The International Seismological Summary for 1920 April, May, June.

FORMERLY THE BULLETIN OF THE BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

In the present number (for April, May, June, 1920) there are 48 cases where a former epicentre is adopted as satisfying the observations; eight others in which a new epicentre is adopted, but one lying close to a former determination (say within 1°·0): and 19 cases where a definitely new epicentre seems to be required. It may be of interest to give for comparison some counts for the whole series of epicentres determined in the years 1913-1920 June. There are 359 recorded once only, 131 recorded twice, and others according to the following table:

No. of times.	Cases.	No. of times.	Cases.	No. of times.	Cases.
1	359	5	13	9	3
2	131	6	16	11	1
3	60	7	6	14	2
4	30	8	2	16	1

These counts are only approximate, for in many cases it has been difficult to decide whether a subsequent shock has come from the same epicentre or one slightly differing in locality. When the difference between two independent determinations is only a fraction of one degree as in the pair

1914 March 6 53°·0N. 158°·0E.
1914 March 27 53°·1N. 158°·4E.

the epicentres have (in the light of accumulated experience) been regarded as from the same focus: but sometimes there seems to be good reason for assuming a definite departure, as on 1920 May 20, when 11°·7S. 166°·3E. has been used, although on five previous dates, viz., 1914 June 26, 1918 March 20, April 15, and Dec. 14, and 1919 Nov. 20, the epicentre 13°·0S. 166°·8E. has been used. It should further be remarked that repetitions from the same epicentre on the same calendar day (Greenwich) have not been credited as separate shocks, though when they fall on a new calendar date (even within 24 hours) they have been so credited. Briefly the figures are only rough.

They suffice to shew, however, that it is about an even chance whether any new shock will turn out to have come from an epicentre previously utilized or not. For the epicentre used 16 times provides 15 cases of repetition and one of use for the first time. Adding up corresponding numbers in all the cases we find that there are 624 cases of use for the first time and 598 of repetition. But the figures (given in the opening paragraph) for April, May, June, 1920, shew a considerable excess of old epicentres over new. We may infer that the number of unrepeated epicentres may in the future not increase indefinitely, but may reach a limit. It does not seem impossible that something like a catalogue of the more important epicentres may be attempted after a few more years of registration.

In this connection it may further be of interest to give a list of the 19 epicentres new in this number of the summary, with the nearest old epicentre in each case.

New. Date.	New. Position.		Nearest Old. Position.		Nearest Old. Date.	Distance Apart.
	°	°	°	°		°
1920 April 16 / 18	57·3N.	165·0W.	55·0N.	169·0W.	1916 April 18	3·2
1920 June 18 / 22	33·0N.	121·5W.	32·0N.	119·0W.	1915 Nov. 21 / 1918 June 21	2·3
1920 April 19	18·4N.	94·3W.	19·0N.	96·0W.	1914 Mar. 30	1·8
1920 May 20	65·0S.	39·0W.	(See below)			
1920 June 26	18·5S.	10·0W.	13·0S.	10·0W.	1917 Aug. 21	5·5
1920 May 13	49·8N.	12·0E.	47·0N.	10·0E.	1917 Sept. 6	3·2
1920 June 20	43·5N.	17·0E.	43·0N.	15·0E.	1920 June 21	1·4
1920 May 19	34·0N.	21·0E.	33·0N.	22·0E.	1918 Oct. 14	1·3
1920 May 27	19·0N.	109·0E.	15·5N.	109·0E.	1919 Nov. 16	3·5
1920 May 19	6·5S.	126·0E.	8·0S.	127·5E.	1920 Mar. 3	2·2
1920 May 10	5·5S.	130·0E.	4·5S.	131·0E.	1919 Nov. 18	1·4
1920 April 15	33·0N.	139·0E.	33·2N.	138·0E.	1919 May 31	0·8
1920 May 22	23·0S.	142·0E.	23·3S.	150·6E.	1918 June 6	7·9
1920 April 2	10·2S.	143·4E.	7·0S.	145·0E.	1918 Sept. 30	3·6
1920 June 9	54·8N.	143·7E.	51·5N.	147·0E.	1915 Feb. 25	3·8
1920 April 11	48·3N.	152·0E.	48·0N.	148·0E.	1919 Sept. 12	2·7
1920 May 20	11·7S.	166·3E.	13·0S.	166·8E.	1919 Nov. 20	1·4
1920 June 12	23·8S.	172·5E.	24·0S.	171·6E.	1918 Sept. 30	0·8
1920 May 9	51·7S.	173·8E.	48·2S.	165·8E.	1918 Nov. 3	6·2

It will be seen that about half of these are 8° or more from any other epicentre—a quantity about which there ought to be no mistake. One of the new epicentres is in the Antarctic. The only epicentres used up to the present south of 50°S. lat. are as follow:

73°0S. 120°0W. on 1917 Mar. 22
51·5S. 75·5W. ,, 1919 Aug. 11
65·0S. 39·0W. ,, 1920 May 20
65·0S. 0·0E. ,, 1917 July 15
77·0S. 110·0E. ,, 1918 Aug. 17
53·8S. 148·0E. ,, 1920 Mar. 11
51·7S. 173·8E. ,, 1920 May 9

It will be seen that these dates are all subsequent to 1917 Jan. 1, when a more extensive reduction was begun. Probably other cases could be recovered in the years 1913-1916 by a more searching scrutiny: but large earthquakes south of 50°S. are apparently not common.

Attention may be drawn to the following cases of deep focus in the present number:

Date.	Epicentre.	Depth.
April 6d. 19h.	5·0S. 155·0E.	+ 0·050
May 6d. 9h.	44·0N. 131·0E.	+ 0·070
May 10d. 18h.	5·5S. 130·0E.	+ 0·060
May 27d. 5h.	5·0N. 110·0E.	+ 0·050

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University Observatory, Oxford.
1924 Aug. 26.

1920 APRIL, MAY, & JUNE.

April 1d. 18h. 26m. 38s. Epicentre 46°·0N. 9°·0E. (as on 1920 Mar. 30d.).

A = +·686, B = +·109, C = +·719.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Coire		1·0	22	—	—	i 0 47	+19	—	—
Zurich	E.	1·4	348	e 0 21	0	0 39	0	—	0·7
Neuchatel		1·8	305	0 14	−14	0 23	−28	—	—
Strasbourg		2·7	342	e 0 40	− 2	e 1 29	?L	(e 1·5)	—

Zurich gives also iP = +23s., iSN = +40s., iSV = +41s., T_0 = 18h.26m.37·5s.

April 1d. Readings also at 0h. (La Paz), 1h. (Helwan and Cape Town), 2h. (Helwan), 4h. (2), 5h., and 6h. (Stonyhurst), 7h. (Stonyhurst and Helwan), 8h. (Stonyhurst), 9h., 12h., and 14h. (La Paz), 15h. (Stonyhurst), 18h. (near Zurich, repetition of the above), 21h. (La Paz), 23h. (near Tacubaya).

April 2d. 1h. 5m. 0s. Epicentre 10°·2S. 143°·4E.

A = −·790, B = +·587, C = −·177 ; D = +·596, E = +·803 ;
G = +·142, H = −·106, K = −·984.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview		24·7	164	e 5 34	− 1	e 9 55	− 2	e 12·5	18·3
Sydney		24·7	164	7 0	+85	—	—	11·0	14·0
Melbourne		27·6	177	—	—	11 48	+56	14·8	19·8
Manila		33·3	320	e 6 50	− 9	—	—	—	—
Perth		33·4	225	13 45	?S	(13 45)	+75	16·8	—
Batavia		36·4	273	7 25	0	9 18	?PR_1	—	12·1
Apia		44·0	100	—	—	—	—	—	21·0
Osaka		45·5	351	7 25	−72	—	—	—	16·4
Honolulu		65·5	61	e 17 12	?	e 23 6	?SR_1	e 30·0	33·4
Kodaikanal		68·7	285	52 42	?L	—	—	(52·7)	—
Mauritius	E.	82·3	250	34 18	?L	—	—	(34·3)	43·4
Victoria		99·8	42	38 31	?L	—	—	(38·5)	49·3
Helwan		114·1	297	30 0	?S	(30 0)	+117	(38·0)	—
Hamburg		122·9	329	e 20 0	?PR_1	—	—	e 57·0	—
De Bilt		126·2	329	—	—	e 36 44	?SR_1	e 56·0	64·2
Rocca di Papa		126·6	315	e 18 18	[−52]	e 26 30	?	70·1	76·1
Strasbourg		126·8	322	—	—	—	—	e 58·0	—
Uccle		127·3	328	—	—	e 37 0	?SR_1	e 57·0	—
Edinburgh		127·4	337	—	—	—	—	62·0	—
Moncalieri		128·5	320	e 23 18	?PR_1	37 44	?SR_1	62·6	—
Stonyhurst		128·6	334	36 0	?	56 0	?	60·0	—
Paris		129·4	327	—	—	e 30 42	+45	62·0	—
Toronto		130·2	39	—	—	—	—	65·0	72·7
Tortosa		135·2	320	—	—	—	—	e 63·0	78·2
La Paz		138·9	130	18 24	[−74]	—	—	68·5	69·6
San Fernando	E.	142·0	319	67 0	?L	—	—	(67·0)	116·0
	N.	142·0	319	57 0	?L	—	—	(57·0)	127·0

Additional readings and notes: Riverview gives MN = +17·3m., MZ = +16·9m. Osaka MN = +17·4m. Honolulu eL = +26·7m. Mauritius PN = +35m.24s. De Bilt MN = +72·0m. Strasbourg L = +63·0m. Toronto eL = +66·5m., +70·3m., and +82·1m. The PN for San Fernando has been increased by 2h. to be consistent with PE and MN.

April 2d. 15h. 10m. 0s. Epicentre 7°·0N. 137°·0E. (as on 1918 June 29d.).

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

It is impossible to satisfy the observations as they stand. The only two direct determinations of T_o from P and S (Manila 15h.12m.15s. and Riverview 15h.11m.15s.) are discordant, and either would assign values of Δ to these and the Japanese stations too small for their distance apart, unless we assume a very deep focus.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	17·5	297	e 4 53	+42	7 0	−29	7·8	7·9
Osaka	27·7	357	5 2	−63	—	—	9·0	9·6
Tokyo	28·8	4	7 34	+78	—	—	10·6	14·2
Riverview	43·0	163	e 8 59	+41	e 15 4	+16	e 20·7	24·1
Sydney	43·0	163	12 30	?	16 0	+72	19·8	21·0
Melbourne	45·4	171	—	—	15 18	− 2	—	26·3
Simla	60·7	302	30 42	?L	—	—	(30·7)	—
Honolulu	64·2	70	19 0	?S	(19 0)	−15	35·4	41·4
Victoria	91·2	40	27 38	?	—	—	—	46·8
Helwan	99·9	302	24 0	?S	(24 0)	−115	—	—
De Bilt	108·1	331	—	—	—	—	e 50·0	53·9
Strasbourg	108·9	326	—	—	—	—	—	66·3
Edinburgh	109·1	337	—	—	—	—	50·0	44·0
Uccle	109·3	330	—	—	e 36 18	?	e 51·0	53·0
Kew	111·0	332	—	—	—	—	—	67·0
Moncalieri	111·0	324	e 21 31	?PR_1	28 57	+80	35·0	—
Oxford	111·2	332	—	—	34 6	?SR_1	—	59·6
Paris	111·4	329	—	—	—	—	57·0	68·0
Algiers	118·6	319	—	—	—	—	65·0	—
San Fernando	124·5	324	75 0	?L	—	—	(75·0)	80·0
La Paz	153·6	113	20 0	[− 1]	—	—	75·0	—

Additional readings: Manila gives MN = +8·5m. Osaka MN = +10·9m. Riverview MN = +25·5m. De Bilt MN = +54·4m.

April 2d. 15h. 34m. 20s. Epicentre 37°·5N. 27°·5E. (as on 1918 Nov. 13d.).

A = +·704, B = +·366, C = +·609; D = +·462, E = −·887; G = +·540, H = +·281, K = −·793.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		3·0	278	0 44	− 3	1 21	− 2	1·6	2·1
Pompeii		10·5	294	6 40	?L	—	—	(6·7)	—
Lemberg		12·6	350	e 0 40	?	—	—	e 8·8	9·9
Vienna		13·4	326	i 4 17	+59	6 18	+25	8·0	9·5
Strasbourg		18·1	314	e 4 22	+ 4	e 7 46	+ 4	e 9·7	11·1
Algiers		19·4	275	4 26	− 8	—	—	—	—
Hamburg		20·1	328	e 4 42	0	e 8 32	+ 7	e 11·7	15·0
Uccle		21·1	316	—	—	e 8 49	+ 3	—	—
Paris		21·3	310	e 4 54	− 3	e 12 34	?L	(e 12·6)	—
De Bilt	E.	21·4	320	e 6 52	?	e 8 58	+ 5	11·7	14·6
	N.	21·4	320	—	—	e 9 4	+11	—	12·5
Oxford		24·7	314	9 46	?S	(9 46)	−11	—	—
San Fernando		26·8	278	11 40	?S	(11 40)	+63	—	50·7
Eskdalemuir		27·3	321	—	—	—	—	14·7	—
Edinburgh		27·5	322	e 9 10	?	e 15 52	?L	(e 15·9)	—
La Paz		104·3	260	55 44	?L	—	—	(55·7)	—

Additional readings and notes: Athens gives its readings 3min. early, MN = +2·0m. Hamburg MNZ = +14·5m.

April 2d. Readings also at 0h. (Christchurch), 7h. (Victoria and near Oaxaca, Tacubaya, and Athens), 13h. (Paris and La Paz), 14h. (La Paz, Taihoku, Tortosa, and Manila), 16h. (Hamburg), 17h. (Stonyhurst), 22h. (near Athens).

April 3d. Readings at 0h. (San Fernando), 3h. (near Tokyo and Mizusawa), 10h. (near Taihoku), 21h. (Helwan).

April 4d. Readings at 0h. (Capetown), 2h. (La Paz and San Fernando), 7h. (La Paz), 9h. (near Tacubaya), 11h. (near Osaka and Kobe), 15h. (Helwan), 16h. (near Taihoku), 17h. (Batavia), 18h. (Helwan and La Paz), 20h. (near Tokyo).

April 5d. 12h. 18m. 26s. Epicentre 41°·0N. 13°·5E.

A = +·734, B = +·176, C = +·656.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	0·9	110	0 15	+ 1	0 27	+ 2	—	0·7
Rocca di Papa	1·0	321	i 0 16	+ 1	0 30	+ 2	—	0·7
Florence	3·2	329	1 29	?S	(1 29)	+ 1	—	2·0
Padova	4·5	345	1 35	+25	2 : 0	?L	(2·5)	—
Moncalieri	5·8	316	e 2 16	+46	3 29	+50	5·1	—
Paris	11·0	319	—	—	—	—	e 6·6	—
De Bilt	12·5	336	—	—	—	—	e 5·3	—
Hamburg	12·8	351	e 5 34	?S	(e 5 34)	− 5	—	7·6

No additional readings.

April 5d. 15h. 52m. 20s. Epicentre 4°·0S. 138°·0E. (as on 1915 Aug. 3d.).

A = −·741, B = +·667, C = −·070; D = +·669, E = +·743; G = +·052, H = −·047, K = −·998.

