -0.922, B = +0.097, C = -0.375; D = +0.104, E = +0.994;  
G = +0.373, H = -0.039, K = -0.927.

	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m. s.	s.	m. s.	s.		m.	m.		
Apia	15.8	61	e 4	5	+16	—	—	e 8	1	11.6	
Sydney	23.2	235	9	35	?S	(9 35)	+ 6	12	4	13.8	
Riverview	23.2	235	e 5	17	- 2	i 9 29	0	e 12	1	13.3	
Melbourne	29.5	231	—	—	—	—	—	15	6	19.4	
Adelaide	33.5	239	14	41	?SR <sub>1</sub>	—	—	—	—	21.0	
Perth	52.2	246	—	—	—	—	—	26	9	—	
Manila	63.5	300	e 10	35	0	—	—	—	—	—	
Victoria	89.9	36	—	—	—	—	—	—	—	49.1	
Mauritius	104.8	241	50	47	?L	—	—	(50.8)	—	55.0	
Helwan	145.7	291	77	35	?L	—	—	(77.6)	—	—	
Eskdalemuir	146.6	357	—	—	—	—	—	63	6	—	
Bidston	148.5	357	69	53	?	77 47	?L	(77.8)	—	—	
De Bilt	N. 148.7	347	e 21	47	?	—	—	e 65	6	72.0	
	E. 148.7	347	e 22	47	?PR <sub>1</sub>	—	—	—	—	74.2	
Zagreb	150.2	328	—	—	—	—	—	e 73	6	—	
Paris	152.3	348	—	—	—	—	—	e 74	6	—	

Additional records: Riverview gives eSR<sub>1</sub> = +10m.46s., MN = +12.7m., T<sub>0</sub> = 22h.29m.24s. Mauritius PN = +70m.41s.

June 5d. Records also at 4h. (San Fernando), 6h. (Manila), 13h. (Osaka), 15h. (Edinburgh), 16h. (Tokyo), 20h. (Pola), 22h. (Athens).

June 6d. 18h. 14m. 16s. Epicentre 23° 3S. 150° 6E.

A = -0.800, B = +0.451, C = -0.396; D = +0.491, E = +0.871.

	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
			m. s.	s.	m. s.	s.		m.	m.		
Riverview	10.5	177	i 2	37	+ 0	i 4 43	+ 0	i 4	8	8.0	
Sydney	10.5	178	4	8	?S	(4 8)	-35	5	0	5.2	
Melbourne	15.3	197	—	—	—	—	—	7	5	8.7	
Adelaide	15.6	219	6	44	?S	(6 44)	- 2	—	—	8.8	
Perth	31.8	247	—	—	—	—	—	14	3	—	
Batavia	45.4	285	e 8	44	+ 8	—	—	—	—	—	
Helwan	125.9	291	75	44	?L	—	—	(75.7)	—	—	
Tortosa	149.4	312	20	7	[+12]	—	—	36	7	39.2	

Additional record: Riverview M<sub>1</sub> = +5.3m., MZ<sub>2</sub> = +6.7m. Epicentre probably 24° 0S. 154° 0E.

June 6d. Records also at 15h. (Monte Cassino), 18h. (Helwan), 22h. (Lick, Athens, and Berkeley).

June 7d. 4h. 54m. 45s. Epicentre 27° 0N. 121° 0E. (as on 1917 July 5d.).

A = -0.459, B = +0.764, C = +0.454; D = +0.857, E = +0.515;  
G = -0.234, H = +0.389, K = -0.891.

	Δ	Az.	P.		O-C.		L.	M.
			m. s.	s.	m. s.	s.		
Taihoku	2.0	187	0	31	+ 0	0.7	1.1	
Hokoto	3.8	201	0	54	- 5	1.3	—	
Zi-ka-wei	4.2	5	e 1	5	+ 0	—	4.2	
Manila	12.4	180	e 2	53	-12	—	—	
Osaka	14.6	55	4	39	+65	—	17.2	

Osaka gives MN = +16.9m.

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**1918. June 7d. 21h. 27m. 6s. Epicentre 18°7N. 103°3W.**

A = -218, B = -922, C = +321; D = -973, E = +230;  
G = -074, H = -312, K = -947;

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Tucson	N. B.O.	15-2	335	3 57	+15	—	—	8-7	10-6
	E. B.O.	15-2	335	3 56	+14	—	—	8-2	9-9
Denver	W.	21-0	356	6 54	?	—	—	8-9	9-9
St. Louis	W.	22-9	27	e 5 24?	+ 8	10 0?	+37	11-4?	15-3?
Lick	W.	24-6	323	e 5 34	0	—	—	—	—
Berkeley	N. E.	25-3	323	e 5 45	+ 4	e 10 29	+20	e 12-9	17-7
	E. E.	25-3	323	e 5 49	+ 8	e 10 32	+23	—	17-1
Ann Arbor	N. B.	28-9	31	6 6	-11	12 30	+75	18-0	19-2
	E. B.	28-9	31	6 0	-17	12 12	+57	17-6	18-2
Cheltenham	N. B.O.	30-4	43	e 7 12?	+40	—	—	e 19-1	21-3
	E. B.O.	30-4	43	e 7 0?	+28	—	—	e 20-3	21-1
Georgetown	N. E.	30-4	43	e 7 1	+29	11 44?	+ 3	e 17-0	21-2
	E. E.	30-4	43	e 7 5	+33	11 25?	-16	e 16-9	21-2
Washington	N. E.	30-4	43	e 6 22	-10	11 27?	-14	14-7?	—
Toronto	M.	32-0	34	i 7 48	?PR <sub>1</sub>	13 12	+64	i 21-3	26-3
Ithaca	B.O.	32-8	38	—	—	e 11 54	-27	—	—
Victoria	M.	33-8	336	6 52	-11	12 49	+11	18-3	20-8
	Z.	33-8	336	6 42	-21	—	—	20-7	22-2
Ottawa	—	35-2	34	e 7 6	- 9	12 40	-18	e 16-8	—
Vieques	B.O.	35-9	84	e 23 29	?L	—	—	(23-5)	24-2
Harvard	B.O.	36-1	42	(8 7)	+44	i 13 0	-11	21-6	24-4
Northfield	B.O.	36-1	38	—	—	e 18 19	?L	23-4	—
La Paz	B.O.	49-4	133	e 9 6	+ 3	16 6	- 5	21-9	23-3
Honolulu	M.	51-3	283	—	—	—	—	e 23-7	25-0
Apia	W.	74-9	249	—	—	—	—	e 36-4	37-9
Dyce	Ma.	80-1	33	—	—	—	—	49-9	—
Edinburgh	M.	80-1	34	11 54	-26	—	—	—	52-9
Eskdalemuir	G.	80-2	35	12 21	+ 1	22 34	+ 9	38-9	48-9
Bidston	M.S.	80-9	36	12 12	-12	22 6	-28	—	49-4
Stonyhurst	M.	81-2	36	i 11 48	-38	i 22 42	+ 5	—	53-6
Coimbra	—	81-7	50	12 34	+ 5	22 50	+ 7	39-9	48-9
Shide	—	82-9	39	12 38	+ 3	22 58	+ 2	45-9	51-1
Kew	M.	83-2	38	—	—	—	—	—	50-9
Rio Tinto	M.	83-7	52	12 54	+14	—	—	—	22-9
San Fernando	—	84-5	53	23 24	?S	(23 24)	+10	49-9	53-4
Paris	—	85-9	39	—	—	e 23 39	+10	49-9	—
Uccle	—	86-2	37	12 55	+ 1	e 23 24	- 8	42-9	45-9
De Bilt	E. N.	86-3	36	12 55	0	e 23 22	-11	e 41-9	53-0
	N.	86-3	36	12 59	+ 4	i 23 49	+16	—	56-2
Tortosa	—	87-8	47	12 58	- 6	e 23 56	+ 8	46-1	54-8
Barcelona	—	88-7	46	—	—	e 23 39	-21	47-2	59-4
Hohenheim	—	89-9	37	e 13 33	+18	—	—	—	—
Zurich	—	90-2	39	—	—	—	—	e 52-9	—
Moncalleri	S.	90-8	41	e 13 17?	- 3	24 1	-21	41-1	55-8
Algiers	B.M.	91-3	50	e 24 14	?S	(e 24 14)	-13	e 49-9	55-9
Vienna	—	94-2	36	e 13 30	—	—	- 9	—	—
Pola	W.	94-6	39	e 24 12	?S	(e 24 12)	-50	e 56-6	58-5
Zagreb	W.	95-3	38	e 13 38	- 7	(e 24 15)	-54	50-9	58-9
Rocca di Papa	Ag.	95-5	42	e 24 15	?S	(e 24 15)	-56	e 45-6?	60-7
Lemberg	B.O.	97-2	31	—	—	—	—	e 54-5	62-7
Riverview	—	113-0	240	e 45 54?	?	—	—	e 53-8	64-5
Helwan	M.	114-7	43	19 54	?PR <sub>1</sub>	—	—	—	—
Melbourne	M.	118-3	236	—	—	—	—	e 55-9	67-4
Cape Town	M.	126-4	119	65 6	?L	—	—	(65-1)	74-1
Colombo	M.	154-2	353	92 54	?L	—	—	(92-9)	98-1