This is only a rough approximation to the time and place of the shock. The evidence is slight and conflicting.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	25·1	317	e 6 34	+55	—	—	—	—
Adelaide	30·9	179	—	—	12 25	+35	14·1	20·7
Batavia	31·3	263	e 6 23	−18	e 8 11	?PR_1	—	—
Riverview	32·2	159	e 7 2	+12	(e 12 34)	+23	e 12·6	16·2
Melbourne	34·4	170	—	—	—	—	18·5	19·3
Perth	34·8	214	12 35	?S	(12 35)	−17	20·0	—
Zi-ka-wei	38·6	337	e 7 46	+ 3	e 13 31	−15	—	—
Helwan	106·3	300	28 40	?S	(37 40)	?SR_1	—	—
Hamburg	114·9	329	—	—	—	—	53·7	—
De Bilt E.	118·2	328	e 20 4	?PR_1	e 30 11	+95	e 60·7	62·0
N.	118·2	328	—	—	—	—	e 59·7	64·5
Strasbourg	118·7	322	—	—	—	—	e 62·7	—
Uccle	119·3	327	—	—	—	—	54·7	—
Edinburgh	119·5	336	—	—	—	—	61·7	—
Eskdalemuir	119·9	336	—	—	29 40	+52	—	—
Stonyhurst	120·7	334	7 40	?	15 10	?P	22·2	—
Paris	121·5	327	e 20 44	?PR_1	—	—	63·7	—
La Paz	147·0	129	19 20	[−31]	—	—	39·9	43·0

Additional readings: Riverview records eS as eL and gives eS = +10m.43s., MZ = +21·7m. Helwan gives its two readings as PN and PE.

April 5d. Readings also at 0h. (San Fernando), 5h. (near Oaxaca), 10h. (Cape Town), 11h. (La Paz), 14h. (Helwan), 15h. (La Paz), 16h. (Stonyhurst, Batavia, and near Rocca di Papa, Pompeii), 18h. (Manila), 20h. (near Tacubaya), 21h. and 23h. (La Paz).

April 6d. 16h. 43m. 20s. Epicentre 15°·6N. 97°·8W.

A = −·131, B = −·954, C = +·269; D = −·991, E = +·136; G = −·036, H = −·266, K = −·963.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oaxaca	1·7	35	0 41	+15	(0 41)	− 7	0·9	1·0
Tacubaya	4·0	341	1 24	+22	—	—	3·3	3·5
Mazatlan	11·1	315	2 45	− 1	—	—	7·0	7·3
Tucson E.	20·4	327	11 18	?L	—	—	11·5	11·9
Chicago	27·6	17	6 7	+ 3	11 3	+11	17·0	—
Georgetown	29·5	34	e 6 17	− 6	11 50	+24	—	—
Berkeley	31·0	321	—	—	—	—	e 15·8	—

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Toronto	32·1	26	—	—	19 52	?	26·6	—
Ottawa	35·1	28	i 7 5	− 9	12 40	−17	—	—
Victoria	38·9	333	13 56	?S	(13 56)	+ 5	20·3	24·3
La Paz	43·6	137	e 8 23	0	15 58	+62	23·7	27·3
Stonyhurst	80·6	38	24 52	?	—	—	—	—
San Fernando	82·1	53	43 40	?L	—	—	(43·7)	44·7
Paris	84·9	40	—	—	e 23 37	+19	39·7	—
De Bilt E.	85·4	37	—	—	e 23 26	+ 3	e 42·7	46·6
N.	85·4	37	—	—	—	—	e 44·7	46·5
Uccle	85·4	38	e 12 54	+ 4	e 23 13	−10	e 40·7	—
Strasbourg	88·2	39	e 13 10	+ 4	e 24 4	+10	e 46·7	—
Algiers	89·1	51	e 24 5	?S	(e 24 5)	+ 1	50·7	—
Helwan	113·1	47	68 40	?L	—	—	(68·7)	—

Additional readings: Oaxaca readings increased by 3min. Ottawa gives T_0 = 16h.43m.22s. San Fernando MN = +47·7m. Helwan P = +69m.40s.

April 6d. 19h. 2m. 25s. Epicentre 5°·0S. 155°·0E. (as on 1913 July 22d.).

A = −·903, B = +·421, C = −·087; D = +·423, E = +·906;
G = +·079, H = −·037, K = −·996.

This earthquake does not seem to afford a good determination without the assumption of a deep focus. Although there is no anti-centric support to this hypothesis, it might be noticed that on 1918 Dec. 25d. an earthquake occurred in this neighbourhood which required a very great depth, 0·070, to bring its readings into line. In the present case 0·050 is sufficient.

	Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	−3·1	29·0	186	e 4 41	−66	e 10 15	− 5	e 13·1	15·3
Sydney	−3·1	29·0	186	5 53	+ 6	10 5	−15	13·2	14·3
Adelaide	−3·5	33·6	205	—	—	11 5	−31	14·1	17·6
Melbourne	−3·5	34·1	192	6 17	−17	11 41	− 3	15·7	17·5
Manila	−3·9	39·0	301	e 6 56	−18	12 33	−25	16·2	18·2
Mizusawa	−4·4	45·5	347	7 58	− 6	—	—	—	—
Perth	−4·5	45·9	229	16 23	?	14 46	+19	26·2	—
Batavia	−4·6	48·0	266	8 25	+ 4	15 10	+16	e 22·6	—
Zi-ka-wei	−4·6	48·3	321	e 8 49	+25	e 14 59	+ 1	—	—
Honolulu	−5·0	53·0	58	9 11	+17	i 16 11	+17	24·5	36·8
Colombo	−6·0	75·9	279	20 35	?S	(20 35)	+10	—	43·6
Kodaikanal	−6·1	78·7	282	46 5	?L	—	—	(46·1)	—
Berkeley	−6·4	87·3	50	—	—	e 22 35?	+ 1	—	—
Victoria	−6·5	88·3	41	—	—	16 1	?PR_1	21·4	29·3
Mauritius	−6·6	94·9	250	23 35	?S	(23 35)	−20	—	53·9
Chicago	—	113·6	47	28 50	?S	(28 50)	+51	53·1	—
Toronto	—	118·7	41	—	—	—	—	43·8	—
Cape Town	—	123·5	224	32 30	?SR_1	—	—	—	71·3
Hamburg	—	123·7	335	e 20 35	?PR_1	—	—	e 58·6	—
De Bilt	—	126·7	337	e 20 45	?PR_1	e 30 59	+81	e 56·6	60·3
Stonyhurst	—	127·8	341	38 35	?SR_1	43 35	?	56.6	62·1
Uccle	—	128·0	337	20 47	?PR_1	27 23	−144	e 55·6	60·6
Strasbourg	—	128·3	332	20 38	?PR_1	—	—	e 62·6	—
Rocca di Papa	—	130·2	322	i 19 40	[+22]	21 36	?PR_1	e 59·6	69·6
Paris	—	130·4	336	e 20 35	?PR_1	—	—	62·6	—
Moncalieri	—	130·9	330	e 20 59	?PR_1	34 13	?SR_1	58·8	—
La Paz	—	132·2	118	19 28	[+ 5]	30 46	?	55·4	58·4
Tortosa	—	137·5	331	e 21 35	?PR_1	—	—	e 64·6	67·6
Algiers	—	139·1	325	e 21 25	?PR_1	—	—	76·6	—
Rio Tinto	—	143·5	336	21 35	?PR_1	—	—	—	27·6

Additional readings and notes: Riverview gives PS = +10m.37s., MN = +14·2m., MZ = +15·9m. Adelaide SR_1 = +12m.50s. Manila MN = +17·8m. Mizusawa PN = +8m.11s. (O−C. = +7s.). Mauritius PE = +22m.47s. Toronto L? = +34·7m. De Bilt e = +39m.57s., MN = +63·6m. Uccle e = +37m.35s. (?SR_1). Rocca di Papa ePN = +18m.47s.

April 6d. Readings also at 0h. (Manila, Algiers, San Fernando, and near Mizusawa), 1h. (La Paz (2)), 12h. (Harvard), 16h. (Stonyhurst (4)), 18h. (Coimbra and near La Paz), 20h. (La Paz, Mizusawa, and Toronto), 21h. (Toronto, Victoria, Riverview, and near Manila), 23h. (Algiers).

April 7d. Readings at 0h. (San Fernando), 11h. (La Paz), 17h. (near Batavia), 19h. (Tokyo), 20h. (San Fernando), 22h. (near La Paz).

April 8d. Readings at 0h. (Manila), 1h. (De Bilt and Paris), 8h. and 10h. (La Paz), 14h. (Riverview (2) and Sydney), 15h. (Helwan), 16h. (La Paz and near Tacubaya), 22h. (Riverview).

April 9d. Readings at 4h. (near Balboa Heights), 5h. (Manila), 6h. (San Fernando), 8h. (near Mizusawa), 11h. (Azores), 14h. (La Paz, near Osaka, Mizusawa (2), and Manila), 15h. (Victoria and Toronto), 16h. (La Paz), 17h. (near Zurich), 19h. (Batavia and Riverview), 21h. (San Fernando).

April 10d. Readings at 2h. (Algiers), 5h. (near Kobe), 7h. (La Paz), 8h. (Helwan and Victoria), 10h. (near Mizusawa), 13h. and 22h. (San Fernando).

1920. April 11d. 23h. 3m. 35s. Epicentre 48°·3N. 152°·0E.

A = −·587, B = +·312, C = +·747 ; D = +·470, E = +·883 ;
G = −·659, H = +·351, K = −·665.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		6·4	258	2 6	+28	—	—	3·4	3·8
Hakodate		10·3	235	e 2 29	− 5	—	—	—	—
Mizusawa	E.	12·1	224	3 0	0	5 14	− 7	—	—
Tokyo		15·6	220	4 5	+18	4 23	?	6·8	6·9
Nagoya		17·2	226	4 8	+ 1	—	—	—	—
Osaka		18·4	228	4 26	+ 4	(7 54)	+ 5	7·9	8·7
Kobe		18·5	229	4 25	+ 2	(7 47)	− 4	7·8	8·8
Nagasaki		22·8	235	e 5 13	− 2	(e 9 3)	−18	e 9·0	—
Zi-ka-wei		28·8	245	e 7 5	+49	10 53	−20	—	—
Taihoku		33·4	238	—	—	e 12 28	− 2	—	—
Manila		42·3	229	e 8 22	+ 9	12 20	?	14·0	15·1
Honolulu		47·9	106	15 37	?S	(15 37)	−16	e 24·8	25·6
Victoria		53·2	56	10 36	+69	(17 0)	+ 1	17·0	23·9
Batavia		67·3	231	e 11 6	+ 6	e 19 17	−37	e 24·4	—
Hamburg		73·2	339	e 11 37	0	e 21 3	− 1	e 34·4	36·4
Eskdalemuir		74·3	348	—	—	i 21 13	− 5	37·4	—
Stonyhurst		75·6	346	21 25	?S	(21 25)	− 8	31·0	—
Chicago		75·7	42	e 14 40	?PR_1	21 13	−21	29·9	—
De Bilt	E.	75·7	340	11 54	+ 1	21 35	+ 1	32·4	41·8
	N.	75·7	340	—	—	—	—	36·4	41·6
Budapest		75·8	330	11 55	+ 1	—	—	—	—
Vienna		76·1	331	i 11 56	0	—	—	—	22·2
Uccle		77·1	340	e 12 0	− 2	21 57	+ 7	e 34·4	—
Kew		77·4	345	—	—	—	—	—	50·4
Ottawa		77·4	32	—	—	e 21 33	−20	—	—
Toronto		77·5	37	—	—	—	—	45·3	—
Strasbourg		78·3	337	12 7	− 2	—	—	e 37·4	—
Zurich	E.	79·2	336	e 12 13	− 1	i 12 17	?	—	—
	N.	79·2	336	e 12 12	− 2	i 12 16	?	—	12·4
	Z.	79·2	336	e 12 11	− 3	i 12 15	?	—	—
Paris		79·3	340	e 12 16	+ 1	e 22 14	− 1	41·4	—
Besancon		80·0	339	12 20	+ 1	22 27	+ 4	37·4	—
Florence		81·6	332	12 0	−28	22 26	−16	34·4	51·4
Harvard		81·6	30	—	—	22 30	−12	—	—
Moncalieri		81·6	336	12 34	+ 6	22 36	− 6	33·5	49·7
Riverview		82·2	181	e 12 56	+25	e 22 26	−22	e 33·9	38·5
Washington		82·5	38	e 12 42	+ 9	22 28	−24	37·9	—
Georgetown		82·5	38	e 12 25	− 8	22 42	−10	48·5	—
Rocca di Papa		83·0	330	e 12 34	− 2	—	—	—	12·8
Helwan		85·6	312	12 25	−26	(22 25)	−61	—	—
Tortosa		87·4	340	12 52	− 9	(e 22 25)	−80	e 22·4	25·1
San Fernando		93·0	345	41 25	?L	—	—	(41·4)	57·2
La Paz		134·4	59	i 19 35	[+ 6]	—	—	67·4	—

For Notes see next page.

NOTES TO APRIL 11d. 23h. 3m. 35s.

Additional readings and notes: Mizusawa gives MN = +5m.9s. Osaka MN = +8·1m. Kobe MN = +8·9m. Manila MN = +16·6m., T_e = 23h.6m.59s. Honolulu records S as P and gives S = +19m.25s. (?SR_1). Eskdalemuir records S as i and gives S? = +26m.42s. Stonyhurst S = +25m.43s. De Bilt T_e = 23h.3m.46s. Epicentre 45°·5N, 153°·0E. Vienna i = +12m.6s. The shock seems to have been mistaken for a local one at Vienna and Zurich. Uccle SR_1 = +27m.1s., T_e = 23h.3m.36s. Toronto L = +27·1m. and 48·5m. Florence MN = +50·4m. and +52·9m. Harvard gives ?N at 5 times, including that read as S. The other four are +19m.41s., +21m.55s., +22m.30s., and +22m.35s. Riverview MN = +44·8m., T_e = 23h.5m.0s. Helwan gives its readings as PN and PE. La Paz gives L = +58·4m. and +85·9m.

April 11d. Readings also at 3h. (Helwan), 6h. (near Rocca di Papa), 9h. (Helwan), 13h. (Zi-ka-wei and near Taihoku), 17h. (2) and 18h. (2) (Stonyhurst), 19h. (Apia, Riverview, and Stonyhurst (2)), 20h. (La Paz, Stonyhurst, and Colombo), 21h. (Helwan, Stonyhurst, and San Fernando), 22h. (Stonyhurst and Manila), 23h. (Stonyhurst).

April 12d. Readings at 0h. (Berkeley and near Florence), 2h. (Stonyhurst (3)), 3h. (La Paz), 6h. (La Paz), 8h. (Helwan), 14h. (Helwan, Mizusawa, and near Osaka and Kobe), 17h. (Helwan, near Tokyo and Mizusawa, and near Vieques), 18h. (Helwan), 19h. (Rio Tinto), 20h. (Port au Prince).

April 13d. Readings at 0h. (Taihoku and La Paz), 2h. (Colombo), 3h. (La Paz), 4h. (Point Loma), 5h. (near Osaka and Kobe), 10h. (Nagasaki), 14h. (Chicago and near Mazatlan), 17h. (Harvard and Chicago).

April 14d. Readings at 0h. (Algiers), 3h. (near Athens), 12h. (La Paz), 13h. (Rocca di Papa), 18h. (Osaka), 20h. (Rio Tinto), 21h. (San Fernando), 23h. (La Paz).

April 15d. 12h. 13m. 30s. Epicentre 33°·0N. 139°·0E.

A = −·633, B = +·550, C = +·545; D = +·656, E = +·755; G = −·411, H = +·357, K = −·839.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2·5	13	0 57	+18	—	—	1·7	1·8
Osaka	3·4	299	0 57	+ 4	—	—	1·7	2·7
Kobe	3·6	298	0 54	− 2	—	—	1·6	1·7
Mizusawa	6·3	15	1 34	− 2	2 48	− 4	—	—
Zi-ka-wei	15·0	268	e 3 4	−35	—	—	—	—
Manila	24·7	226	e 6 30	+55	—	—	—	—
Helwan	87·1	304	21 30	?S	(21 30)	−132	—	—
La Paz	150·5	63	19 21	[−35]	—	—	—	—

Additional readings: Osaka gives MN = +2·9s. Helwan PN = +7m.30s.

April 15d. Readings also at 2h. (Helwan), 10h. (La Paz), 12h. (La Paz), 19h. (San Fernando), 20h. (near Mizusawa).