For Notes see next page.

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### NOTES TO JUNE 7d. 21h. 27m. 6s.

Additional records: Berkeley gives  $T_0 = 21h.26m.53s.$  Ann Arbor  $T_0 = 21h.25m.48s.$  Cheltenham PE? = +17m.15s., PN? = +17m.25s. Toronto  $T_0 = 21h.28m.6s.$  Victoria  $T_0 = 21h.26m.27s.$  Ottawa PR<sub>1</sub> = +8m.24s., SR<sub>1</sub> = +14m.36s., L = +20.9m.,  $T_0 = 21h.27m.10s.$  Harvard gives P at 26m.42s., and the true P as S. Also SE = +8m.33s., eE = +16m.0s., P? or L = +19m.57s., MN = +24.0m.,  $T_0 = 21h.16m.12s.$  La Paz  $T_0 = 21h.27m.23s.$  Eskdalemuir  $T_0 = 21h.27m.12s.$  Bidston PR<sub>1</sub> = +15m.57s. Coimbra LN = +46.9m.,  $T_0 = 21h.27m.22s.$  Uccle  $T_0 = 21h.27m.30s.$  De Bilt eSR<sub>1</sub>N = +29m.6s., eSR<sub>1</sub>E = +29m.11s., eSR<sub>2</sub> = +33m.19s.,  $T_0 = +21h.27m.32s.$  Barcelona M = +64.6m. Moncalieri MN = 55.0m. Pola MN = +67.8m. Zagreb MNW = +59.9m. Rocca di Papa L = +59.6m. Riverview MN = +69.2m.

June 7d. Records also at 1h. (San Fernando), 6h. (Rio Tinto), 7h. (Zagreb), 9h. (Tacubaya), 10h. (Algiers), 11h. and 12h. (La Paz), 14h. (Manila and Riverview), 18h. (Zurich), 23h. (Athens).

June 8d. 20h. 13m. 12s. Epicentre  $5^{\circ}0'N. 128^{\circ}0'E.$  (as on 1916 Feb. 14d. and 1916 June 9d.).

$$A = -0.613, B = +0.785, C = +0.087; \quad D = +0.788, E = +0.616;$$

$$G = -0.054, H = +0.069, K = -0.996.$$

It seems possible that the Manila S is one minute in error; and perhaps both P and S of Mizusawa; but without knowledge of these points improvement of the solution is uncertain.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	11.8	325	e 2 54	- 2	6 0	+46	7.6	9.3
Batavia	23.9	243	5 30	+ 3	9 37?	- 5	—	10.8
Osaka	30.5	12	6 43	+10	11 41	- 2	16.4	21.7
Mizusawa	E. 36.1	17	6 32	-51	11 57	-74	—	—
Riverview	44.6	152	e 15 6	?S	(e 15 6)	- 4	e 24.1	32.8
Colombo	48.0	275	14 48	?S	(14 48)	-66	—	—
Kodalkanal	50.3	279	19 54	?SR <sub>1</sub>	—	—	—	—
Helwan	93.2	300	23 48	-?S	(23 48)	-59	—	—
Zagreb	101.4	319	e 14 7	-10	e 27 18	+34	54.8	55.8
De Bilt	105.2	328	—	—	—	—	(58.8)	—
Edinburgh	107.2	334	58 48	?L	—	—	—	—
Eskdalemuir	107.5	333	31 48	?	—	—	—	61.8
Stonyhurst	108.1	332	—	—	—	—	—	—
Paris	108.3	326	—	—	—	—	54.8	—

Additional records: Manila gives MN = +9.5m.,  $T_0 = 20h.(12m.16s.).$  Batavia  $T_0 = 20h.(13m.33s.).$  Osaka MN = +23.5m.,  $T_0 = 20h.13m.39s.$  Mizusawa N/S = +12m.3s.,  $T_0 = 20h.(12m.54s.).$  Riverview eS = +19m.24s., PS = +19m.49s., MN = +29.6m. De Bilt MN = +55.6m., Epicentre  $5^{\circ}8'N. 124^{\circ}5'E.$

June 8d. Records also at 2h. (Tokyo), 3h. (Andalgala), 8h. (Athens), 10h. (Simla), 11h. (Tacubaya (3)), 12h. (Tacubaya), 14h. (Sydney and Rocca di Papa), 15h. (Tacubaya and Manila), 16h. (Athens (2)), 19h. (Zi-ka-wei), 23h. (San Fernando).

June 9d. Records at 2h. (Taihoku), 13h. (Rocca di Papa), 14h. (Pompeii), 15h. and 17h. (La Paz), 18h. (Manila), 19h. (Rio Tinto), 21h. (La Paz).

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June 10d. 15h. 35m. 30s. Epicentre 4° 0S. 144° 5E. (as on 1916 Aug. 3d.).

A = -0.812, B = +0.570, C = -0.070; D = +0.581, E = +0.814;  
G = +0.057, H = -0.041, K = -0.998.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	s.	m.	s.	m.	s.	m.	m.
Manila	29.8	309	e 7 3	+37	—	—	—	—
Sydney	30.5	169	11 30	?S	(11 30)	-13	15.2	17.5
Riverview	30.5	169	e 4 48	-105	110 48	-55	e 15.7	16.5
Melbourne	33.8	179	12 6	?S	(12 6)	-32	18.5	19.0
Batavia	37.6	265	e 9 30	?PR <sub>1</sub>	—	—	—	17.5
Osaka	39.6	348	8 14	+23	—	—	—	18.2
Mizusawa	E. 43.2	356	8 30	+10	14 51	0	—	—
	N. 43.2	356	8 29	+9	14 54	+3	—	—
Colombo	65.5	279	19 30	?S	(19 30)	-1	—	—
Helwan	112.0	301	23 30	?	—	—	—	—
De Bilt	121.4	332	—	—	e 29 30	+30	e 58.5	63.3
Eskdalemuir	122.5	339	—	—	—	—	51.5	—
Bidston	123.9	337	61 12	?L	—	—	(61.2)	69.5
Kew	124.2	334	—	—	—	—	—	67.5
Moncalleri	124.3	320	—	—	—	—	63.4	—
San Fernando	137.9	324	68 30	?L	—	—	(68.5)	—
La Paz	141.8	123	19 41	[-2]	28 45	?	e 41.0	42.3

Additional records: Riverview gives SR<sub>1</sub> = +12m.51s., MZ = +22.6m. Melbourne S = +16m.48s. Osaka MN = +17.6m. De Bilt e = +37m.36s.

June 10d. Records also at 1h. (San Fernando), 3h. (Rocca di Papa and Athens), 4h. (Zagreb), 5h. (Riverview), 14h. (Zi-ka-wei), 19h. (La Paz), 22h. (Manila).

June 11d. 12h. 36m. 25s. Epicentre 19° 3N, 62° 5W.

A = +0.436, B = -0.837, C = +0.330; D = -0.887, E = -0.462;  
G = +0.153, H = -0.293, K = -0.944.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	s.	m.	s.	m.	s.	m.	m.
Vieques	3.0	249	—	—	—	—	2.6	3.3
Cheltenham	N. 23.1	330	5 16	-2	9 29	+2	e 12.2	18.7
	E. 23.1	330	5 18	0	9 28	+1	e 12.6	17.3
Washington	23.3	330	5 19	-1	9 16	-15	12.1	—
Georgetown	23.3	330	e 5 19	-1	9 33	+2	11.7	—
Harvard	24.2	344	e 3 43	?	e 8 34	-74	13.6	—
Ithaca	E. 26.0	336	—	—	e 10 16	-6	e 12.6	—
	N. 26.0	336	—	—	e 10 11	-11	e 13.2	—
Northfield	26.3	344	5 33?	-18	10 5?	-23	12.9	—
Toronto	28.2	333	—	—	—	—	13.1	18.4
Ottawa	28.4	340	e 5 29	-43	—	—	e 13.0	—
Ann Arbor	E. 29.2	327	6 5	-15	9 35	?	15.1	20.9
	E. 29.2	327	5 41	-39	—	—	15.6	20.9
	N. 29.2	327	4 53	?	10 35	-45	16.1	20.8
La Paz	36.2	189	17 14	-10	13 7	-6	20.0	22.7
San Fernando	51.9	58	16 35	?S	(16 35)	-8	—	—
Berkeley	54.7	303	—	—	—	—	e 27.6	—
Bidston	56.5	38	—	—	—	—	—	28.6
Victoria	56.5	316	—	—	—	—	—	37.5
Eskdalemuir	56.9	36	13 35	?PR <sub>1</sub>	—	—	—	—
Stonyhurst	57.0	38	—	—	—	—	—	29.1
Edinburgh	57.1	35	17 35	?S	(17 35)	-12	—	36.1
Barcelona	58.5	53	—	—	—	—	e 28.6	—
Paris	59.3	44	—	—	e 17 35	-40	—	—
De Bilt	61.2	40	—	—	18 42	+4	e 29.6	32.6
Zagreb	68.4	47	e 11 13	+6	20 9	+2	36.9	—
Helwan	83.7	61	44 35	?L	—	—	(44.6)	—

Additional records: Vieques gives MN = +2.9m. Cheltenham T<sub>1</sub> = 12h.36m.25s. Georgetown ePN = +5m.17s., T<sub>1</sub> = 12h.36m.21s. Harvard eE = +3m.12s., eLN? = +8.0m. Toronto L = +11.9m. La Paz T<sub>1</sub> = 12h.36m.14s. De Bilt e = +22m.53s., MN = +34.2m., Epicentre 19° 7N. 60° 8W.

June 11d. Records also at 0h. (Taihoku), 6h. (Manila), 12h. (Rocca di Papa), 14h. (Zi-ka-wei), 15h. (Osaka, Taihoku, and Rocca di Papa), 18h. (Kobe), 19h. (Osaka and Manila), 21h. (Zagreb and Taihoku), 22h. (San Fernando), 23h. (Mizusawa and Tokyo).

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June 12d. 4h. 24m. 40s. Epicentre 43°-0N. 125°-0W. (as on 1914 Aug. 22d.).

A = -.420, B = -.599, C = +.682; D = -.819, E = +.574;  
G = -.391, H = -.559, K = -.731.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Berkeley		5.5	157	e 1 15	-10	—	—	—	3.8
Victoria		5.5	12	—	—	—	—	3.1	4.1
Lick		6.5	155	e 1 40	+ 1	—	—	—	—
Tucson	N.	15.5	129	4 10	+24	—	—	9.3	10.3
	E.	15.5	129	4 4	+18	—	—	9.3	10.3
Ann Arbor		30.1	77	6 20	- 9	11 32	- 4	19.5	20.4
Toronto		32.8	72	—	—	—	—	21.6	22.1
Ottawa		34.9	69	—	—	e 12 50	- 4	e 21.1	—
Ithaca		35.1	74	—	—	—	—	20.8	—
Washington		36.0	80	12 29?	?S	(12 29?)	-41	e 17.7	—
Georgetown		36.0	80	e 10 44	?	—	—	e 19.8	—
Cheltenham		36.2	80	—	—	e 19 29	?L	e 23.5	—
Harvard		38.9	72	e 7 54	+ 9	—	—	22.1	—
Edinburgh		69.6	31	29 5	?L	—	—	(29.1)	44.3
Eskdalemuir		70.0	31	—	—	—	—	35.3	—
Bidston		71.5	32	32 26	?L	—	—	(32.4)	46.0
Kew		74.1	32	—	—	—	—	—	47.3
Shide		74.7	34	—	—	—	—	—	46.0
De Bilt	E.	75.6	29	—	—	e 22 5	+32	e 36.3	47.5
	N.	75.6	29	—	—	—	—	e 38.3	45.5
Paris		77.4	32	—	—	—	—	e 45.3	48.3
Rio Tinto		81.8	45	46 20	?L	—	—	(46.3)	49.3
Moncalieri		82.5	32	e 45 3	?L	—	—	48.8	—
Zagreb		84.7	26	e 12 57	+11	23 26	+10	50.3	54.3
Rocca di Papa		87.1	30	e 16 44	?PR <sub>1</sub>	—	—	—	23.7
Helwan		104.0	21	71 20	?L	—	—	(71.3)	—

Additional records: Berkeley gives MN = +3.9m. Georgetown LN = +22.4m., eLE = +23.4m. Washington S? = +17m.40s. Cheltenham eLN = +22.4m. Harvard eN? = +5m.54s., eN = +11m.48s., eN = +19m.59s., LN = +21.4m. Zagreb MNW = +53.3m. Rocca di Papa M = +25.8m.

June 12d. Records also at 1h. (Pompeii), 7h. (Manila), 8h. (Helwan, La Paz, and Colombo), 15h. (La Paz), 18h. (Moncalieri), 22h. (San Fernando), 23h. (Batavia).

June 13d. 8h. 58m. 35s. Epicentre 14°-5N. 86°-0W.