April 16d. 22h. 35m. 15s. Epicentre 57°·3N. 165°·0W.

A = −·522, B = −·140, C = +·842; D = −·259, E = +·966;
G = −·813, H = −·218, K = −·540.

Very uncertain.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	26·2	92	(5 51)	+ 1	—	—	5·8	15·2
Berkeley	33·9	108	—	—	e 13 45	+66	—	—
Honolulu	36·3	169	8 45	?PR_1	—	—	—	20·0
Chicago	49·6	75	6 25	? −159	11 30	?PR_1	17·6	—
Toronto	52·3	67	—	—	—	—	e 28·0	29·0
Ottawa	52·9	61	—	—	—	—	24·8	—
Ithaca	54·7	65	—	—	—	—	29·8	—
Zi-ka-wei	55·5	276	e 1 49	?	—	—	—	—
Georgetown	57·0	69	e 11 14	+82	—	—	35·0	—
Washington	57·0	69	—	—	—	—	e 28·2	—
Harvard	57·3	61	—	—	13 48	?PR_1	29·0	35·5
Eskdalemuir	66·4	11	i 12 54	?PR_1	—	—	32·8	—
Hamburg	69·0	3	e 30 45	?	—	—	38·8	42·8
De Bilt E.	70·3	6	e 11 18	− 1	e 20 28	− 2	e 33·8	42·9
N.	70·3	6	—	—	—	—	e 30·8	42·5
Kew	70·5	10	—	—	—	—	—	51·8
Uccle	71·6	8	—	—	(20 45)	0	e 30·8	—
Strasbourg	74·0	4	—	—	—	—	e 41·8	—
Simla	77·4	311	e 34 21	?L	—	—	(e 34·4)	—
Moncalieri	77·5	5	e 16 5	?PR_1	29 23	?SR_1	43·5	—
Rocca di Papa	81·0	1	i 5 58	?	16 25	?PR_1	e 47·2	53·2
Rio Tinto	83·2	17	30 45	?SR_1	—	—	—	63·8
San Fernando	84·6	17	15 45	?PR_1	—	—	(48·8)	58·8
Helwan	91·8	347	18 45	?PR_1	(23 45)	−48	—	—

Additional readings and notes: Chicago gives L = +17·7m. All these readings are assumed to be 10min. early. Toronto L? = +12·8m., L = +22·0m. Ottawa e?E = +12m.15s., e?N = +13m.33s. Georgetown eE and N = +11m.14s. Washington L = +34·8m. Harvard eE = +15m.39s., LN = +29·6m., MN = +35·2m., T_0 = 22h.27m.42s. Uccle reads S as SR_1 and gives eS = +14m.15s.

April 16d. Readings also at 6h. (Taihoku), 16h. (La Paz), 18h. (Taihoku).

April 17d. Readings at 0h. (San Fernando), 4h. (Manila), 5h. (Batavia), 10h. (near Mizusawa), 17h. (Helwan), 21h. (San Fernando).

April 18d. 21h. 1m. 45s. Epicnetre 57°·3N. 165°·0W. (as on April 16d. 22h.).

A = −·522, B = −·140, C = +·842; D = −·259, E = +·966;
G = −·813, H = −·218, K = −·540.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka E.	15·9	78	e 6 54	?S	(e 6 54)	+ 1	7·8	9·0
Victoria	26·2	92	—	—	—	—	13·1	14·6
Chicago	49·6	75	25 5	?L	26 0	?	26·4	—
Ann Arbor	51·2	70	—	—	—	—	27·1	—
Toronto	52·3	67	—	—	—	—	24·6	—
Ottawa	52·9	61	—	—	—	—	e 27·8	—
Ithaca	54·7	65	—	—	—	—	e 28·6	—
Northfield	55·2	60	e 29 5	?L	—	—	e 32·2	—
Washington	57·0	69	29 53	?L	—	—	33·2	—
Georgetown	57·0	69	—	—	30 4	?L	31·4	—
Cheltenham	57·3	69	29 26	?L	31 43	?	—	—
Harvard N.	57·3	61	—	—	—	—	30·3	31·2

Additional readings: Sitka gives ePN = +7m.58s. (?eLN), MN = +10·0m. Ann Arbor MN = +27·3m. Ottawa e = +28m.10s. Georgetown LZ = +33·5m. Cheltenham PN = +29m.57s., PR_1EN = +30m.27s., SR_1N = +33m.17s., SR_1E = +33m.43s.

April 18d. Readings also at 2h. (near Osaka and Kobe), 4h. (near Nagasaki), 5h. (La Paz), 7h. (near Rocca di Papa, Pompeii, and Athens), 8h. (near Batavia), 13h. (near Manila), 14h. (near Algiers), 16h. (La Paz), 20h. (San Fernando and Apia).

1920. April 19d. 21h. 6m. 25s. Epicentre 18°·4N. 94°·3W.

A = −·071, B = −·946, C = +·316; D = −·997, E = +·075; G = −·024, H = −·315, K = −·949.

Station and Component.		Δ °	Az. °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	L. m.	M. m.
Oaxaca		2·7	240	0 1	−41	—	—	0·2	—
Tacubaya		4·9	282	0 39	−37	—	—	1·0	1·3
Mobile		13·4	23	e 4 45	+87	7 1	?L	7·4	7·9
Tucson	E.	20·3	316	4 26	−19	8 4	−25	10·2	11·3
Chicago		24·0	12	i 5 30	+ 2	9 52	+ 8	11·8	—
Cheltenham	E.	25·3	33	5 47	+ 6	—	—	20·3	24·0
	N.	25·3	33	5 47	+ 6	10 25	+16	17·6	24·2
Georgetown	E.	25·4	32	5 48	+ 6	10 30	+19	e 12·3	—
	Z.	25·4	32	5 47	+ 5	—	—	21·8	—
Washington		25·4	32	5 45	+ 3	10 23	+12	—	—
Ann Arbor	E.	25·5	18	5 59	+16	10 5	− 8	12·2	—
	E.	25·5	18	5 35	− 8	10 17	+ 4	12·2	—
	N.	25·5	18	5 59	+16	10 11	− 2	—	—
Vieques	E.	27·4	86	6 37	+35	11 35	+47	16·0	17·2
Toronto		28·1	23	6 59	+50	11 11	+10	e 23·6	26·6
Ithaca		28·4	28	6 0	−12	10 57	− 9	15·2	—
Lick		30·5	315	e 5 59	−34	—	—	—	—
Harvard	E.	31·0	34	6 33	− 5	10 39	−72	e 11·7	—
	N.	31·0	34	e 6 32	− 6	(11 48)	− 3	e 11·8	—
Ottawa		31·1	26	6 35	− 4	11 47	− 6	—	—
Berkeley		31·2	316	e 6 4	−36	—	—	e 16·8	—
Northfield		31·5	30	—	—	e 10 35	−85	—	—
Victoria		38·1	330	9 25	?PR_1	12 52	−47	17·8	23·2
La Paz		43·4	141	8 21	0	14 53	− 1	17·8	21·4
Honolulu		59·6	284	e 10 11	+ 2	i 17 41	−37	26·3	30·1
Coimbra		75·2	51	11 55	+ 5	21 47	+19	36·4	—
Edinburgh		75·4	37	21 31	?S	(21 31)	+ 1	37·6	41·1
Eskdalemuir	E.	75·5	37	12 2	+10	21 47	+15	37·6	—
Stonyhurst		76·3	39	21 35	?S	(21 35)	− 6	35·6	39·1
Rio Tinto		77·0	54	15 35	?PR_1	—	—	—	26·6
Oxford		77·5	40	12 36	+32	22 9	+14	—	—
San Fernando		77·7	55	12 8	+ 3	22 5	+ 8	—	25·6
Kew		78·1	40	—	—	—	—	—	23·6
Granada		79·5	54	12 29	+13	22 46	+28	—	—
Paris		80·6	41	e 12 25	+ 2	e 22 23	− 7	41·6	—
De Bilt		81·1	38	12 34	+ 8	22 48	+12	e 39·6	40·5
Uccle		81·1	40	12 26	0	22 46	+10	e 39·6	—
Tortosa		81·6	50	12 35	+ 7	23 18	+36	35·7	47·9
Barcelona		82·6	48	e 12 35	+ 1	(22 54)	+ 1	22·9	—
Besancon		83·3	42	12 42?	+ 4	—	—	—	—
Hamburg		83·4	36	i 12 37	− 1	e 23 13	+12	e 41·6	43·6
Strasbourg		84·0	41	12 39	− 3	e 23 14	+ 6	45·6	—
Algiers		84·7	52	12 46	0	23 11	− 5	38·6	51·6
Zurich		84·9	42	12 46	− 1	—	—	—	—
Moncalieri		85·2	45	13 6	+17	23 16	− 5	31·3	—
Vienna		89·3	39	i 13 4	− 8	(e 24 35)	+29	e 24·6	—
Rocca di Papa		89·8	46	e 12 45	−30	(e 24 11)	− 1	24·2	26·1
Pompeii	E.	91·5	46	13 35	+11	24 35	+ 6	—	—
Helwan		108·8	48	19 35	?PR_1	—	—	—	—
Simla		129·8	9	e 22 5	?PR_1	—	—	(61·1)	74·8
Manila		132·1	311	e 18 35	[−48]	—	—	—	—
Mauritius		153·7	98	75 5	?L	—	—	(75·1)	—
Batavia		156·0	298	e 19 11	[−52]	—	—	—	22·2

Additional readings: Tacubaya gives all three components for L and M which are substantially the same. Mobile eP = +5m.5s. and +5m.23s. Georgetown SN = +10m.31s., the other N readings being the same as the E or Z. T_o = 21h.6m.15s. Vieques SN = +11m.45s. Toronto eS = +12m.35s., i = +20m.41s., and +21m.41s., also eL = +33·6m. T_o = 21h.8m.6s. Harvard PR_1E = +7m.47s., PR_1N = +7m.43s., T_o = 21h.7m.48s. Berkeley ePN = +6m.5s. Coimbra iE = +12m.23s., iN = +22m.15s. T_o = 21h.6m.26s. Stonyhurst reads S as P and gives S = +26m.35s. San Fernando MN = +49·6m. T_o = 21h.6m.34s. Paris i = +12m.50s. and +23m.11s. T_o = 21h.6m.50s. De Bilt SN = +23m.13s. i = +24m.6s., MN = +41·9m. T_o = 21h.6m.43s. Uccle i = +12m.53s., SR_1 = +28m.0s. T_o = 21h.6m.28s. Zurich e = +13m.14s. Vienna iN = +17m.11s., L = +38·6m. Rocca di Papa ePN = +12m.59s., eS = +15m.53s.

April 19d. Readings also at 3h. (near Batavia (3)), 4h. (Zurich), 11h. (La Paz), 14h. (Batavia), 16h. (Stonyhurst), 17h. (Batavia), 20h. (La Paz and Manila).

April 20d. Readings at 2h. (San Fernando), 3h. (near Algiers), 5h. (near Taihoku), 10h. (near Tokyo and near Mizusawa different shocks), 15h. (La Paz and Manila).

April 21d. Readings at 0h. (San Fernando), 4h. (Apia and La Paz), 11h. (Colombo), 12h. (Taihoku), 19h. (Apia), 21h. (Batavia, La Paz, and near Oaxaca and Tacubaya), 22h. (San Fernando).

April 22d. Readings at 0h. (La Paz), 2h. (San Fernando), 4h. (La Paz), 7h. (Cape Town), 8h., 12h., and 15h. (near Mizusawa), 16h. (near Tokyo), 17h. (Cape Town), 19h. (La Paz), 22h. (Nagasaki), 23h. (San Fernando).

April 23d. Readings at 0h. and 2h. (near Mizusawa), 5h. (Nagasaki), 8h. (Uccle and Hamburg), 9h. (Helwan), 10h. (La Paz), 11h. (near Mizusawa), 12h. (La Paz), 14h. (Cape Town), 15h. (near Mizusawa and Tokyo), 18h. (Taihoku and San Fernando), 19h. (Uccle, La Paz, De Bilt, Pompeii, Rocca di Papa, and Strasbourg).

April 24d. Readings at 2h. (La Paz), 3h. (Cape Town), 7h. (La Paz), 8h. (Helwan), 9h. (La Paz), 11h. (Stonyhurst), 14h. and 19h. (La Paz), 23h. (San Fernando).

April 25d. 16h. 45m. 0s. Epicentre 4°·0N. 130°·0E. (as on 1913 Mar. 26d.).

$A = -\cdot641$, $B = +\cdot764$, $C = +\cdot070$; $D = +\cdot766$, $E = +\cdot643$; $G = -\cdot045$, $H = +\cdot053$, $K = -\cdot998$.

Very doubtful.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	13·8	321	—	—	e 6 17	+14	9·5	10·6
Batavia	25·3	246	5 36	− 5	—	—	—	11·0
Riverview	42·8	154	e 12 6	?	e 14 6	−39	—	18·4
Colombo	50·0	276	21 30	?SR_1	—	—	—	—
Helwan	95·7	301	28 0	?SR_1	—	—	—	—
La Paz	158·2	126	20 19	[+13]	—	—	—	—

Additional readings: Manila gives MN = +9·8m. Batavia i = +6m.20s. Riverview MZ = +18·9m. Helwan PN = +29m.0s.

April 25d. Readings also at 0h. (near Tokyo), 2h. (Rocca di Papa and Athens), 6h. and 7h. (Colombo), 8h. (near Athens), 9h. (Hamburg), 14h. (Taihoku and Helwan), 15h. (Batavia and near Tokyo), 16h. (La Paz and Melbourne), 22h. (San Fernando).

April 26d. Readings at 2h. (near Tokyo and Mizusawa), 7h. (La Paz), 12h. (near Tokyo), 18h. (near Tacubaya), 23h. (San Fernando, Manila, Helwan, and near Barcelona and Tortosa).

April 27d. Readings at 0h. (near Barcelona and Tortosa), 4h. (La Paz), 6h. (Helwan and near Rocca di Papa), 15h. (Manila and near Athens), 16h. (near Oaxaca and Tacubaya), 18h. (near Balboa Heights), 21h. (San Fernando).

April 28d. Readings at 2h. (near Tacubaya), 4h. and 6h. (La Paz), 10h. (near Tokyo), 12h. (San Fernando and La Paz), 17h. (Tortosa), 18h. (Lick), 23h. (San Fernando).

April 29d. Readings at 0h. (La Paz and near Lick), 3h. (near Mizusawa), 6h. (Manila, Batavia, and near Tacubaya), 7h. (near Osaka and near Tokyo, independent shocks), 10h. (Manila and near Tacubaya), 12h. (near Tacubaya), 13h. (La Paz and near Tokyo), 14h. (near Mizusawa), 15h. (Paris and Helwan), 16h. (Riverview, La Paz, Batavia, Manila, and Sydney), 17h. (La Paz), 21h. (Algiers), 22h. (San Fernando).

April 30d. Readings at 1h. (near Lick and near Tokyo), 2h. (Riverview), 3h. (near Tokyo), 5h. (Batavia and La Paz), 9h. (near La Paz), 11h. (near Tacubaya), 14h. (near Tokyo), 19h. (near Tacubaya), 22h. (San Fernando).

May 1d. 6h. 34m. 40s. Epicentre 37°·0N. 28°·7E.

A = +·700, B = +·383, C = +·602; D = +·480, E = −·877; G = +·528, H = +·289, K = −·799.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		4·0	286	1 7	+ 5	1 56	+ 6	2·4	2·8
Pompeii		11·6	294	2 59	+ 6	14 20	?	—	—
Rocca di Papa		13·2	296	3 12	− 4	—	—	—	8·9
Moncalieri		17·6	304	3 23	−49	8 2	+31	11·8	—
Strasbourg		19·1	314	4 31	+ 1	e 7 7	−57	—	13·4
Hamburg		21·0	328	i 4 58	+ 5	e 10 40	?L	14·2	—
Uccle		22·1	316	e 5 4	− 2	e 9 4	− 3	e 12·3	—
Paris		22·3	310	e 5 3	− 6	e 9 4	− 7	13·3	—
De Bilt	E.	22·4	320	—	—	e 9 22	+ 9	e 14·3	15·8
	N.	22·4	320	—	—	e 9 20	+ 7	—	15·6

Additional readings: Athens gives PE also at +1m.16s., MN = +2·9m. Strasbourg MN = +13·3m.