A = +.068, B = -.966, C = +.250; D = -.998, E = -.070;  
G = +.017, H = -.250, K = -.968.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Cheltenham		25.6	17	5 45	+ 1	—	—	—	13.3
Washington		25.7	16	5 44	- 1	10 11	- 5	12.2	—
Georgetown		25.7	16	15 45	0	11 22	?SR <sub>1</sub>	e 14.7	—
Ann Arbor	E.	27.9	4	5 37	-30	10 19	-38	13.0	12.9
	N.	27.9	4	5 55	-12	10 31	-26	13.0	13.1
Ithaca	N.	29.1	14	e 6 39	+20	e 12 24	+65	—	—
	E.	29.1	14	e 6 54	+35	e 12 27	+68	—	—
Toronto		29.7	10	—	—	—	—	12.2	—
Harvard	N.	30.7	21	16 24	-11	11 33?	-13	e 15.0?	—
	E.	30.7	21	16 33	- 2	11 42?	- 4	—	—
Ottawa		32.1	12	6 36	-12	11 50	-20	14.9?	—
La Paz		35.6	151	7 27	+ 9	13 13	+ 9	18.4	20.0
Victoria		45.7	326	—	—	—	—	—	23.9
Edinburgh		74.0	35	31 25	?L	—	—	(31.4)	—
De Bilt		79.3	39	—	—	22 24	+ 9	e 38.4	39.6
Moncalieri		82.4	45	e 13 16	+44	—	—	20.6	—
Rocca di Papa		86.7	47	e 12 37	-20	16 3?	?PR <sub>1</sub>	—	26.4
Zagreb		87.6	43	e 15 25	?PR <sub>1</sub>	25 25	+97	—	—
Helwan		105.1	53	28 25	?S	(28 25)	+102	—	—

Additional records: Cheltenham gives MN = +13.4m. Georgetown T<sub>1</sub> = 8h.57m.15s. Ann Arbor SE = +9m.55s. Ithaca T<sub>1</sub> = 8h.57m.59s. Harvard T<sub>1</sub>N? = 8h.58m.26s., T<sub>1</sub>E? = 8h.58m.35s. Ottawa L = +16.4m., T<sub>1</sub> = 8h.58m.34s. La Paz PR<sub>1</sub> = +9m.33s., T<sub>1</sub> = 8h.58m.46s. De Bilt M = +52.0m.

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June 13d. 18h. 13m. 55s. Epicentre 39°-0N. 27°-0E. (as on 1917 Aug. 8d.).

A = +.692, B = +.353, C = +.629 ; D = +.454, E = -.891 ;  
G = +.561, H = +.286, K = -.777.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	248	0 47	+ 3	—	—	1.3	1.9
Helwan	9.8	158	8 5	?L	—	—	(8.1)	—
Pompeii	9.8	284	2 31	+ 4	—	—	—	—
Zagreb	10.6	314	—	—	e 4 26	-19	—	7.6
Lemberg	11.0	350	—	—	—	—	e 6.2	6.9
Rocca di Papa	11.2	289	e 3 35	+48	—	—	—	5.6
Graz	11.6	318	e 5 41?	?L	—	—	(e 5.7?)	—
Moncalieri	15.5	299	—	—	e 6 40	- 4	e 9.5	—
De Bilt	20.0	318	—	—	—	—	e 10.9	—

Additional records : Athens gives MN = +1.5m. Zagreb iMNE = +7.3m.,  
iMNW = +7.6m. Rocca di Papa e = +1m.18s., S = +4m.27s., M = +5.0m.

June 13d. Records also at 0h. (De Bilt, Rocca di Papa, and Zagreb), 1h. (Helwan and Eskdalemuir), 6h. (La Paz), 8h. (Zi-ka-wei), 16h. (Batavia).

June 14d. Records at 1h. (Taihoku), 3h. (San Fernando), 8h. (Lick), 13h. and 15h. (La Paz), 17h. (Taihoku and San Fernando), 20h. (Tokyo), 21h. (Honolulu and Berkeley), 22h. Lick (2), 23h. (Bidston).

June 15d. Records at 0h. (La Paz, Eskdalemuir, Bidston, De Bilt, and Helwan), 1h. (La Paz), 4h. (Tokyo), 5h. and 10h. (Manila), 16h. (La Paz), 17h. (Zagreb), 19h. and 22h. (La Paz).

June 16d. 5h. 11m. 0s. Epicentre 8°-4S. 155°-8E.

A = -.902, B = +.406, C = -.146 ; D = +.410, E = +.912 ;  
G = +.133, H = -.060, K = -.989.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	25.8	189	5 46	0	e 10 18	0	13.5	16.2
Melbourne	31.0	197	—	—	10 54	-57	15.4	16.4
Manila	41.5	303	e 7 58	- 9	—	—	10.0	—
Tokyo	46.6	342	8 40	- 4	—	—	—	—
Osaka	47.2	337	8 52	+ 4	—	—	—	27.3
Batavia	48.5	269	e 9 0	+ 3	—	—	—	18.0
Honolulu	54.2	56	17 12	?S	(17 12)	+ 1	24.2	25.9
Victoria	90.3	41	35 33?	?L	41 27	?L	49.3	54.8
Toronto	120.6	44	—	—	—	—	68.0	—
Capetown	121.4	221	61 36	?L	—	—	(61.8)	123.6
Ottawa	122.3	41	—	—	—	—	e 59.0	—
Helwan	124.0	300	37 0	?SR <sub>1</sub>	—	—	—	—
Zagreb	129.1	324	e 19 18	[+ 2]	—	—	142.7	—
Edinburgh	129.7	345	62 0	?L	—	—	(62.0)	—
La Paz	129.9	120	18 44	[ - 84]	—	—	62.9	80.4
De Bilt	130.2	337	e 23 0	?PR <sub>1</sub>	—	—	e 65.0	65.9
Pompeii	132.9	320	19 18	[ - 7]	—	—	—	—
Rocca di Papa	133.4	322	e 19 28	[+ 2]	—	—	e 24.9	28.4
Moncalieri	134.2	328	22 55	?PR <sub>1</sub>	—	—	57.3	—

Additional records : Riverview gives PR<sub>1</sub> = +7m.24s., i = +10m.23s., PS = +10m.33s., +11m.15s., +11m.43s., MN = +16.0m. Osaka MN = +25.5m. Toronto LE = +74.6m. Rocca di Papa eP = +19m.25s., M = +19.6m.

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June 16d. 12h. 27m. 36s. Epicentre 15°·1N. 84°·8W. (as on 1914 May 28d.).

A = +·087, B = -·962, C = +·261 ; D = -·996, E = -·091 ;  
G = +·024, H = -·259, K = -·966.

The European stations from Edinburgh to Paris in this table do not fit at all. They must have had some other origin, but have been included for the sake of completeness.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	8·0	140	1 58	- 3	(3 22)	-15	3·4	3·5
Washington	24·8	14	5 51	+15	10 21	+22	12·9?	—
Ann Arbor	27·2	2	5 54	- 6	10 36	- 9	—	14·4
	27·2	2	6 0	0	10 42	- 3	—	14·5
Ithaca	28·2	12	6 21	+11	11 13	+10	—	—
Toronto	29·0	8	—	—	11 48	+31	14·7	19·1
Harvard	N. 29·7	21	i 6 21?	- 4	11 22?	- 7	i 13·8?	—
	E. 29·7	21	i 6 35	+10	11 41	+12	i 13·0	—
Northfield	30·8	17	6 4?	-32	11 19?	-29	14·4	—
Ottawa	31·3	12	i 6 45	+ 4	e 11 54	- 2	e 14·9	—
La Paz	35·5	152	3 54	?	—	—	17·3	18·0
Victoria	45·9	325	—	—	—	—	29·1	—
Edinburgh	72·9	35	17 54	?	—	—	—	—
Eskdalemuir	72·9	36	18 24	?	—	—	—	—
Bidston	73·1	38	18 24	?	26 54	?SR <sub>1</sub>	—	36·1
Stonyhurst	73·3	38	—	—	—	—	—	21·9
Shide	74·3	40	—	—	e 21 19	+ 1	—	—
De Bilt	78·2	39	e 13 23	+75	e 22 1	- 1	39·7	40·3
Moncalieri	81·1	46	12 22?	- 4	i 22 28	- 8	34·4	—
Zagreb	86·3	43	e 12 51	- 4	i 23 22	-11	—	—
Helwan	103·8	53	24 24	?S	(24 24)	-127	—	—