May 1d. Readings also at 2h. (Helwan), 6h. (La Paz), 10h. (Apia), 13h. (Moncalieri), 14h. (Helwan), 16h. (Lick), 18h. (Pompeii), 23h. (Helwan, Eskdalemuir, Kew, Edinburgh, Moncalieri, Calcutta, Simla, Hamburg, Uccle, De Bilt, and Rocca di Papa).

May 2d. 8h. 27m. 50s. Epicentre 35°·0N. 90°·5E. (as on 1919 June 28d.).

A = −·007, B = +·819, C = +·574; D = +1·000, E = +·009; G = −·005, H = +·574, K = −·819.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		11·8	255	—	—	e 5 28	+14	7·5	7·7
Calcutta	E.	12·6	189	3 34	+27	—	—	6·2	—
	N.	12·6	189	3 28	+21	—	—	6·1	—
Bombay		22·4	229	9 13	?S	(9 13)	0	—	12·6
Zi-ka-wei		26·1	90	e 5 47	− 2	10 28	+ 4	—	16·8
Kodaikanal		27·5	208	10 52	?S	(10 52)	+ 2	14·0	16·0
Taihoku		28·5	102	11 6	?S	(11 6)	− 2	15·3	17·7
Colombo		29·8	202	12 28	?S	(12 28)	+57	22·8	27·7
Nagasaki		32·5	85	e 13 9	?S	(e 13 9)	+53	—	—
Manila		34·2	119	e 10 44	?	—	—	—	—
Osaka		36·3	79	—	—	14 43	+89	—	23·0
Tokyo		39·8	76	22 37	?L	—	—	25·2	29·2
Batavia		44·0	156	—	—	—	—	e 25·1	23·7
Helwan		49·5	282	16 10	?S	(16 10)	− 3	—	—
Vienna		54·7	310	—	—	—	—	e 30·2	38·2
Hamburg		57·2	316	—	—	e 23 46	?SR$_1$	e 33·2	34·5
Rocca di Papa		59·3	303	e 43 14	?L	—	—	(e 43·2)	46·4
Strasbourg		60·1	310	—	—	—	—	e 34·9	38·1
De Bilt		60·4	315	—	—	e 25 10	?SR$_1$	e 33·2	36·2
Uccle		61·3	315	—	—	—	—	e 33·2	36·7
Moncalieri		61·4	309	—	—	(e 19 34)	+53	35·5	41·8
Dyce		62·5	323	—	—	—	—	35·2	—
Paris		63·2	313	—	—	—	—	e 41·2	—
Kew		63·8	318	—	—	—	—	—	41·2
Eskdalemuir		63·8	321	—	—	—	—	33·2	—
Oxford		64·2	318	—	—	—	—	38·1	—
Barcelona		66·6	307	—	—	—	—	41·5	—
Tortosa		67·9	308	e 39 12	?L	—	—	40·2	44·0
Algiers		68·1	301	—	—	—	—	e 43·7	47·2
San Fernando	N.	74·7	306	44 40	?L	—	—	(44·7)	56·2
Chicago		103·2	359	—	—	—	—	e 48·7	—

Additional readings: Zi-ka-wei gives MN = +15·7m. T_g = 8h.27m.43s Osaka MN = +21·8m. Batavia e = +17m.40s. and +22m.6s. Helwan PN = +20m.10s. Moncalieri gives S = +27m.40s., MN = 41·5m. Eskdalemuir L = +38·2m. Barcelona e = +40m.10s. San Fernando PE = +47m.40s., ME = +50·2m. Chicago L = +60·7m.

May 2d. 14h. 46m. 40s. Epicentre 35°·0N. 90°·5E. (as at 8h.).

A = −·007, B = +·819, C = +·574; D = +1·000, E = +·009; G = −·005, H = +·574, K = −·819.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		11·8	255	—	—	e 5 38	+24	7·2	8·0
Calcutta	E.	12·6	189	3 8	+ 1	—	—	6·3	—
	N.	12·6	189	2 56	−11	(5 50)	+16	5·8	—
Bombay		22·4	229	9 16	?S	(9 16)	+ 3	—	12·6
Zi-ka-wei		26·1	90	e 5 49	0	10 24	0	—	15·9
Kodaikanal		27·5	208	10 32	?S	(10 32)	−18	13·5	16·1
Taihoku		28·5	102	11 6	?S	(11 6)	− 2	15·3	18·2
Colombo		29·8	202	12 20	?S	(12 20)	+49	22·8	26·3
Manila		34·2	119	e 10 23	?	—	—	15·0	19·3
Osaka		36·3	79	—	—	15 0	+106	—	21·2
Tokyo		39·8	76	18 43	?L	—	—	22·3	24·5
Batavia		44·0	156	—	—	—	—	e 25·4	—
Helwan		49·5	282	17 20	?S	(17 20)	+67	—	—
Vienna		54·7	310	—	—	—	—	e 31·4	38·6
Hamburg		57·2	316	—	—	e 21 20	?SR_1	e 33·3	34·5
Rocca di Papa		59·3	303	—	—	—	—	—	43·6
Strasbourg		60·1	310	—	—	—	—	e 35·3	40·1
De Bilt		60·4	315	—	—	—	—	e 33·3	36·4
Uccle		61·3	315	—	—	—	—	e 32·3	36·7
Moncalieri		61·4	309	—	—	(e 19 37)	+56	35·6	41·3
Dyce		62·5	323	—	—	—	—	i 40·3	—
Paris		63·2	313	—	—	e 27 20	?	34·3	36·3
Eskdalemuir		63·8	321	—	—	—	—	34·3	—
Kew		63·8	318	—	—	—	—	—	40·3
Stonyhurst		64·0	319	—	—	—	—	33·8	36·3
Oxford		64·2	318	—	—	—	—	38·3	—
Tortosa		67·9	308	—	—	—	—	e 39·3	44·0
Rio Tinto		74·2	308	44 20	?L	—	—	(44·3)	61·3
Coimbra		74·2	310	40 0	?L	—	—	43·3	45·5
SanFernando		74·7	306	31 32	?L	—	—	(31·5)	50·8
Cape Town		96·4	233	55 8	?L	—	—	(55·1)	57·6
La Paz		153·4	309	92 44	?L	—	—	(92·7)	—

Additional readings: Zi-ka-wei gives MN = +15·8m., T_o = 14h.46m.43s.
Colombo S = +20m.2s. Manila MN = +18·8m. Osaka MN = +20·6m.
Batavia e = +19m.22s. and e = +22m.56s. Vienna i = +35m.39s.
De Bilt MN = +36·3m. Moncalieri S = +27m.56s., MN = +42·4m.
San Fernando MN = +49·3m. La Paz i = +93m.37s.

May 2d. Readings also at 2h. (Algiers), 5h. (Apia), 6h. (La Paz), 9h. (Pompeii), 13h. (Kew), 14h. (La Paz), 18h. (Batavia and near Tacubaya), 21h. (San Fernando), 22h. (near Tacubaya), 23h. (Rocca di Papa).

May 3d. Readings at 5h. (near Manila (2)), 8h. (Dehra Dun), 13h. (Helwan), 14h. (Apia and Dehra Dun), 16h. (Pompeii), 20h. (Helwan), 23h. (Nagasaki (2)).

May 4d. Readings at 0h. (San Fernando), 1h. (La Paz), 9h. (Manila), 11h. (Manila and Riverview), 12h. (Melbourne and La Paz), 16h. (Athens), 22h. (Helwan), 23h. (Apia and La Paz).

May 5d. 14h. 41m. 55s. Epicentre 45°·5N. 15°·0E. (as on 1918 Aug.13d.).

A = +·677, B = +·181, C = +·713; D = +·259, E = −·966; G = +·689, H = +·185, K = −·701.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Padova	2·1	270	0 31	− 2	0 51	− 7	—	—
Vienna	2·9	19	i 1 9	+24	i 1 17	− 3	i 1·8	2·3
Florence	3·1	229	0 50	+ 1	1 15	−11	—	2·3
Milan	4·0	270	1 52	?S	(1 52)	+ 2	(2·1)	2·6
Rocca di Papa	4·0	205	e 1 34	+32	—	—	—	3·8
Pompeii	4·8	181	3 5	?	—	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Zurich	E.	4·8	296	e 1 13	− 1	i 2 7	− 4	—	2·2
	N.	4·8	296	e 1 14	0	i 2 6	− 5	—	2·2
Moncalieri		5·1	269	1 23	+ 4	—	—	—	2·9
Neuchatel		5·8	288	e 1 28	− 2	2 37	− 2	—	—
Strasbourg		5·8	305	1 27	− 3	e 2 17	−22	2·7	2·9
Besançon		6·4	289	1 37	− 1	2 57	+ 2	3·1	3·1
Hamburg		8·7	340	—	—	e 3 17	−39	—	6·6
Uccle		8·8	311	e 2 17	+ 4	—	—	i 4·3	—
Paris		9·1	296	e 3 14	+56	e 3 54	−12	4·6	5·1
De Bilt		9·3	319	—	—	—	—	e 4·4	—
Oxford		12·4	306	—	—	—	—	i 6·3	—

Additional readings: Vienna MZ = +2·1m. Florence S = +1m.11s. Zurich iP = +1m.22s. Neuchatel P = +1m.41s. Hamburg MN = +4·9m., MZ = +5·4m.

May 5d. Readings also at 3h. (near Batavia), 4h. (Padova), 6h. (near Mizusawa), 8h. (Batavia, La Paz, Apia, Honolulu, Helwan, Manila, Riverview, and Sydney), 11h. (Manila), 12h. (Manila and Taihoku), 17h. (Manila (2)), 18h. (Melbourne), 20h. (near Tacubaya).

May 6d. 9h. 40m. 30s. Epicentre 44°·0N. 131°·0E. (as on 1918 April 10d.).

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

The depth of focus estimated at 0·070 on 1918 April 10d. has been retained below. This seems to be indicated by direct comparison of the records of the two shocks.

		Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		−0·5	8·7	68	1 36	−28	—	—	3·2	4·0
Mizusawa	E.	−0·6	9·0	119	2 4	− 3	3 43	− 4	—	—
	N.	−0·6	9·0	119	2 6	− 1	3 40	− 7	—	—
Osaka		−0·8	9·9	158	2 55	+37	—	—	4·3	4·8
Tokyo		−1·0	10·7	138	2 22	− 4	(4 5)	−16	4·1	4·2
Zi-ka-wei		−1·9	14·9	214	e 3 4	− 9	e 5 32	−12	—	—
Manila		−4·4	30·6	198	e 7 30	?PR_1	—	—	—	—
Batavia		−6·7	54·7	210	e 8 31	−23	15 24	−30	—	15·6
De Bilt		−7·9	73·2	328	—	—	e 19 35	+ 6	e 43·5	—
Helwan		−8·0	76·1	299	21 30	?S	(21 30)	+87	—	—
San Fernando		−8·6	90·7	327	25 30	?SR_1	—	—	—	—
La Paz		—	148·2	36	i 18 57	[−56]	25 42	?PR_1	—	—

Additional readings: Osaka gives MN = +5·3m. Tokyo reads S as L and gives S = +3m.9s. Ootomari MN = +3·3m. Helwan PE = +20m.30s.

May 6d. Readings also at 13h. and 16h. (Apia), 18h. (Simla (2) and Calcutta), 20h. (Lick and Helwan), 21h. (Lick, Manila, and Riverview), 22h. (Mizusawa).

1920. May 7d. 5h. 40m. 40s. Epicentre 6°·5N. 126°·0E.

(as on 1918 Sept. 11d.).

A = −·584, B = +·804, C = +·113; D = +·809, E = +·588;
G = −·066, H = +·092, K = −·994.

The observation of [P] at La Paz suggests a high focus: but on trial it was found that the observations could not be reconciled with that condition.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		9·5	330	2 30	+ 7	(4 31)	+15	4·5	5·8
Taihoku		19·0	347	4 23	− 6	8 2	0	10·5	10·7
Batavia		22·9	237	i 5 22	+ 6	9 34	+11	e 20·6	—
Zi-ka-wei		25·0	351	e 5 30	− 8	e 9 47	−16	e 11·1	17·5
Kobe		29·4	15	6 4	−18	—	—	14·1	15·2
Osaka		29·5	16	6 44	+21	—	—	13·0	20·6
Nagoya		30·4	18	5 37	−55	—	—	—	—
Tokyo		31·8	21	6 57	+12	10 47	−78	13·3	23·5
Mizusawa		35·4	21	6 57	−20	12 28	−33	—	—
Perth		39·6	194	9 34	?PR$_1$	(13 25)	−35	13·4	—
Calcutta	E.	39·7	299	7 56	+ 4	—	—	17·7	—
	N.	39·7	299	8 26	+34	13 26	−36	17·8	—
Ootomari		42·7	18	8 0	−16	—	—	—	—
Adelaide		42·9	166	e 9 5	+48	i 14 32	−15	e 21·5	24·3
Colombo		45·9	273	7 50	−49	—	—	14·1	29·4
Riverview		46·8	151	e 8 34	−12	e 15 21	−17	e 20·6	27·7
Sydney	E.	46·9	151	8 38	− 8	15 20	−20	22·5	28·3
Melbourne		47·7	160	—	—	17 8	+78	19·5	19·8
Kodaikanal		48·2	278	1 38	?	—	—	30·8	34·0
Simla		51·8	308	e 9 8	−11	(e 16 26)	−15	e 16·4	29·6
Bombay		53·2	289	9 24	− 3	—	—	—	30·3
Apia		65·0	109	—	—	e 19 26	+ 1	31·3	34·3
Mauritius		71·9	246	23 44	?	—	—	38·7	41·3
Honolulu		74·7	69	i 11 32	−15	i 21 44	+22	38·8	45·9
Helwan		90·8	300	13 20	0	—	—	—	—
Budapest		96·4	319	13 50	− 1	—	—	—	—
Vienna		97·9	320	13 48	−11	24 28	−67	e 36·8	49·8
Victoria		98·6	40	15 29	+86	24 21	−81	36·6	51·4
Hamburg		99·7	327	e 13 55	−14	e 24 23	−90	e 47·3	55·1
Pompeii	E.	101·6	313	17 59	?PR$_1$	23 59	−132	38·3	52·3
Strasbourg		102·4	321	e 14 39	+17	—	—	e 48·3	64·4
Rocca di Papa		102·6	315	e 19 3	?PR$_1$	24 38	−102	e 52·6	66·4
De Bilt	E.	102·9	327	—	—	e 27 45	+82	e 48·3	56·8
	N.	102·9	327	—	—	—	—	e 49·3	55·7
Dyce	E.	103·7	334	—	—	28 8	+98	54·3	—
Uccle		104·0	326	e 18 32	?PR$_1$	e 24 20	−133	e 42·3	64·3
Moncalieri		104·6	320	18 35	?PR$_1$	33 44	?SR$_1$	49·0	66·1
Besançon		104·8	321	—	—	—	—	61·3	—
Edinburgh		105·0	333	28 5	?S	(28 5)	+83	48·3	65·9
Eskdalemuir		105·4	333	i 18 46	?PR$_1$	i 27 47	+61	47·3	—
Stonyhurst		105·9	331	28 20	?S	35 20	?SR$_1$	49·5	58·8
Paris		106·1	324	e 14 24	−16	29 20	+147	51·3	56·3
Kew		106·1	328	28 20	?S	(28 20)	+87	—	70·3
Oxford		106·4	328	—	—	i 29 11	+135	49·7	69·5
Cape Town		108·1	235	24 43	?	—	—	—	76·2
Barcelona		109·9	319	—	—	e 28 32	+65	52·0	62·3
Tortosa		111·2	319	19 29	?PR$_1$	29 48	+129	e 51·3	68·6
Algiers		111·4	313	e 14 31	−33	21 42	?PR$_1$	29·8	69·3
Granada		115·9	316	59 46	?L	—	—	(59·8)	—
Coimbra	E.	117·4	322	20 58	?PR$_1$	30 48	+139	e 58·9	74·5
	N.	117·4	322	—	—	29 54	+85	e 57·6	65·8
Rio Tinto		117·5	319	21 20	?PR$_1$	—	—	—	75·3
San Fernando		118·0	318	23 10	?	—	—	—	81·3
Chicago		122·8	29	i 20 40	?PR$_1$	30 34	+84	52·3	—
Ottawa		124·7	18	—	—	—	—	e 54·3	—
Toronto		124·9	20	20 50	?PR$_1$	—	—	69·8	87·7
Washington		129·8	21	e 21 26	?PR$_1$	31 29	+89	64·8	—
La Paz		162·9	127	20 22	[+12]	34 20	?	78·2	101·8

For Notes see next page.

NOTES TO MAY 7d. 5h. 40m. 40s.

Additional readings and notes: Manila gives also MN = +5·7m. Zi-ka-wei PS = +10m.17s., MN = +15·4m., T_e = 5h.40m.47s. Osaka MN = +16·3m. Tokyo 12m. have been added to these readings. Riverview PS = +15m.48s., SR_2? = +19m.1s., MNZ = +31·9m. Sydney SR_1E = +18m.50s. Mauritius LN = +33·9m., MN = +37·6m. Helwan PN = +13m.26s. Adelaide e = +10m.14s., +15m.20s., +18m.38s., and +20m.20s., i = +17m.29s. Hamburg PR_1 = 18m.1s., MN = +49·3m., MZ = +61·9m. Strasbourg MN = +56·6m. De Bilt ePR_1 = +18m.26s., T_e = 5h.40m.32s. Epicentre 6°·5N. 127°·6E. Dyce readings have been corrected by one hour. Uccle MN = +57·6m. Moncalieri MN = +66·8m. Eskdalemuir i = +35m.4s., LN = +50·3m., +56·3m., and +66·3m. Coimbra LE = +39·6m. San Fernando MN = +74·3m. Toronto L = +73·1m., eL = +78·0m. Washington eL? = +48·8m. La Paz iP = +20m.29s.

1920. May 7d. 21h. 31m. 10s. Epicentre 8·4S. 155·8E.

(As on 1918 June 16d.).

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	e 5 27	−19	10 4	−14	12·1	13·1
Adelaide		30·9	208	e 7 38	+61	e 11 44	− 6	i 18·3	—
Melbourne		31·0	197	i 6 26	−12	11 38	−13	14·8	18·2
Apia		32·3	101	e 6 26	−25	e 11 14	−59	13·2	14·8
Christchurch		38·1	160	12 38	?S	(12 38)	−61	17·5	22·3
Manila		41·5	303	e 7 50	−17	—	—	—	—
Perth		43·9	231	8 0	−25	14 57	− 4	23·5	26·2
Tokyo		46·6	342	9 5	+21	14 59	−37	18·8	29·0
Osaka		47·2	337	9 22	+34	16 41	+57	21·6	26·3
Taihoku		47·2	318	8 46	− 2	15 43	− 1	22·0	26·8
Kobe		47·3	338	8 40	− 9	15 48	+ 3	21·4	26·5
Nagasaki		48·0	333	8 44	−10	—	—	e 17·0	—
Batavia		48·5	269	8 52	− 5	i 16 4	+ 4	e 21·4	—
Mizusawa		49·4	349	8 59	− 4	16 7	− 4	—	—
Zi-ka-wei		51·5	323	e 9 18	+ 1	e 16 46	+ 8	24·2	30·5
Honolulu		54·2	56	i 10 8	+34	i 17 20	+ 9	23·6	33·8
Ootomari		56·3	350	7 57	?	—	—	16·7	17·3
Calcutta	N.	72·8	299	21 26	?S	(21 26)	+26	—	—
Colombo		77·2	280	13 20	+78	22 20	+29	27·0	34·3
Kodaikanal		80·2	282	22 44	?S	(22 44)	+19	48·5	52·2
Dehra Dun		83·8	303	—	—	23 50?	+43	—	—
Simla		84·7	304	—	—	e 22 44	−32	—	50·7
Sitka	E.	85·9	31	—	—	e 23 8	−21	e 38·3	42·2
	N.	85·9	31	—	—	e 23 9	−20	e 36·2	41·8
Bombay		86·1	290	13 13	+19	—	—	—	—
Berkeley	E.	88·8	51	e 13 2	− 7	—	—	e 39·4	—
	N.	88·8	51	13 1	− 8	e 23 52	− 9	e 37·5	—
Lick		89·3	51	—	—	(e 23 55)	−11	e 23·9	—
Victoria		90·3	41	22 33	?S	(22 33)	−104	39·8	47·6
Mauritius	E.	94·5	250	23 56	?S	(23 56)	−65	43·7	49·9
	N.	94·5	250	23 50	?S	(23 50)	−71	44·5	46·9
	E.	97·3	59	—	—	—	—	43·6	45·1
Tucson		106·7	74	18 52	?PR_1	29 6	?	48·3	52·6
Tacubaya		115·3	47	19 32	?PR_1	29 15	+63	36·8	—
Chicago		118·0	45	—	—	—	—	57·0	74·9
Ann Arbor	E.	118·0	45	—	—	—	—	56·5	75·7
	N.	118·0	45	—	—	—	—	—	—
Cape Town		121·4	221	30 44	?S	38 14	?SR_1	—	84·2
Ottawa		122·3	41	e 20 26	?PR_1	—	—	e 50·8	—
Ithaca		123·0	43	—	—	—	—	56·3	—
Washington		123·8	48	e 20 44	?PR_1	29 50	+32	60·8	—
Georgetown		123·8	48	—	—	e 27 50	−88	57·2	—
Helwan	E.	124·0	300	21 26	?PR_1	—	—	—	82·1
	N.	124·0	300	23 26	?	—	—	—	97·5
Cheltenham	E.	124·0	48	22 38	?PR_1	30 21	+62	60·2	70·6
	N.	124·0	48	42 50	?	—	—	58·6	—
Northfield		124·8	40	—	—	—	—	e 59·8	—
Harvard	E.	126·7	42	e 21 26	?PR_1	i 38 46	?SR_1	e 59·3	74·0
	N.	126·7	42	e 20 35	?PR_1	32 42	?	e 59·3	—
Hamburg		127·1	335	e 19 10	[− 1]	—	—	e 59·8	83·8
Vienna		127·5	328	19 9	[− 3]	32 12	?	e 59·3	65·8

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh		129·7	345	20 50	?PR$_1$	—	—	54·8	68·0
La Paz		129·9	120	i 19 25	[+ 7]	33 5	?	60·6	112·5
De Bilt		130·2	337	e 21 41	?PR$_1$	—	—	e 60·8	72·8
Eskdalemuir		130·2	345	81 38	?	—	—	—	—
Stonyhurst		131·3	341	39 26	?SR$_1$	44 20	?	54·5	66·8
Uccle		131·5	337	e 19 20	[− 2]	e 21 44	?PR$_1$	e 57·8	70·7
Padova		131·7	329	20 15	[+53]	27 35	?	—	82·4
Strasbourg		131·7	329	e 19 22	[0]	—	—	e 62·8	73·2
Oxford		132·7	340	e 21 46	?PR$_1$	—	—	54·7	86·2
Kew		132·7	340	40 50	?	—	—	—	74·8
Pompeii	E.	132·9	320	19 24	[− 1]	21 59	?PR$_1$	68·8	71·8
Rocca di Papa		133·4	322	e 18 54	[−32]	31 28	?	e 67·9	77·9
Besançon		133·5	332	19 32	[+ 5]	—	—	68·8	—
Paris		133·7	337	i 19 30	[+ 3]	—	—	62·8	67·8
Moncalieri		134·2	328	19 34	[+ 6]	34 9	?	54·7	86·8
Vieques	E.	138·8	71	—	—	—	—	66·5	67·7
Barcelona		139·5	330	19 46	[+ 7]	40 22	?SR$_2$	65·9	73·8
Tortosa		140·8	331	18 22	[−78]	32 23	?	64·0	80·7
Coimbra	E.	145·2	339	19 34	[−14]	—	—	e 61·8	76·8
	N.	145·2	339	19 46	[− 2]	—	—	e 68·8	80·6
Granada		145·7	331	19 53	[+ 4]	—	—	—	—
Rio Tinto		146·6	335	20 50	[+59]	—	—	—	90·8
San Fernando		147·5	332	20 6	[+14]	30 50	?	—	84·8

Additional readings and notes: Riverview gives also iP = +5m.35s. and +6m.9s., S = +10m.22s. T$_0$ = 21h.30m.42s. Epicentre 8°·5S. 144°·0E. Apia eP = +7m.14s. Ootomari MN = +17·7m., all these readings are increased by 10m. Perth SR$_1$ = +19m.2s. Tokyo 12m. are added to all readings. Osaka MN = +24·9m., T$_0$ = 21h.31m.21s. Kobe SN = +15m.49s., MN = +26·3m. Nagasaki readings are increased by 11m. Batavia i = +11m.13s. and +13m.22s., iE = +17m.44s. Mizusawa PN = +8m.58s., T$_0$ = 21h.31m.9s. Zi-ka-wei MN = +30·8m., T$_0$ = 21h.31m.6s. Berkeley ePV = +12m.53s., T$_0$ = 21h.31m.0s. Victoria S = +29m.27s., L (recrudescence) = +2h.20·0m. Tacubaya LN = +48·4m., MN = +52·7m. Ann Arbor gives E Bosche-Omori and N Wiechert, also LE (Wiechert) = +57·2m. Ottawa gives L = +63·8m., +74·8m. and +88·8m. Georgetown eLE? = +32·4m., eLN? = +32·5m., LN = +42·9m. Hamburg iZ = +21m.17s., eSR$_1$ = +38m.26s., e = +45m.34s., MNZ = +73·9m. Vienna iE = +21m.27s. Edinburgh P = +39m.9s., PS = +41m.33s., SR$_2$ = +53m.26s. La Paz SR$_1$ = +38m.40s., T$_0$ = 21h.33m.54s. De Bilt iE = +22m.44s., iN = +22m.48s., MN = +77·9m., T$_0$ = 21h.30m.42s. Uccle MN = +82·0m. Strasbourg MN = +77·6m. Paris PR$_1$ = +22m.57s. Moncalieri iP = 22m.3s., MN = +22·9m. All readings given one hour late. Barcelona i = +35m.1s. San Fernando MN = +90·3m.

May 7d. Readings also at 1h. (Lick and La Paz), 5h., 9h., and 10h. (La Paz), 12h. (Dyce and Algiers), 13h. (La Paz), 15h. (Helwan), 17h. (Balboa Heights), 21h. (Stonyhurst), 23h. (Mauritius).

May 8d. 21h. 3m. 50s. Epicentre 56°·0N. 136°·0W. (as on 1919 May 18d.).

A = −·402, B = −·389, C = +·829; D = −·695, E = +·719; G = −·596, H = −·576, K = −·559.

The origin should be rather further west, but the old origin is retained for convenience.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria		10·8	129	2 43	+ 2	—	—	—	8·1
Lick	E.	21·0	147	—	—	—	—	e 10·8	—
Chicago		33·9	93	13 10	?S	(13 10)	+31	(23·9)	—
Toronto		37·3	84	—	—	—	—	30·0	31·2
Ottawa		38·3	79	—	—	—	—	24·2	—
Washington		41·8	88	—	—	—	—	19·2	—
Harvard		42·7	80	—	—	—	—	e 28·9	—
Edinburgh		61·8	28	—	—	—	—	48·2	—
Stonyhurst		63·8	28	42 20	?L	—	—	(42·3)	—
De Bilt		67·3	25	—	—	—	—	e 37·2	45·5
Uccle		68·2	25	—	—	—	—	e 38·2	—
Paris		69·7	28	—	—	—	—	e 50·2	—
Granada		78·4	37	47 13	?L	—	—	(47·2)	—

Additional readings: Lick gives eLN = 10·3m. Harvard LE = +30·4m. and +33·1m., LN = +31·2m.

May 8d. Readings also at 0h. (Riverview, Adelaide, and Melbourne), 1h. (near Balboa Heights), 3h. (near Lick and Tokyo), 5h. (Dehra Dun), 6h. (Sapporo and Tacubaya), 7h. (Manila and near Rocca di Papa and Pompeii), 8h. (Tacubaya), 19h. (La Paz), 20h. (Berkeley and Chicago), 22h. (La Paz), 23h. (La Paz, Chicago, Toronto, Ottawa, Washington, De Bilt, and Victoria).

May 9d. 8h. 0m. 4s. Epicentre 51°·7S. 173°·8E.

A = −·616, B = +·067, C = −·785; D = +·108, E = +·994; G = +·780, H = −·085, K = −·620.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	24·2	309	e 5 30	0	e 9 48	0	e 12·2	13·9
Melbourne	24·5	294	—	—	—	—	e 12·9	18·5
Perth	46·0	272	24 56	?L	—	—	(24·9)	—
Honolulu	77·1	28	21 50	?S	(21 50)	0	23·9	30·8
Victoria	113·5	39	39 28	?SR_1	—	—	—	44·9
Chicago	126·3	67	18 41	[−28]	28 36	−59	e 54·9	—
Toronto	132·2	69	—	—	e 27 26	?	31·0	—
Helwan	144·9	247	25 56	?PR_1	—	—	—	—
Paris	173·7	246	—	—	—	—	e 72·9	—

No additional readings.

May 9d. 17h. 9m. 20s. Epicentre 9°·8N. 126°·2E.

A = −·582, B = +·795, C = +·170; D = +·807, E = +·591; G = −·101, H = +·137, K = −·985.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	7·0	314	e 1 42	− 4	—	—	—	—
Taihoku	15·9	344	e 3 54	+ 3	—	—	7·9	—
Zi-ka-wei	21·9	349	5 3	− 1	e 9 1	− 2	—	—
Batavia	25·0	231	5 43	+ 5	—	—	—	11·2
Helwan	89·3	300	59 40	?L	—	—	(59·7)	—
Hamburg	97·0	328	—	—	—	—	e 50·7	—
De Bilt	100·3	326	—	—	—	—	e 50·7	54·4
Rocca di Papa	100·4	315	—	—	—	—	e 53·7	55·7
Uccle	101·4	327	—	—	—	—	e 49·7	53·7
Eskdalemuir	102·5	332	—	—	—	—	52·7	—
Paris	103·4	325	—	—	—	—	e 54·7	—

Additional readings: Helwan gives PN = +53m.40s. De Bilt MN = +53·8m. Epicentre 11°·5N. 123°·8E.

May 9d. Readings also at 0h. (Paris), 4h. (Taihoku), 7h. (La Paz), 9h. (Helwan and near Tacubaya), 11h. (near Kobe), 13h. (La Paz), 14h. (Lick), 16h. (Edinburgh and La Paz), 18h. (Osaka), 22h. (Lick).

1920. May 10d. 18h. 49m. 40s. Epicentre 5°·5S. 130°·0E.

A = −·640, B = +·763, C = −·096; D = +·766, E = +·643; G = +·062, H = −·073, K = −·995.

A depth of focus 0·060 has been assumed.