Additional records: Balboa Heights PN = +2m.15s., LN = +3·6m., MN = +3·7m. Toronto SE = +9m.42s. Ithaca SE = +11m.12s., T<sub>0</sub> = 12h.27m.50s. Harvard iN? = +12m.32s., T<sub>0</sub>N? = 12h.27m.45s., T<sub>0</sub>E = 12h.27m.44s. Ottawa i = +8m.12s., SR<sub>1</sub> = +13m.0s., T<sub>0</sub> = 12h.27m.48s. Stonyhurst M = +37·4m. De Bilt e = +23m.30s., LN = +35·1m., MN = +35·3m. Moncalieri T<sub>0</sub> = 12h. (27m.50s.). Zagreb i = +13m.48s., eSNE? = +22m.33s. These records are given a day later.

June 16d. Records also at 0h. (San Fernando), 1h. (La Paz), 3h. (Colombo), 4h. (La Paz, Rio Tinto, and Marseilles), 7h. (Moncalieri), 10h. (La Paz), 15h. (Batavia), 16h. and 17h. (La Paz), 18h. (San Fernando), 21h. (Colombo).

June 17d. 16h. 41m. 25s. Epicentre 42°·5N. 85°·5W.

A = +·058, B = -·735, C = +·676 ; D = -·997, E = -·078 ;  
G = +·053, H = -·674, K = -·737.

The solution is unsatisfactory in that it does not account for the records at De Bilt or Ann Arbor. But no solution satisfying all the material suggests itself, after several trials.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	1·3	99	1 47	?	—	—	4·1	—
Ithaca	6·6	88	—	—	—	—	e 3·5	—
Washington	7·3	116	—	—	—	—	e 4·2	—
Georgetown	7·3	116	e 1 50?	- 1	4 25?	?L	(4·4)	—
Cheltenham	7·5	117	—	—	—	—	e 4·6	5·4
Ottawa	7·6	64	i 1 55	0	e 3 27	+ 1	e 4·5	—
Harvard	10·6	86	—	—	e 4 13	-32	4·6	—
De Bilt	58·1	46	—	—	e 15 35	?	—	—

Additional records: Ithaca gives eN = +3m.37s. Georgetown SN? = +4m.29s. Ottawa e = +2m.7s. Harvard LE = +8·0m.

June 17d. Records also at 0h. and 1h. (La Paz), 13h. (Osaka), 16h. (Sitka), 18h. (Riverview), 22h. (La Paz), 23h. (San Fernando).



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June 18d. 15h. 45m. 15s. Epicentre 41°·0N. 13°·0E.

$$A = +.735, B = +.170, C = +.656.$$

	$\Delta$	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Monte Cassino	0·7	0 7	- 4	—	—	—	0·2
Rocca di Papa	0·8	1 0 13	+ 1	1 0 26	+ 4	—	0·6
Pompeii	1·2	0 25	+ 7	0 43	?L	(0·7)	—
Pola	3·9	e 1 14	?S	(e 1 14)	-33	e 1·7?	1·9
Zagreb	N.E. 5·2	1 24	+ 4	1 2 29	+ 7	1 2·7	3·2
	N.W. 5·2	1 34	+14	2 25	+ 3	1 2·9	2·9

No additional records.

June 18d. Records also at 0h. (Manila), 1h. (Tokyo), 3h. (Rio Tinto), 4h. (Algiers), 12h. (Mauritius), 13h. (Helwan), 16h. (Manila), 19h. (Helwan).

June 19d. 21h. 12m. 8s. Epicentre 39°·0N. 27°·0E. (as on 1918 June 13d. 18h.).

$$A = +.692, B = +.353, C = +.629; \quad D = +.454, E = -.891;$$

$$G = +.561, H = +.286, K = -.777.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2·8	248	e 0 47	+ 3	1 1 17	0	—	1·6
Pompeii	9·8	284	2 28	+ 1	—	—	—	—
Zagreb	10·6	314	e 1 52	?	1 4 50	+ 5	5·3	—
Rocca di Papa	11·2	289	1 3 40	?	—	—	—	4·5
De Bilt	20·0	318	—	—	—	—	e 9·8	10·8

Additional records: Athens gives MN = +2·2m., Zagreb i = +4m.33s. De Bilt MN = +10·7m.

June 19d. Records also at 1h. (Manila), 2h. (San Fernando), 6h. (Manila), 8h. (Tokyo), 12h. (Helwan and La Paz), 13h. (La Paz), 15h. (Helwan), 19h. (San Fernando), 20h. (Manila), 23h. (Riverview and Graz).

June 20d. Records at 3h. (San Fernando), 5h. (Balboa Heights and Manila), 6h. (Tokyo), 7h. (Manila), 17h. (Paris), 20h. (Andalgala), 21h. (Honolulu).

June 21d. 3h. 59m. 5s. Epicentre 22°·0S. 141°·0W.

$$A = -.721, B = -.583, C = -.375; \quad D = -.629, E = +.777;$$

$$G = +.291, H = +.236, K = -.927.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	46·4	338	29 49	?L	35 7	?	37·8	38·4
Riverview	60·0	243	—	—	—	e	68·0	69·7
Berkeley	62·4	17	—	—	e 23 55	?SR <sub>1</sub>	—	—
Cipolletti	63·4	124	28 13	?	—	—	35·2	39·2
La Paz	68·4	100	11 7	0	20 8	+ 1	27·4	29·3
Chacarita	71·9	121	38 43	?L	—	—	(38·7)	—
Victoria	72·2	12	37 58	?L	—	—	(38·0)	42·9
Toronto	86·5	40	—	—	—	—	59·1	—
Capetown	120·8	160	70 49	?L	—	—	(70·8)	72·8
Edinburgh	134·1	32	61 55	?L	—	—	(61·9)	71·4
Eskdalemuir	134·3	32	—	—	—	—	60·9	—
De Bilt	140·3	32	—	—	—	—	61·9	66·0
Helwan	169·6	40	85 55	?L	—	—	(85·9)	—

Additional records: Riverview gives MN = +73·6m. Victoria L = +40·4m.

The above solution is clearly defective, but will serve to show the difficulties in reconciling all the observations. There were probably at least two shocks, one of them about 38° from Honolulu at 4h.21m.20s., according to the Honolulu record. The Berkeley record would fit in with this and place the epicentre a few degrees from Berkeley, and if we adopt the position 32°·0N. 119°·0W., as on 1917 November 7, and 1915 November 21, the European records (Eskdalemuir, De Bilt, and Edinburgh) will also fit fairly well; but, in view of the complete silence of other American stations, it seems impossible to put forward this solution seriously, though we may give the figures:

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June 21d. 4h. 21m. 20s. At 32°-0N. 119°-0W., as on 1917 Nov. 7.

	$\Delta$	P.	O-C.	S.	O-C.	L.
	°	m. s.	s.	m. s.	s.	m.
Berkeley	6.4	(1 40)	+ 2	1 40	?P	—
Honolulu	36.2	7 34	+10	12 52	-21	15.6
Eskdalemuir	76.9	—	—	—	—	38.7
Edinburgh	76.6	39 40	?L	—	—	(39.7)
De Bilt	82.8	—	—	—	—	39.7
Capetown	144.5	48 34	?L	—	—	(48.6)

June 21d. 5h. 54m. 36s. Epicentre 19°-0N. 144°-0E.

A = -.765, B = +.556, C = +.326; D = +.588, E = +.809;  
G = -.263, H = +.191, K = -.946.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	17.1	348	e 4 13	+ 7	—	—	—	—
Osaka	17.4	336	4 28	+18	—	—	—	10.2
Mizusawa	N. 20.3	354	4 41	- 4	8 22	- 7	—	—
Manila	N. 20.3	354	4 39	- 6	8 19	-10	—	—
Zi-ka-wei	22.5	262	e 5 13	+ 2	9 17	+ 2	9.9	10.6
	23.7	305	e 5 13	-12	10 52	?L	(10.9)	—

Additional records: Osaka MN = +11.4m., and Manila MN = +10.4m.

June 21d. Records also at 0h. (Lick and San Fernando), 3h. (Apia), 14h. (Lick and Manila), 15h. (Manila, La Paz, Batavia, and Zi-ka-wei), 16h. (Helwan, De Bilt, and Bidston), 20h. and 21h. (Taihoku), 22h. (Cape Town), 23h. (Lick).

June 22d. 22h. 5m. 30s. Epicentre 9°-5N. 84°-0W. (as on 1916 April 26d. 2h.).

A = +.103, B = -.981, C = +.165; D = -.995, E = -.105;  
G = +.017, H = -.164, K = -.986.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	N. 4.4	96	1 20	+12	(1 56)	- 5	1.9	3.0
	E. 4.4	96	1 14	+ 6	—	—	2.4	3.2
Vieques	N. 20.0	62	4 47	+ 6	—	—	—	—
Cheltenham	N. 29.9	11	e 6 39	+12	e 11 39	+ 7	e 17.7	19.8
Washington	30.0	11	(6 23?)	- 5	(11 57?)	+23	17.3	—
Georgetown	30.0	11	e 6 30	+ 2	10 53	-41	15.9	—
La Paz	30.4	149	6 25	- 7	11 31	-10	15.9	16.6
Ann Arbor	N. 32.8	0	6 36	-19	10 42	?S	—	20.5
Ithaca	33.5	10	e 8 7	?PR <sub>1</sub>	e 14 18	?SR <sub>1</sub>	18.4	—
Toronto	34.4	6	—	—	—	—	15.5	20.4
Harvard	34.8	17	7 3	- 8	i 12 54	+ 2	e 17.6?	—
Ottawa	36.6	10	i 9 42	?S	i 13 6	-12	e 20.5	—
Victoria	51.0	327	—	—	—	—	26.4	38.7
Edinburgh	77.1	35	21 30	?S	(21 30)	-20	—	52.2
Stonyhurst	77.4	37	15 0	?PR <sub>1</sub>	i 26 36	?SR <sub>1</sub>	—	42.8
Tortosa	79.7	50	13 20	+63	—	—	43.5	47.6
Paris	80.6	42	—	—	e 28 30	?SR <sub>1</sub>	38.5	—
Rocca di Papa	88.6	48	i 13 18	+10	e 22 12?	-107	28.5	30.3
Helwan	106.5	55	28 30	?S	(28 30)	+93	—	—
Manila	145.5	314	e 19 50	[ + 1 ]	—	—	—	—

Additional records: Vieques gives ePE = +4m.58s. Washington gives P as S and S as L. Georgetown eLN? = +12.7m., LN = +16.8m. Ithaca LN = +19.2m. Toronto LE = +19.2m. Harvard iS? = +8m.28s., LE = +23.0, T<sub>1</sub>? = 21h.56m.51s. Very uncertain. Victoria L = +31.3m.

June 22d. Records also at 0h. (San Fernando), 2h. and 5h. (Rocca di Papa), 10h. (Manila), 13h. (Cipolletti), 14h. (Athens and La Paz), 17h. (Tokyo), 18h. (Helwan).

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June 23d. Records at 0h. (Manila), 1h. (Taihoku and San Fernando), 4h. (Athens (2) ), 5h. (La Paz), 6h. (Athens), 14h. (La Paz), 15h. (Rocca di Papa), 23h. (Manila).

June 24d. 1h. 57m. 28s. Epicentre 42°·3N. 17°·8E.

$$A = +.704, B = +.226, C = +.673.$$

	$\Delta$	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Monte Cassino	2·8	0 50	+ 6	—	—	—	—
Pompeii	2·9	0 45	0	1 20	0	—	—
Rocca di Papa	3·8	1 3	+ 4	—	—	—	2·1
Zagreb	4·0	i 1 46	?S	(i 1 46)	- 4	(2·5)	2·8

Additional record : Zagreb gives e = +1m.42s. Also L is recorded as S.

1918. June 24d. 14h. 46m. 40s. Epicentre 1°·2S. 149°·5E.

$$A = -.862, B = +.508, C = -.021; \quad D = +.508, E = +.862; \\ G = +.011, H = -.018, K = -1.000.$$

Station and Component.	Machine.	$\Delta$	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. s.	s.	M. s.	s.	M.	M.
Manila	W.	32·4	302	7 32	+40	12 30	+16	16·0	16·7
Riverview	—	32·7	178	e 7 14	+20	e 11 2	-77	e 13·3	16·9
Sydney	M.	32·7	178	11 8	?S	(11 8)	-71	15·0	17·1
Melbourne	M.	36·8	188	13 8	?S	(13 8)	-13	19·1	21·0
Taihoku	O.	37·7	318	—	—	—	—	e 14·0	—
Osaka	O.	38·2	342	—	—	10 1	?PR,	—	20·0
Honolulu	M.	55·9	63	9 38	- 7	17 20	-13	24·8	27·3
Victoria	M.	89·1	41	42 50	?L	46 17	?L	52·2	57·6
Helwan	M.	114·8	303	21 20	?PR	—	—	—	—
Graz	W.	119·2	327	—	—	—	—	e 62·3	—
Toronto	M.	119·3	38	—	—	—	—	63·5?	75·8
Zagreb	W.	120·3	325	—	—	e 31 20	+149	61·3	—
Ottawa	—	120·6	34	—	—	—	—	i 55·2?	—
De Bilt	N.	121·0	335	—	—	—	—	e 61·3	66·2
	E.	121·0	335	—	—	—	—	e 62·3	65·6
Edinburgh	M.	121·0	344	46 20	?L	—	—	(46·3)	—
Eskdalemuir	G.	121·5	343	—	—	e 28 31	-30	57·3	—
Stonyhurst	M.	122·4	340	—	—	—	—	—	78·3
Bidston	M.S.	123·0	340	29 20	?S	(29 20)	+ 8	(36·3)	78·6
Paris	—	124·5	334	—	—	—	—	e 64·3	78·3
Shide	—	124·6	339	—	—	—	—	e 64·6	—
Coimbra	—	138·1	337	—	—	—	—	e 73·6	—
La Paz	Bi.	138·9	116	19 50	[+12]	—	—	61·7	—

Additional records : Manila gives MN = +16·3m. Riverview PS = +11m.35s., MZ = +17·1m., T<sub>0</sub> = 14h.49m.6s. Melbourne S = +17m.8s., SR<sub>1</sub> = +17m.56s. Honolulu T<sub>0</sub> = 14h.46m.42s. Toronto LE = +71·4m. Ottawa eL = +59·3m. Bidston gives S as P and L as S.