	Corr. for Focus	Δ	Az.	P.	O—C.	S.	O—C.	L.	M.
	°	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	−2·7	22·0	336	e 4 33	0	—	—	9·2	—
Batavia	−2·8	23·0	267	4 42	− 1	i 9 56	?L	(i 9·9)	10·4
Perth	−3·7	29·6	205	5 38	− 9	11 50	+90	17·9	—
Adelaide	−3·8	30·5	166	i 5 50	− 5	i 10 28	− 9	i 11·9	17·8
Riverview	−4·2	34·5	148	6 32	+ 1	11 36	− 3	e 14·9	25·0
Sydney	−4·2	34·5	148	6 26	− 5	11 32	− 7	17·9	19·8
Melbourne	−4·2	35·1	160	6 44	+ 7	12 2	+12	14·5	22·2
Zi-ka-wei	−4·5	37·6	350	e 6 55	− 2	e 12 16	−10	—	66·7
Kobe	−4·7	40·5	8	7 19	− 1	—	—	16·2	17·0
Tokyo	−4·9	42·2	12	7 21	−11	—	—	7·5	7·6

Continued on next page.

		Corr. for Focus	Δ	Az.	P.		O−C.	S.		O−C.	L.	M.
		°	°	°	m.	s.	s.	m.	s.	s.	m.	m.
Mizusawa	E.	−5·2	45·8	13	7	50	−10	14	22	+ 7	—	—
	N.	−5·2	45·8	13	7	49	−11	14	21	+ 6	—	—
Calcutta		−5·5	49·5	308	15	14	?S	(15	14)	+12	—	—
Colombo		−5·6	51·6	282	8	38	− 2	10	26	?PR_1	11·6	22·3
Christchurch		−5·8	53·4	141	—		—	16	20	+31	34·1	35·3
Kodaikanal		−5·9	54·7	286	9	2	+ 3		—	—	32·1	33·3
Apia		−6·1	57·9	102	—		—		—	—	—	16·3
Mauritius		−6·8	71·3	251	—		—		—	—	4·5	6·6
Honolulu		−7·0	75·4	66	i11	50	+43	i 21	14	+67	e 37·0	43·6
Helwan		−7·8	100·2	300	17	32	?		—	—	—	—
Cape Town	E.	−8·0	104·4	233	19	19	?PR_1	24	49	−31	—	27·5
Victoria		—	105·1	41	22	25	?	30	46	?SR_1	42·6	53·9
Berkeley	E.	—	107·3	50	23	55	?		—	—	—	—
Lick		—	107·9	51	—		—		—	—	e 56·4	—
Vienna		—	109·7	320	e17	37	?	i 27	37	+12	—	64·3
Hamburg		—	111·8	326	e19	53	?PR_1		—	—	e 55·3	65·1
Pompeii		—	112·7	311	15	28	+18		—	—	—	—
Rocca di Papa		—	113·8	313	e18	20	[−13]		—	—	e 51·8	—
Strasbourg		—	115·0	321	e19	14	?PR_1	e 29	37	+87	e 59·3	63·0
De Bilt		—	115·1	325	—		—	e 26	36	−95	e 59·3	65·3
Uccle		—	116·1	324	e19	14	?PR_1	26	46	−93	—	—
Moncalieri		—	116·3	319	e11	34	?	26	47	−93	41·7	73·1
Dyce	N.	—	116·3	334	20	22	?PR_1	26	50	−90	—	63·8
Edinburgh		—	117·5	331	e20	44	?PR_1	30	14	+104	—	62·6
Eskdalemuir		—	117·8	331	20	14	?PR_1	i 27	1	−91	—	—
Paris		—	118·1	323	e19	28	?PR_1	e 27	7	−88	34·3	75·3
Stonyhurst		—	118·3	330	21	38	?PR_1	28	50	+14	39·3	60·3
Kew		—	118·4	328	—		—		—	--	—	66·3
Oxford		—	118·8	328	19	56	?PR_1		—	—	60·3	—
Algiers		—	122·4	310	e19	53	?PR_1	31	10	+123	43·3	78·3
Tortosa		—	122·8	316	18	37	[−23]	36	33	?SR_1	60·3	76·4
Granada		—	127·2	312	e18	30	[−42]	30	50	+69	—	—
Coimbra		—	129·1	319	22	6	?PR_1	36	30	?PR_1	e 53·6	—
San Fernando		—	129·4	313	21	32	?PR_1		—	—	—	76·3
Chicago		—	130·7	37	21	44	?PR_1	32	32	?	61·3	—
Toronto		—	133·9	28	21	44	?PR_1	28	38	?	33·1	42·3
Washington		—	138·6	30	21	56	?PR_1		—	—	—	—
La Paz		—	151·6	141	i19	30	[−28]	32	55	?	78·5	95·1

Additional readings and notes: Batavia gives iP = +5m.31s., eL = +21·3m., T_o = 18h.49m.38s. Adelaide i = +8m.14s., and +10m.50s. Riverview iP = +6m.36s., iPR = +7m.57s., i = +11m.41s., PR_1 = +11m.51s., iSR_2 = +14m.15s., MZ = +17·0m., MN = +20·3m., T_o = 18h.49m.52s. Sydney PR_2 = +7m.56s. Zi-ka-wei MN = +79·6m. Kobe MN = +17·6m. Calcutta PN = +15m.8s. Christchurch PR_1 = +9m.8s. Mauritius gives P = 18h.44m.12s. earlier than T_o. It would seem that some time correction is required. Helwan PN = +20m.20s. (?PR_1N). Victoria eL = +51·4m. Berkeley e?N = +24m.10s. Hamburg ePR_1 = +27m.45s., eSR_1 = +38m.25s., MN = +58·3m. Strasbourg PR_1?N = +28m.22s., MN = +62·8m. De Bilt ePR_1 = +19m.22s., MN = +65·6m. Epicentre 5°·9S. 130°·4E. Uccle i = +28m.32s. Dyce iN = +40m.0s., iE = +30m.2s. Edinburgh SR_1 = +35m.32s. Eskdalemuir iE = +28m.45s. Granada i = +20m.4s. Coimbra PR_1E = +29m.58s., PR_1N = +30m.24s., i = +38m.6s., L = +67·7m. San Fernando MN = +79·3m. Toronto eL = +39·2m., also eL = +73·9m., M = +75·9m., and eL = +87·2m., M = +90·3m., which, although given separately, are probably connected with this earthquake. La Paz gives L = +65·2m. and +87·5m.

May 10d. Readings also at 0h. (near Rocca di Papa), 10h. (La Paz), 11h. (Helwan), 13h. (La Paz and Balboa Heights), 17h. (2) and 19h. (Tokyo), 20h. (Stonyhurst (2)).

May 11d. Readings at 0h. (San Fernando), 2h. (Riverview), 5h. (La Paz), 6h. (near Mizusawa and Tokyo), 11h. (Manila), 15h. (La Paz), 19h. (near Tokyo), 21h. (near Algiers, San Fernando, De Bilt, and Tortosa).

May 12d. 21h. 53m. 12s. Epicentre 38°·0N. 136°·0E.

A = −·567, B = +·547, C = +·616; D = +·695, E = +·719;
G = −·443, H = +·428, K = −·788.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	2·9	166	0 33	−12	—	—	—	—
Tokyo	3·3	166	0 20	−32	—	—	0·6	—
Osaka	3·4	188	0 51	− 2	(1 27)	− 7	1·4	1·8
Kobe	3·4	192	0 50	− 3	—	—	1·6	1·6
Mizusawa E.	4·1	74	1 5	+ 1	1 54	+ 1	—	—
N.	4·1	74	1 4	0	1 55	+ 2	—	—
Nagasaki	7·3	225	1 54	+ 3	—	—	3·4	4·0
Zi-ka-wei	13·8	245	i 3 31	+ 8	e 5 57	− 6	—	—
Taihoku	17·9	227	3 59	−17	(7 17)	−21	7·3	—
Manila	27·0	214	e 5 52	− 6	—	—	13·1	—
Batavia	51·9	219	—	—	i 15 49	−54	—	—
Hamburg	77·3	330	e 12 2	− 1	i 22 2	+10	—	42·8
Vienna	78·5	324	i 12 8	− 2	22 27	+21	—	55·0
De Bilt	80·3	331	—	—	e 22 26	− 1	43·8	50·4
Eskdalemuir	80·4	339	23 17	?S	(23 17)	+49	41·3	—
Uccle	81·6	331	e 12 23	− 5	22 34	− 8	—	46·8
Strasbourg	82·0	329	e 12 26	− 4	e 22 36	−10	50·8	—
Padova	82·6	324	12 48	+14	23 33	+40	—	—
Kew	82·7	335	—	—	—	—	—	59·8
Oxford	82·8	335	—	—	i 22 42	−13	—	—
Pompeii	84·8	320	15 37	?PR_1	22 48	−29	—	—
Rocca di Papa	85·0	321	e 16 15	?PR_1	e 23 15	− 4	e 56·2	58·7
Moncalieri	85·4	325	e 16 9	?PR_1	i 23 13	−10	37·2	—
Tortosa	91·3	328	21 31	?	—	—	e 33·2	51·2
San Fernando	97·8	330	37 48	?	—	—	—	—
La Paz	149·8	51	19 37	[−19]	—	—	—	—

Additional readings: Osaka gives MN = +2·2m. De Bilt ePR_1 = +15m.36s., MN = +46·0m. Epicentre 34°·7N. 139°·3E.

May 12d. Readings also at 0h. (San Fernando), 7h. (near Mizusawa), 9h. (Taihoku and Zi-ka-wei), 14h. (La Paz), 18h. (Riverview), 21h. (Moncalieri, De Bilt, Uccle, and Helwan).

1920. May 13d. 1h. 48m. 25s. Epicentre 4°·0S. 144°·5E.

(as on 1918 June 10d.).

A = −·812, B = +·579, C = −·070; D = +·581, E = +·814;
G = +·057, H = −·041, K = −·998.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	29·8	309	e 6 13	−13	—	—	14·4	16·7
Riverview	30·5	169	e 6 29	− 4	i 11 37	− 6	e 15·0	18·4
Sydney	30·5	169	—	—	11 35	− 8	15·3	18·2
Adelaide	31·4	189	e 7 5	+23	i 11 41	−17	e 14·7	23·4
Melbourne	33·8	179	—	—	12 29	− 9	15·8	24·2
Taihoku	36·6	323	7 20	− 7	(13 0)	−18	13·0	20·6
Batavia	37·6	265	7 29	− 6	—	—	21·6	10·9
Perth	38·8	221	7 32	−12	13 38	−11	19·2	21·2
Osaka	39·6	348	7 51	0	13 8	−52	16·6	16·7
Kobe	39·6	348	7 37	−14	—	—	e 16·7	19·2
Tokyo	39·9	355	8 16	+22	13 50	−15	17·2	24·2
Nagoya	40·5	350	e 8 3	+ 4	—	—	—	—
Zi-ka-wei E.	41·5	330	7 58	− 9	14 12	−16	18·7	22·6
Mizusawa N.	43·2	356	8 9	−11	14 31	−20	—	—
Christchurch	46·7	150	8 41	− 4	15 47	+10	24·3	34·5
Ootomari	50·7	359	8 32	−39	16 22	− 5	21·2	22·0
Honolulu	61·7	63	e 9 59	−24	i 18 17	−27	32·0	40·2
Colombo	65·5	276	19 35	?S	(19 35)	+ 4	23·8	24·6
Kodaikanal	68·3	283	19 35	?S	(19 35)	−31	43·1	45·7

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		72·9	305	—	—	e 20 53	− 8	36·3	43·3
Bombay		74·1	291	11 52	+ 9	—	—	—	—
Mauritius	E.	85·4	250	22 47	?S	(22 47)	−39	32·9	48·1
Sitka		88·0	33	—	—	—	—	e 39·9	44·6
Victoria		94·4	42	24 48	?S	(24 48)	−12	41·5	48·9
Berkeley	Z.	94·9	52	13 24	−19	—	—	e 43·2	—
Lick		95·5	53	e 17 39	?	e 25 42	+31	e 43·6	—
Tucson	E.	105·5	57	—	—	—	—	48·1	52·6
Helwan	E.	112·0	301	19 47	?PR_1	—	—	—	78·3
	N.	112·0	301	27 59	?S	(27 59)	+13	—	111·9
Cape Town	E.	116·5	229	29 39	?S	(29 39)	+77	—	69·2
Vienna		117·5	324	c 19 2	[+18]	i 26 47	−103	—	68·1
Hamburg		118·1	331	e 20 23	?PR_1	e 30 9	+94	e 52·6	61·6
Chicago		120·2	42	20 43	?PR_1	30 15	+84	e 52·6	—
Dyce		120·7	340	—	—	30 49	+114	64·8	69·3
De Bilt		121·4	332	—	—	e 30 31	+91	e 54·6	62·8
Padova		121·6	323	20 35	?PR_1	30 35	+94	—	—
Edinburgh		122·1	339	29 55	?S	(29 55)	+50	49·6	58·3
Pompeii		122·1	317	19 43	[+45]	29 13	+ 8	47·6	71·6
Strasbourg		122·3	326	e 20 34	?PR_1	e 30 41	+95	e 59·6	73·2
Eskdalemuir		122·5	339	15 0	−55	e 24 24	?	58·6	—
Uccle		122·6	330	e 20 35	?PR_1	30 35	+86	50·6	63·4
Ann Arbor	E.	122·6	40	21 29	?PR_1	32 17	+188	62·5	—
	N.	122·6	40	20 59	?PR_1	31 53	+164	62·4	—
	E.	122·6	40	21 35	?PR_1	32 59	+230	—	—
Rocca di Papa		122·8	319	e 19 13	[+13]	e 25 35	?	60·5	67·4
Stonyhurst		123·4	337	32 17	?	38 5	?SR_1	51·1	60·6
Toronto		124·0	37	—	—	32 11	?	i 67·3	80·9
Besançon		124·0	326	—	—	—	—	62·6	—
Kew		124·2	334	26 35	?	—	—	—	78·6
Moncalieri		124·3	320	20 58	?PR_1	37 9	?SR_1	60·1	80·0
Oxford		124·5	335	21 0	?PR_1	32 27	?	54·1	67·1
Paris		124·8	326	—	—	e 28 44	−41	56·6	64·6
Ithaca		127·0	37	—	—	e 38 15	?SR_1	60·2	—
Northfield		128·2	32	—	—	—	—	e 66·6	—
Georgetown	E.	128·7	42	e 21 35	?PR_1	31 39	+107	62·6	—
	N.	128·7	42	e 21 35	?PR_1	31 40	+108	e 58·6	—
	Z.	128·7	42	e 20 51	?PR_1	—	—	62·0	—
Washington		128·7	42	e 21 25	?PR_1	—	—	e 55·6	—
Cheltenham	E.	128·9	41	—	—	—	—	73·2	75·6
	N.	128·9	41	—	—	—	—	66·8	74·8
Barcelona		129·7	323	21 42	?PR_1	—	—	56·0	69·1
Harvard	E.	130·3	34	e 21 33	?PR_1	33 25	?	e 57·3	—
	N.	130·3	34	e 21 23	?PR_1	—	—	e 57·3	64·0
Tortosa		131·1	324	21 29	?PR_1	33 32	?	56·2	80·8
Algiers		131·8	319	e 19 35	[+12]	28 40	?	39·6	67·6
Granada		135·8	323	19 50	[+18]	—	—	—	—
Coimbra	E.	136·3	330	22 8	?PR_1	34 34	?	e 60·6	68·6
	N.	136·3	330	—	—	—	—	68·6	83·3
Rio Tinto		137·2	327	23 35	?PR_1	—	—	—	85·6
San Fernando		137·9	324	—	—	44 35	?SR_1	79·6	117·6
La Paz		141·8	123	e 19 50	[+ 7]	31 55	?	60·6	73·2

Additional readings: Manila gives also MN = +16·6m. Riverview iSR_1 = +13m.43s., SR_2 = +14m.25s., MZ = +21·2m., MN = +21·4m., T_e = 1h.48m.25s. Adelaide i = +12m.23s. and +12m.59s. Osaka MN = +19·4m., T_e = 1h.49m.36s. Kobe MN = +19·0m. Zi-ka-wei SN = +14m.10s., SR_1N = +16m.6s., SR_2N = +17m.33s., SR_2N = +18m.13s., MN = +20·5m., T_e = 1h.48m.33s. Mizusawa SE = +14m.27s., T_e = 1h.48m.36s. Christchurch SR_1 = +19m.35s. Colombo S = +19m.53s. Mauritius PN = +23m.11s. Victoria S = +30m.42s., L (repetition) = 4h.9m.50s. Hamburg SR_1 = +36m.38s., SR_2 = +41m.13s., MN = +74·6m., MZ = +71·6m. De Bilt PR_1 = +20m.45s., e = +37m.47s., MN = +70·4m., T_e = 1h.57m.22s. Edinburg gives S as P and S as = +37m.32s. Eskdalemuir L? = +37·6m. Strasbourg PR_1E = +21m.5s., MN = +72·8m. Uccle SR_1 = +37m.53s., MN = +62·6m. Toronto gives its readings as on 12d., also L or S = +38m.29s., L = +56·5m., L Rep = +130·3m. Moncalieri MN = +74·7m. Paris e_2 = +42m.35s. (?SR_1). Georgetown LN = +61·6m. Harvard iPE = +21m.42s., iPN = +22m.4s., giving all its readings as on 12d. Algiers PR_1 = +23m.0s. Coimbra LN? = +45·5m., LE? = +48·8m. San Fernando MN = +123·6m. La Paz gives L = +69·6m.