The above is about the best compromise solution that can be obtained from rather refractory data. But the La Paz residual (+12s.) suggests a "high focus." If we suppose a focus 0·020 above the normal and transfer the epicentre to 1°S. 154°E. (as on 1914 May 18-19), the chief observations near the epicentre would be as follows :—

$$A = -.899, B = +.438, C = -.017.$$

	$\Delta$	Corr. for Focus.	P.	O-C.	S.	O-C.
	°	°	m. s.	s.	m. s.	s.
Riverview	32·9	+1·5	7 14	+ 6	11 2	-104
Sydney	32·9	+1·5	11 8	?S	(11 8)	- 98
Manila	36·3	+1·6	7 32	- 5	12 30	- 67
Melbourne	37·8	+1·6	13 8	?S	(13 8)	- 49
Osaka	39·8	+1·7	10 1	+114	—	—
Honolulu	51·9	+2·2	9 38	+ 4	17 20	+ 10

The Osaka observation may be 2min. in error, but the discordances in S for the first four stations probably represent something real, perhaps another shock from another focus.

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June 24d. Records also at 0h. (San Fernando), 2h. (Osaka, Tokyo, and Manila), 3h. (Manila), 8h. (Taihoku), 13h. (San Fernando), 14h. (La Paz), 21h. (Tortosa).

June 25d. Records at 0h. (San Fernando), 3h. (Monte Cassino), 6h. (Helwan and La Paz), 10h. (Helwan), 12h. (La Paz), 19h. (Zi-ka-wei (2) and Taihoku), 21h. (La Paz).

June 26d. 13h. 46m. 3s. Epicentre 35°-0N. 139°-5E.

A = -0.623, B = +0.532, C = +0.574; D = +0.649, E = +0.760;  
G = -0.436, H = +0.372, K = -0.819.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	0.7	16	0 14	+ 3	0 23	+ 3	—	—
Osaka	3.4	266	0 54	+ 1	—	—	1.7	3.2
Kobe	3.6	266	0 56	0	—	—	1.8	2.2
Mizusawa	4.3	17	1 7	0	1 58	0	—	—
N.	4.3	17	1 6	- 1	1 57	- 1	—	—
Zi-ka-wei	15.6	261	3 43	- 4	7 51	?L	9.0	10.0
Melbourne	73.0	176	—	—	—	—	—	50.2
Edinburgh	83.7	340	45 57	?L	—	—	(46.0)	—
Graz	83.7	325	e 12 35	- 5	—	—	—	—
De Bilt	N.	84.2	334	—	—	—	e 46.0	53.4
E.	84.2	334	—	—	—	—	e 47.0	50.1
Zagreb	84.5	324	e 12 32	-13	—	—	48.0	—
Stonyhurst	85.3	339	—	—	—	—	—	53.0
Bidston	85.8	339	40 27	?L	—	—	(40.4)	46.0
Helwan	86.4	304	22 57	?S	(22 57)	-37	—	—
Paris	87.9	333	—	—	—	—	54.0	56.0
Moncalieri	88.9	328	e 47 27	?L	50 53?	?	55.4	—
Rocca di Papa	89.1	323	i 16 28	?PR <sub>1</sub>	—	—	58.4	59.6
La Paz	149.2	60	i 20 9	[+15]	—	—	—	—

Additional records: Osaka gives MN = +2.4m. Kobe MN = +2.0m.  
Zi-ka-wei SR<sub>1</sub>E = +8m.31s. Melbourne iM = +72.4m. Rocca di Papa  
M = +16.6m.

June 26d. 21h. 29m. 50s. Epicentre 16°-0S. 168°-0E. (as on 1917 May 29d. and 1917 Nov. 29).

A = -0.940, B = +0.200, C = -0.276; D = +0.208, E = +0.978;  
G = +0.636, H = -0.159, K = -0.755.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	19.7	86	e 4 40	+ 3	—	—	8.2	11.6
Riverview	23.4	217	5 28	+ 7	e 9 34	+ 1	e 12.2	14.6
Sydney	23.4	217	5 22	+ 1	9 52	+19	12.7	13.5
Melbourne	29.8	219	—	—	12 28	+57	19.3	19.8
Adelaide	32.4	230	11 58	?S	(11 58)	-16	—	19.9
Honolulu	50.1	43	16 16	?S	(16 16)	-4	22.4	23.9
Osaka	59.4	329	10 4	- 4	—	—	—	29.3
Victoria	88.5	38	—	—	—	—	40.7	51.1
Kodakanal	93.4	279	61 10?	?L	—	—	(61.2?)	—
La Paz	115.8	118	72 22	?L	—	—	(72.4)	—
Toronto	117.2	49	—	—	—	—	62.3	69.5
Ottawa	119.7	45	—	—	—	—	e 59.2	—
Helwan	138.0	298	28 10	?S	(28 10)	-162	—	—
De Bilt	E.	141.4	343	e 20 40	[+58]	—	e 74.2	78.4
N.	141.4	343	—	—	—	—	e 75.2	77.6
Bidston	142.0	351	73 4	?L	76 34	?L	(73.1)	82.6
Zagreb	142.1	330	e 22 10	?PR <sub>1</sub>	—	—	—	—
Rocca di Papa	146.7	328	19 38	[-13]	—	—	—	19.8

Additional records: Riverview gives i = +6m.21s., PS = +9m.57s., i = +11m.32s., MN = +13.2m. Melbourne SR<sub>2</sub> = +16m.34s. Ottawa L = +64.2m. and +68.2m.

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June 26d. Records also at 0h. (Tokyo), 5h. (La Paz and Batavia), 12h. (Athens (2) ), 14h. (Tokyo), 15h. (Zi-ka-wei), 19h. (Tokyo), 21h. (San Fernando), 23h. (Harvard and Stonyhurst).

June 27d. 21h. 29m. 30s. Epicentre 53°·5N. 159°·0W. (as on 1917 June 4d. and July 25d.).

A = -·555, B = -·213, C = +·804 ; D = -·358, E = +·934 ;  
G = -·751, H = -·288, K = -·595.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	22·8	89	10 58	?L	—	—	(11·0)	22·9
Honolulu	32·2	177	6 48	- 2	—	—	13·1	16·5
Toronto	50·7	67	—	—	—	—	31·8	37·9
Harvard	56·1	63	—	—	—	—	31·4?	—
Edinburgh	63·8	14	20 0	?S	(20 0)	-12	—	50·8
Eskdalemuir	69·3	14	—	—	e 20 37	+19	42·5	—
Bidston	71·2	15	20 36	?S	(20 36)	- 4	—	35·5
Kew	73·5	14	—	—	—	—	—	50·5
De Bilt	73·6	10	—	—	21 23	+14	39·5	41·4
Shide	74·1	15	—	—	i 21 29	+14	48·0	50·7
Paris	76·5	12	—	—	e 19 30	-133	45·5	54·5
Graz	79·3	3	e 12 9	- 6	22 36	+21	—	—
Zagreb	80·6	3	e 12 14	- 9	e 22 30	0	48·5	—
Moncalieri	80·8	9	e 23 2	?S	(e 23 2)	+29	47·9	—
Coimbra	82·9	22	—	—	—	e 44·0	—	—
Tortosa	83·9	16	12 37	- 4	23 5	- 3	—	57·2
Rocca di Papa	84·4	6	12 34	-10	—	—	—	12·9
Rio Tinto	85·6	21	32 0	?L	—	—	(32·0)	54·5
San Fernando	87·0	22	41 30	?L	53 0	?	(41·5)	59·5
Helwan	96·0	351	43 30	?L	—	—	(43·5)	—
La Paz	103·7	99	—	—	—	—	75·5	—

Additional records: Toronto gives L = +36·2m. Harvard L? = +32·3m., LE = +37·0m., L = +42·8m. Stonyhurst  $\Delta$  = 70°·9, gives "Tremors from 20h.50m. to 21h.40m." De Bilt LN = +41·5m. Moncalieri S? = +35m.37s. San Fernando L = +56·5m., MN = +58·0m.

June 27d. Records also at 3h. (La Paz), 4h. (De Bilt and Helwan), 5h. (La Paz), 6h. (Rocca di Papa), 11h. and 12h. (La Paz), 14h. (Pola), 16h. (Melbourne).

June 28d. Records at 0h. (San Fernando), 7h. (La Paz), 8h. (La Paz, Balboa Heights, and Helwan), 9h. (Tacubaya), 12h. (La Paz and Apia), 14h. (Riverview).

June 29d. 4h. 12m. 30s. Epicentre 7°·0N. 137°·0E.

A = -·726, B = +·677, C = +·122 ; D = +·682, E = +·731 ;  
G = -·089, H = +·083, K = -·993.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	32·9	247	—	—	—	e 18·5	22·5	—
Riverview	43·0	163	e 8 18?	0	e 14 48	0	e 36·1	40·2
Sydney	43·0	163	—	—	—	—	—	39·3
Melbourne	45·4	171	—	—	—	—	37·3	38·6
Colombo	56·7	274	39 0	?L	—	—	(39·0)	41·0
Helwan	99·9	302	30 30	?	—	—	—	—
De Bilt	N. 108·1	331	—	—	—	—	77·5	81·8
	E. 108·1	331	—	—	—	—	78·5	79·6
Eskdalemuir	109·5	337	—	—	—	—	70·5	—
Bidston	110·9	336	59 48	?L	70 48	?	(59·8)	84·3

Riverview gives MN = +39·3m. Sydney gives P = 4h.6m.0s. This determination depends entirely on the Riverview observations and the L given by Batavia. Even if these are correct the epicentre may therefore lie anywhere on an arc of a circle drawn with Riverview as centre, and distant between 30° and 40° from Batavia, but the whole uncertainty is greater still.

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June 29d. 11h. 2m. 0s. (I) } Epicentre 42°·3N. 17°·8E. (as on 1918 June  
 12h. 51m. 10s. (II) } 24d. 1h.).

$$A = +.704, B = +.226, C = +.673.$$

	$\Delta$	P.	O-C.	S.	O-C.	L.	M.
	o.	m. s.	s.	m. s.	s.	m.	m.
I Pompeii	2·9	e 2 28	?L	—	—	(e 2·5)	—
II	2·9	e 2 14	?L	—	—	(e 2·2)	—
I Pola	3·8	1 49	?S	(1 49)	+ 5	—	2·1
I Rocca di Papa	3·8	i 1 29	?S	(i 1 29)	-15	—	2·8
II	3·8	e 0 56	- 3	1 56	+12	—	2·9
I Zagreb	N.E. 4·0	i 1 5	+ 3	i 1 54	+ 4	—	2·0
I	N.W. 4·0	0 59	- 3	i 1 43	- 7	—	1·9
II	4·0	i 0 59	- 3	i 1 56	+ 6	—	—
I Zurich	8·3	e 2 5	- 1	3 19?	-26	—	—

Zagreb I gives another M = +1·9m., II i = +1m.6s.

June 29d. 16h. 15m. Epicentre near Berkeley and Lick. A very slight shock not recorded elsewhere.

		eP.	eL.	M.
		s.	s.	s.
Berkeley	N.	51	69	72
	E.	52	67	72
Lick	N.	41	50	63
	E.	41	50	66
	V.	40	49	56

June 29d. Records also at 0h. (Tokyo), 1h. (Manila), 2h. (La Paz), 6h. (Stonyhurst), 7h. (La Paz), 8h. (Manila), 14h. (San Fernando), 20h. (Stonyhurst), 21h. (Mizusawa and Tokyo), 22h. (Tokyo).

June 30d. Records at 4h. and 5h. (Batavia), 6h. (Melbourne), 8h. (Manila), 16h. (La Paz), 19h. (San Fernando), 22h. (Tokyo).

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TABLE.

	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710	
2	31	55	24	52	560	1004	444	102	860	1575	715	
3	47	83	36	53	566	1016	450	103	865	1584	719	
4	62	110	48	54	573	1029	456	104	870	1593	723	
5	77	137	60	55	579	1041	462	105	874	1602	728	
6	92	164	72	56	586	1054	468	106	879	1612	733	
7	106	190	84	57	592	1066	474	107	884	1621	737	
8	121	217	96	58	599	1079	480	108	888	1630	742	
9	136	243	107	59	605	1091	486	109	893	1639	746	
10	150	269	119	60	612	1103	491	110	897	1648	751	
11	164	294	130	61	619	1116	497	111	902	1657	755	
12	179	319	140	62	625	1128	503	112	907	1666	759	
13	193	344	151	63	632	1141	509	113	911	1674	763	
14	206	368	162	64	638	1153	515	114	916	1682	766	
15	219	392	173	65	645	1165	520	115	920	1690	770	
16	232	415	183	66	651	1177	526	116	925	1698	773	
17	245	438	193	67	658	1190	532	117	929	1706	777	
18	257	460	203	68	664	1202	538	118	934	1714	780	
19	269	482	213	69	671	1214	543	119	938	1722	784	
20	281	503	222	70	677	1226	549	120	942	1729	787	
21	293	524	231	71	683	1238	555	121	947	1737	790	
22	305	545	240	72	690	1250	560	122	952	1744	792	
23	317	565	248	73	696	1262	566	123	957	1752	795	
24	328	584	256	74	702	1274	572	124	961	1759	798	
25	338	603	265	75	709	1286	577	125	966	1766	800	
26	348	622	274	76	715	1297	582	126	970	1773	803	
27	358	641	283	77	721	1309	588	127	974	1780	806	
28	368	659	291	78	727	1320	593	128	978	1787	809	
29	378	677	299	79	733	1332	599	129	983	1794	811	
30	388	694	306	80	739	1343	604	130	988	1801	813	
31	398	711	313	81	745	1355	610	131	992	1807	815	
32	407	728	321	82	750	1366	616	132	996	1814	818	
33	416	744	328	83	756	1377	621	133	1001	1821	820	
34	425	760	335	84	762	1388	626	134	1005	1827	822	
35	433	775	342	85	768	1399	631	135	1009	1833	824	
36	442	790	348	86	773	1410	637	136	1014	1840	826	
37	450	804	354	87	779	1421	642	137	1018	1846	828	
38	458	818	360	88	785	1432	647	138	1023	1852	829	
39	466	832	366	89	790	1443	653	139	1027	1858	831	
40	475	847	372	90	796	1454	658	140	1031	1864	833	
41	483	861	378	91	801	1464	663	141	1035	1869	834	
42	491	875	384	92	807	1475	668	142	1039	1875	836	
43	498	888	390	93	812	1485	673	143	1043	1881	838	
44	506	902	396	94	818	1496	678	144	1047	1886	839	
45	513	915	402	95	823	1506	683	145	1051	1892	841	
46	520	928	408	96	829	1516	687	146	1055	1897	842	
47	527	941	414	97	834	1526	692	147	1059	1902	843	
48	534	954	420	98	840	1536	696	148	1063	1907	844	
49	540	966	426	99	845	1546	701	149	1067	1912	845	
50	547	979	432	100	851	1556	705	150	1071	1917	846	