May 13d. 4h. 40m. 40s. Epicentre 49°·8N. 12°·0E.

A = +·631, B = +·134, C = +·764.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Strasbourg	3·1	246	e 1 48	?L	—	—	(e 1·8)	—
Zurich E.	3·3	223	e 0 53	+ 1	1 35	+ 4	—	—
N.	3·3	223	e 0 54	+ 2	1 34	+ 3	—	—
Vienna	3·3	118	e 0 46	− 6	i 1 26	− 5	—	1·6
Padova	4·4	181	1 4	− 4	1 21	−40	—	—
Rocca di Papa	8·1	176	e 2 2	− 1	—	—	—	3·4

Rocca di Papa gives also ePE = +2m.26s., iN = +2m.34s.

May 13d. Readings also at 8h. (Batavia), 14h. (Apia), 21h. (San Fernando).

May 14d. 17h. 57m. 10s. Epicentre 64°·1N. 27°·5W. (as on 1914 June 19d.).

A = +·388, B = −·202, C = +·900; D = −·462, E = −·887;
G = +·798, H = −·415, K = −·437.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	14·5	113	—	—	—	—	6·8	8·5
Eskdalemuir	14·6	112	—	—	—	—	5·8	—
Oxford	18·4	120	—	—	7 52	+ 3	9·9	13·9
Kew	19·0	119	—	—	—	—	—	11·8
De Bilt	20·6	110	e 4 56	+ 7	—	—	e 9·8	13·2
Uccle	21·3	113	—	—	e 8 38	−12	e 10·3	—
Hamburg	21·6	101	e 8 50	?S	(e 8 50)	− 7	(e 17·8)	—
Paris	22·2	119	e 7 12	?	—	—	11·8	12·8
Strasbourg	24·4	112	e 5 36	+ 4	e 9 50	− 2	e 12·8	—
Coimbra N.	26·4	146	9 20	?	12 36	?	14·4	—
Moncalieri	27·3	117	—	—	e 10 37	− 9	14·2	—
Vienna	28·3	103	e 6 20	+ 9	—	—	—	19·3
Tortosa	28·4	131	6 30	+18	11 2	− 4	14·6	18·2
Barcelona	28·7	128	e 8 50	?	—	—	e 15·0	18·8
San Fernando N.	30·4	145	11 26	?S	(11 26)	−15	—	18·8
Rocca di Papa	32·0	114	i 6 50	+ 3	—	—	20·5	21·8
Algiers	32·9	131	—	—	—	—	e 19·5	20·3
Toronto	35·3	261	—	—	—	—	34·1	—
Helwan	49·9	104	34 50	?L	—	—	(34·8)	—
Victoria	50·0	300	26 41	?L	—	—	(26·7)	29·2

Additional readings: De Bilt gives MN = +12·1m. Coimbra eE = +10m.40s. ?S, LE = +15·1m. Helwan PN = +31m.50s.

May 14d. Readings also at 2h. (near Lick), 5h. (Apia), 6h. (near Lick), 12h. (near La Paz), 13h., 14h., and 16h. (Helwan), 21h. (Manila and near La Paz), 23h. (near Tokyo).

May 15d. Readings at 0h. (San Fernando), 2h. (Zi-ka-wei), 3h. (Pompeii, Zi-ka-wei, Taihoku, Padova, Rocca di Papa, and Manila), 4h. (Manila and near De Bilt), 5h. (near Zurich), 6h. (near Tokyo), 9h. (La Paz), 11h. (Rocca di Papa), 12h. (De Bilt, Hamburg, Paris, and Vienna), 17h. (Helwan), 18h. (La Paz).

May 16d. 21h. 11m. 15s. Epicentre 7°·5N. 121°·5E. (suggested by De Bilt).

A = −·518, B = +·846, C = +·130; D = +·853, E = +·522:
G = −·068, H = +·111, K = −·991.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	7·2	356	1 57	+ 8	(3 21)	+ 6	3·4	4·1
Batavia	20·0	227	4 41	0	i 8 41	+18	—	13·0
Zi-ka-wei	23·7	0	e 5 0	−25	e 10 6	+28	—	—
Colombo	41·2	271	23 45	?L	—	—	(23·8)	29·8
Helwan	86·5	299	55 45	?L	—	—	(55·8)	—
De Bilt	99·7	325	—	—	e 24 27	−86	52·8	64·0
Uccle	100·6	324	—	—	—	—	e 50·8	—
Paris	102·6	323	—	—	—	—	e 60·8	—
La Paz	167·0	135	20 9	[− 4]	—	—	—	—

Additional readings: Manila gives MN = +3·8m. Helwan PN = +56m.45s. De Bilt MN = +54·6m. Epicentre 7°·5N. 121°·5E. (as adopted).

May 16d. Readings also at h. (San Fernando), 3h. (Zi-ka-wei and near Taihoku), 4h. (Edinburgh, De Bilt, and near Lick), 5h. (La Paz), 6h. (Helwan), 7h. (La Paz and near Manila), 10h. (Taihoku), 15h. (Apia).

May 17d. Readings at 1h. (San Fernando, Sydney, and near Lick), 6h. (Manila), 20h. (Harvard and near Athens), 21h. (near Athens), 22h. (Florence and near Athens), 23h. (Lick).

May 18d. Readings at 1h. (San Fernando, Florence, and Rocca di Papa), 3h. (Ootomari, Mizusawa, and La Paz), 7h. (near Zurich), 11h. (near Riverview and Melbourne), 12h. and 13h. (Paris), 16h. (Paris and near Osaka, Kobe, and Tokyo), 18h. (La Paz).

May 19d. 3h. 11m. 0s. Epicentre 3°·0N. 122°·0E. (as on 1913 Jan 11d.).

A = −·318, B = +·141, C = +·052 ; D = +·848, E = +·530 ;
G = −·428, H = +·044, K = −·999.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	11·3	5	2 43	− 6	5 3	+ 1	5·5	6·3
Batavia	17·1	139	i 3 24	−49	6 31	−62	—	9·6
Taihoku	22·9	359	5 15	+10	—	—	9·5	—
Zi-ka-wei	28·9	2	e 5 42	−26	—	—	—	—
Perth	35·1	189	7 40	+23	—	—	18·3	—
Adelaide	41·1	159	i 12 6	?	i 13 48	−34	e 18·0	23·6
Colombo	42·3	278	16 0	?S	(16 0)	+81	29·0	35·0
Sydney	46·4	146	8 42	+ 2	—	—	20·5	22·1
Riverview	46·4	146	e 13 18	?	e 16 31	+63	e 20·2	25·2
Melbourne	46·4	152	13 42	?	16 54	+86	19·3	26·0
Simla	50·1	309	—	—	—	—	28·8	—
Honolulu	79·4	69	e 22 30	?S	(22 30)	+12	43·0	47·0
Helwan	89·4	300	23 0	?S	(23 0)	−63	—	—
Zante	93·4	310	9 0	?	—	—	—	—
Hamburg	100·3	336	—	—	—	—	e 54·0	—
De Bilt	103·4	325	—	—	—	—	e 55·0	71·8
Ocole	104·4	324	—	—	—	—	e 52·0	—
Edinburgh	106·1	332	—	—	—	—	56·0	—
La Paz	163·4	144	19 25	[−45]	28 25	?	41·7	45·0

Additional readings: Manila gives e = +2m.36s., MN = +6·6m. Riverview and Melbourne seem to record a different clock not registered elsewhere. Helwan PN = +22m.0s. De Bilt MN = +8·6m. Epicentre 0°·2S. 124°·5E.

May 19d. 3h. 11m. 16s. Epicentre 34°·0N. 21°·0E.

A = +·714, B = +·087, C = +·559 ; D = +·358, E = −·934 ;
G = +·602, H = +·200, K = −·829.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	4·4	59	1 19	+ 9	—	—	1·9	2·5
Pompeii R.	8·4	335	e 2 11	+ 2	(3 1)	−49	—	3·8
Rocca di Papa	10·1	332	2 12	−18	4 38	+ 6	—	5·0
Padova	13·4	311	5 30	?S	(5 30)	−23	(7·9)	—
Vienna	14·7	316	e 3 55	+20	i 6 36	+11	i 7·2	7·8
Moncalieri	15·9	311	—	—	e 6 51	+19	—	—
Batavia	90·4	93	—	—	—	—	e 42·7	44·4

Athens gives MN = +2·0m.

May 19d. 12h. 41m. 33s. Epicentre 6°·5S. 126°·0E.

A = −·584, B = +·804, C = −·113; D = +·809, E = +·588; G = +·067, H = −·092, K = −·994.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	19·0	270	4 23	− 6	i 8 21	+19	—	13·4
Manila	21·7	346	e 4 58	− 3	8 53	− 6	10·5	—
Perth	27·2	199	13 47	?L	—	—	(13·7)	26·6
Adelaide	30·8	159	—	—	—	—	e 20·4	—
Taihoku	31·8	354	—	—	11 34	−31	—	—
Melbourne	35·7	153	—	—	—	—	e 24·9	28·5
Riverview	35·9	143	—	—	19 11	?	24·9	27·5
Zi-ka-wei.	37·9	355	e 7 41	+ 4	—	—	—	—
Colombo	47·9	285	23 15	?L	—	—	26·1	31·9
Kodaikanal	51·2	289	28 27	?L	—	—	(28·4)	—
Mauritius E.	67·2	250	30 3	?L	—	—	(30·0)	33·9
Helwan	97·3	299	25 27	?S	(25 27)	− 2	—	—
Victoria	108·5	40	—	—	—	—	52·3	56·7
Hamburg	110·4	325	—	—	—	—	e 57·8	70·4
Rocca di Papa	111·6	313	—	—	e 28 39	+57	39·5	50·7
De Bilt	113·7	325	—	—	—	—	e 57·5	62·7
Moncalieri	114·4	318	—	—	e 34 5	?SR_1	62·7	—
Uccle	114·6	324	—	—	—	—	e 55·5	—
Edinburgh	116·5	331	—	—	—	—	64·5	—
Paris	116·5	322	—	—	e 29 27	+65	67·5	—
Eskdalemuir	116·8	331	—	—	—	—	56·5	—
Kew	117·0	327	—	—	—	—	—	56·5
Rio Tinto	127·0	314	79 27	?L	—	—	(79·5)	87·5
Toronto	136·7	27	—	—	—	—	57·9	—
La Paz	153·1	149	21 6	[+66]	i 26 31	?	—	—

Additional readings and notes: Batavia gives i = +5m.16s. and +7m.27s. Adelaide i = +22m.9s. Riverview ePR_1 = +15m.48s., MN = +25·3m. Probably the readings of Riverview belong to a different shock, but there is no other evidence of it. Helwan PN = +24m.27s. Mauritius PN = +27m.39s., MN = +36·4m. De Bilt MN = +62·9m. Epicentre 2°·0S. 120°·0E. Toronto L = +71·0m.

May 19d. Readings also at 0h. (Lick), 1h. (San Fernando and near Athens), 3h. (near Athens), 4h. (near Algiers), 5h. (Rocca di Papa), 7h. (Besançon), 8h. (La Paz), 9h. (Helwan), 19h. (Berkeley), 21h. (La Paz).

May 20d. 4h. 36m. 35s. Epicentre 65°·0S. 39°·0W.

A = +·328, B = −·266, C = −·906; D = −·629, E = −·777; G = −·704, H = +·570, K = −·423.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Cape Town	46·1	77	23 9	?L	—	—	(23·2)	—
La Paz	52·3	324	9 22	0	16 48	0	25·5	27·4
Helwan	107·6	60	26 25	?S	(26 25)	−41	—	—
Tortosa	108·6	31	—	—	—	—	e 54·4	60·0
Strasbourg	117·7	36	—	—	—	—	58·4	—
Paris	118·5	30	—	—	e 29 25	+47	58·4	—
Kew	118·7	26	—	—	—	—	—	118·4
Uccle	119·0	30	—	—	—	—	e 56·4	—
De Bilt	120·4	30	—	—	e 29 25	+33	e 59·4	60·8

Additional readings: Helwan gives PN = +25m.25s. Strasbourg gives another reading at +62·4m. De Bilt e = +35m.31s., MN = +60·9m.

1920. May 20d. 7h. 25m. 55s. Epicentre 11°·7S. 166°·3E.

A = −·952, B = +·232, C = −·203; D = +·237, E = +·972; G = +·197, H = −·048, K = −·979.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		21·5	98	i 4 48	−11	i 8 42	−13	10·1	—
Riverview		26·1	209	i 5 35	−14	i 9 58	−26	e 11·3	12·9
Sydney		26·1	209	5 23	−26	9 53	−31	12·6	15·6
Melbourne		32·3	211	6 53	+ 2	12 11	− 2	15·1	18·0
Christchurch		32·3	170	8 5	?PR$_1$	11 35	−38	14·3	18·1
Adelaide		34·2	223	i 6 47	−20	i 11 59	−44	e 14·4	19·4
Honolulu		48·2	47	9 17	+22	i 16 5	+ 9	23·6	35·9
Perth		50·5	238	9 10	0	11 15	?PR$_1$	18·3	—
Manila		52·1	300	e 9 16	− 5	—	—	—	—
Tokyo		53·6	332	e 9 27	− 3	—	—	—	41·6
Osaka		54·9	329	9 39	+ 1	17 24	+ 4	24·7	30·1
Taihoku		57·0	310	9 51	− 1	—	—	—	—
Batavia		58·9	270	i 10 5	+ 1	18 7	− 3	e 28·8	—
Zi-ka-wei		60·8	318	e 10 18	0	e 18 36	+ 3	—	—
Calcutta		83·6	295	12 35	− 5	—	—	—	—
Victoria		86·2	39	13 14	+20	23 9	−23	36·0	47·0
Colombo		88·0	278	17 35?	?PR$_1$	(24 29)	+37	24·5	24·9
Tucson	E.	90·3	56	23 55	?S	(23 55)	−22	41·0	43·1
Kodaikanal		91·0	280	49 11	?L	—	—	61·5	64·1
Mauritius	E.	102·8	244	26 47	?S	(26 47)	+25	52·1	55·9
	N.	102·8	244	26 11	?S	(26 11)	−11	50·6	130·0
Chicago		109·7	50	19 7	?PR$_1$	28 35	+70	52·1	—
Ann Arbor	E.	112·6	49	—	—	—	—	54·9	—
Toronto		115·6	46	e 5 5	?	30 29	+134	36·4	74·1
Ithaca		117·8	47	—	—	—	—	56·2	—
Georgetown		117·9	51	—	—	—	—	56·1	—
Washington		117·9	51	—	—	—	—	e 50·1	—
Cheltenham		118·1	51	—	—	—	—	56·2	—
La Paz		119·2	117	e 19 18	[+28]	30 26	+103	50·2	58·1
Harvard	E.	121·7	47	e 20 49	?PR$_1$	e 33 39	?	56·7	—
	N.	121·7	47	e 20 2	?PR$_1$	—	—	e 50·8	—
Lemberg		130·9	329	e 19 23	[+ 2]	e 22 47	?PR$_1$	—	22·9
Hamburg		134·1	341	i 19 19	[− 9]	—	—	e 63·1	78·1
Helwan		134·5	301	22 5	?PR$_1$	—	—	—	—
Edinburgh		135·0	352	19 5	[−25]	—	—	—	—
Eskdalemuir		135·6	352	i 22 1	?PR$_1$	—	—	53·1	—
Vienna		135·7	333	i 19 26	[− 5]	—	—	e 56·1	84·7
De Bilt		136·8	343	19 47	[+14]	—	—	66·1	87·6
Stonyhurst		137·0	350	23 23	?PR$_1$	—	—	36·0	—
Uccle		138·2	343	19 17	[−19]	—	—	—	83·3
Oxford		138·7	349	20 5	[+28]	—	—	62·5	114·4
Kew		138·8	349	—	—	—	—	—	89·1
Strasbourg		139·0	338	e 19 25	[−13]	—	—	e 74·1	80·6
Padova		139·9	332	20 45	[+66]	—	—	—	—
Paris		140·5	345	i 19 28	[−12]	—	—	77·1	90·1
Florence		141·4	331	20 5	[+23]	—	—	—	—
Pompeii	E.	141·8	325	19 25	[−18]	29 25	?	—	—
Moncalieri		142·0	337	19 32	[−11]	33 37	?	47·8	89·6
Rocca di Papa		142·1	329	19 30	[−13]	—	—	e 79·7	87·7
Barcelona		147·2	338	19 36	[−15]	—	—	56·0	91·5
Tortosa		148·3	340	19 49	[− 4]	—	—	e 48·1	95·9
Algiers		150·7	332	19 55	[− 2]	29 30	?	43·1	110·1
Coimbra		151·1	352	19 25	[−32]	—	—	58·1	90·4
Granada		153·0	342	19 23	[−37]	25 18	?PR$_1$	—	—
Rio Tinto		153·2	347	40 5	?SR$_1$	—	—	—	97·1
San Fernando		154·4	346	19 47	[−14]	—	—	88·1	117·1

Additional readings: Apia gives also i = +5m.4s. Riverview iP = +5m.59s., PS = +10m.32s., and +10m.48s., MZ = +12·6m., T_0 = 7h.25m.51s. Epicentre 13°·5S. 167°·0E. Melbourne SR_1 = +13m.47s. Adelaide i = +8m.5s., +12m.23s., +12m.53s., and +13m.35s. Osaka MN = +34·6m. Batavia i = +13m.47s. Calcutta PN = +12m.41s. (O−C. = +1s.). Toronto gives also L = +61·8m., eL = +72·0m., L rep. = +130·5, +132·3. Ann Arbor LN = +54·7m. and +55·4m. Georgetown LN = +60·1m. Washington L = +55·1m. La Paz iP = +19m.25s., MN = +59·2m., T_0 = 7h.32m.0s. Helwan PN = +21m.5s. Harvard eN? = +4m.50s., eN = +6m.40s., eE = +37m.45s., eN = +37m.59s., LN = +53·1m. and +55·4m., LE = +61·5m., L(repetition) = +112·4m. Hamburg i = +21m.56s. (?PR_1), MN = +66·1m., MZ = +79·1m. Vienna i = +22m.7s., +23m.5s. De Bilt iPR_1 = +22m.17s., MN = +76·2m., T_0 = 7h.25m.51s. Uccle e_1 = +22m.17s., e_2 = +40m.53s. Strasbourg PR_1 = +22m.28s., MN = +84·8m. Paris PR_1 = +22m.35s. Coimbra P = +21m.40s., PR_1E? = +27m.5s., eLN = +45·8m. San Fernando MN = +114·6m.

May 20d. Readings also at 0h. (Batavia), 2h. (Helwan), 4h. (La Paz), 6h. (Eskdalemuir), 9h. (Mauritius), 14h. (La Paz), 17h. (San Fernando).

May 21d. 19h. 19m. 15s. Epicentre 34°·0N. 131°·0E. (as on 1919 July 2d.).

A = −·544, B = +·626, C = +·559.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagasaki	1·6	216	0 24	0	(0 40)	− 5	0·7	0·8
Kobe	3·5	83	—	—	1 32	− 5	—	3·2
Osaka	3·8	83	1 5	+ 6	(1 43)	− 1	1·7	3·7
Zi-ka-wei	8·5	254	—	—	—	—	e 4·3	—

No additional readings.

May 21d. Readings also at 0h. (San Fernando), 5h. (La Paz), 8h. (Zi-ka-wei, Calcutta, Manila, and Colombo), 9h. (Uccle and Helwan), 10h. (near Athens), 13h. and 14h. (Point Loma), 16h. (near Tokyo and Mizusawa), 17h. (Toronto), 21h. (San Fernando and Lick).

May 22d. 17h. 4m. 4s. Epicentre 35°·0N. 139°·5E. (as on 1918 June 26d.).

A = −·623, B = +·532, C = +·574; D = +·649, E = +·760;
G = −·436, H = +·372, K = −·819.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	0·7	16	e 0 7	− 4	—	—	e 0·3	0·3
Osaka	3·4	266	1 9	+16	—	—	—	2·6
Mizusawa	4·3	17	1 7	0	—	—	4·9	—
Zi-ka-wei	15·6	261	e 3 47	0	e 7 11	+25	—	—
Manila	26·4	224	e 5 32	−20	—	—	—	—
Honolulu	55·8	87	—	—	—	—	23·9	32·9
Adelaide	70·0	181	—	—	—	—	—	11·9

Additional readings and notes: Tokyo gives MN = +0·4m. Zi-ka-wei P has been corrected by +2m. Manila has been corrected by +7m.

May 22d. 17h. 8m. 50s. Epicentre 23°·0S. 142°·0E.

A = −·725, B = +·567, C = −·391; D = +·616, E = +·788;
D = +·308, E = −·240, G = −·920.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	13·5	145	3 20	0	i 5 57	+1	e 6·7	9·3
Sydney	13·5	145	3 10	−10	(6 4)	+8	6·1	7·7
Melbourne	15·0	171	—	—	—	—	i 7·7	8·2
Victoria, B.C.	110·0	44	—	—	—	—	33·5	40·0
Helwan	118·5	293	60 10	?L	—	—	(60·2)	—
Hamburg	132·8	323	—	—	—	—	e 51·2	—
Chicago	134·9	53	—	—	—	—	e 50·7	—
De Bilt	136·1	321	—	—	—	—	e 44·2	56·9
Uccle	137·1	320	—	—	—	—	e 45·2	—
Paris	139·0	320	—	—	—	—	e 55·2	—
Coimbra	149·7	310	—	—	—	—	e 58·2	—

Additional readings: Riverview gives iS = +6m.30s. Sydney correction of 7min. for P only. Helwan PN = +57m.10s. De Bilt MN = +58·8m. Coimbra e? = 16h. 48m. 30s.

May 22d. Readings also at 3h. (Vienna), 5h. (Taihoku and Manila), 13h. (near Tokyo), 17h. (Toronto, La Paz, and Riverview), 18h. (near Tokyo, Osaka, Kobe, Batavia, Rocca di Papa, and Rio Tinto).

May 23d. 20h, 13m. 6s. Epicentre 3°·0S. 149°·0E. (as on 1913 June 4d.).

A = −·856, B = +·514, C = −·052; D = +·515, E = +·857; G = +·045, H = −·027, K = −·999.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	30·9	176	e 6 38	+ 1	e 11 51	+1	e 15·3	16·4
Manila	32·8	303	e 8 54	?	—	—	—	—
Taihoku	38·7	318	—	—	13 44	−4	—	—
Batavia	42·2	264	e 7 54	−18	—	—	—	—
Helwan	115·3	302	33 54	?	—	—	—	—

Riverview gives also MN = +17·8m.

May 23d. Readings also at 4h. (near Pompeii), 6h. (Taihoku), 16h. (Stonyhurst), 17h. (La Paz, Melbourne, and Riverview), 20h. (San Fernando).

May 24d. Readings at 2h. (near Tokyo), 6h. (Manila), 9h. (near Tokyo), 11h. (Manila and near Athens), 12h. (Manila and La Paz), 14h. (near Athens), 17h. (Taihoku), 18h. (Dyce), 22h. (San Fernando).

May 25d. 11h. 39m. 55s. Epicentre 33°·5N. 46°·5E. (as on 1917 Nov. 24d.).

A = +·574, B = +·605, C = +·552; D = +·725, E = −·688; G = +·380, H = +·401, K = −·834.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	E.	13·4	259	5 53	?S	(5 53)	0	(8·1)	9·7
	N.	13·4	259	6 29	?S	(6 29)	+36	(8·5)	9·1
Pompeii	E.	26·3	295	5 45	− 6	—	—	—	—
Vienna		26·9	312	i 6 3	+ 6	10 44	+ 5	e 15·8	21·3
Rocca di Papa		27·8	297	e 6 5	− 1	—	—	—	18·0
Moncalieri		31·8	304	—	—	e 11 52	−13	18·1	—
Strasbourg		32·4	309	—	—	e 12 26	+12	—	—
Hamburg		32·7	319	—	—	e 12 5	−14	23·1	—
Uccle		35·1	313	—	—	e 12 47	−10	—	—
Paris		35·9	309	—	—	(e 13 5)	− 4	e 13·1	22·1
Eskdalemuir		40·5	318	—	—	—	—	22·1	—

No additional readings.

May 25d. Readings also at 2h. (Lick), 4h. (near Tokyo), 10h. (Manila), 12h. (Strasbourg), 13h. (Manila and Batavia), 14h. and 15h. (Manila), 22h. (La Paz).

1920. May 26d. 12h. 21m. 40s. Epicentre **18°·0S. 173°·0W.**

(as on 1918 Feb. 3d.).

A = −·944, B = −·116, C = −·309; D = −·122, E = +·993; G = +·307, H = +·038, K = −·951.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	4·3	17	i 0 57	−10	1 17	−41	1·6	—
Riverview	35·7	236	e 7 23	+ 4	e 13 13	+ 7	e 15·8	19·5
Sydney	35·7	236	12 56	?S	(12 56)	−10	17·1	19·3
Melbourne	41·6	233	—	—	—	—	20·1	24·8
Honolulu	42·0	21	e 15 8	?S	(e 15 8)	+33	19·8	25·9
Adelaide	46·0	239	i 8 50	+10	i 15 44	+16	e 22·8	29·2
Manila	72·8	292	e 11 49	+14	—	—	—	—
Berkeley	73·4	40	—	—	—	—	e 9·4	—
Batavia	78·8	274	i 13 28	+76	i 22 27	+17	—	—
Victoria	79·8	31	—	—	23 5	+44	35·4	40·3
Zi-ka-wei	79·9	308	e 12 23	+ 5	—	—	—	—
La Paz	98·4	111	14 10	+ 8	25 38	− 2	47·7	49·7
Chicago	98·6	49	24 20	?S	31 36	?SR$_1$	50·6	—
Toronto	104·8	48	29 38	?	e 41 32	?	e 55·9	59·9
Washington	105·7	54	—	—	—	—	e 54·8	—
Ithaca	106·7	50	—	—	—	—	55·0	—
Ottawa	107·7	47	—	—	e 49 20	?	58·3	—

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Harvard	110·6	51	—	—	28 41	+68	57·4	58·5
Eskdalemuir	141·8	9	19 44	[+ 1]	—	—	—	—
Hamburg	144·3	357	e 20 20	[+33]	—	—	e 70·3	85·3
Oxford	145·6	10	19 51	[+ 2]	—	—	—	89·3
De Bilt	145·9	2	19 49	[− 1]	—	—	—	90·0
Kew	146·0	8	—	—	—	—	—	83·3
Uccle	147·1	4	i 19 53	[+ 2]	—	—	—	86·3
Vienna	148·8	349	i 19 57	[+ 3]	—	—	—	—
Paris	149·0	6	i 20 0	[+ 6]	—	—	82·3	88·3
Strasbourg	149·4	358	19 57	[+ 2]	—	—	78·3	—
Moncalieri	153·1	359	20 8	[+ 8]	35 29	?	83·3	—
Coimbra	154·3	28	20 10	[+ 9]	32 13	?	e 78·3	—
Helwan	154·7	303	24 20	?PR_1	—	—	—	—
Rio Tinto	156·9	28	80 20	?L	—	—	(80·3)	93·3
San Fernando	158·0	29	22 50	?	—	—	—	95·3
Algiers	160·9	9	e 20 28	[+19]	—	—	87·3	—

Additional readings: Riverview gives also $PR_1 = +8$m.56s., PS = +13m.43s., MN = +20·6m., MZ = +20·3m., T_o = 12h.21m.5s. Honolulu S = +17m.8s. Harvard $SR_1E = +34$m.35s., LE = +68·3m., T_o = 12h.28m.9s. Eskdalemuir $PR_1? = +23$m.23s. De Bilt MN = +86·6m. Vienna PE = +20m.1s., i = +20m.4s. Helwan PN = 26m.20s. San Fernando MN = +94·8m.

May 26d. Readings also at 0h. (San Fernando and La Paz), 2h. (near Athens), 19h. (La Paz), 20h. (Stonyhurst), 21h. (La Paz), 22h. (Helwan and Batavia), 23h. (Zi-ka-wei).

May 27d. 5h. 49m. 30s. Epicentre 19°·0N. 109°·0E.

A = −·308, B = +·894, C = +·326; D = +·946, E = +·326; G = −·106, H = +·308, K = −·946.

This solution is about the best that can be done with the observations as they stand: but there are probably some errors. If Manila S is 1 min. too small and Zi-ka-wei both P and S one min. too large, then T_o may be about 5h.47m.30s., and the epicentre 10°N. 100°E. would suit all but the European observations. Or reducing T_o 18 seconds only we get the alternative solution with deep focus, given below.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto	10·8	63	5 54	?L	—	—	(5·9)	—
Manila	12·3	109	e 3 2	− 1	5 24	− 2	6·2	6·7
Taihoku	13·1	60	6 18	?S	(6 18)	+32	8·9	—
Zi-ka-wei	16·5	40	5 14	+75	e 10 23	+196	—	—
Calcutta	19·6	284	5 12	+36	—	—	10·2	—
Kobe	27·9	51	6 11	+ 4	—	—	e 12·2	—
Nagoya	29·1	51	6 11	− 8	—	—	—	—
Colombo	30·8	250	6 48	+12	—	—	—	9·0
Kodaikanal	31·7	260	13 48	?L	—	—	(13·8)	—
Tokyo	31·8	52	e 7 34	+49	e 11 3	−62	12·8	14·8
Mizusawa	34·2	48	7 2	− 5	13 40	+57	—	—
Adelaide	60·9	152	i 10 0	−18	—	—	—	22·3
Melbourne	66·1	149	(11 36)	+44	—	—	11·6	11·8
Riverview	66·5	142	—	—	(e 21 6)	+82	e 21·1	27·6
Helwan	70·3	295	—	—	20 30	0	—	—
Hamburg	80·0	324	i 16 2	?PR_1	e 24 14	+111	50·5	—
Pompeii E.	81·0	310	14 18	?PR_1	—	—	—	—
Rocca di Papa	82·0	312	e 16 0	?PR_1	—	—	—	33·8
Strasbourg V.	83·0	320	e 16 11	?PR_1	—	—	—	—
De Bilt	83·2	323	e 16 24	?PR_1	—	—	—	65·4
Uccle	84·2	322	e 16 18	?PR_1	25 48	?	—	—
Eskdalemuir	86·3	329	16 57	?PR_1	23 35	+ 2	29·4	—
Oxford	87·0	324	16 50	?PR_1	—	—	—	—
Victoria	98·0	31	—	—	—	—	—	31·7
Chicago	117·3	14	20 0	?PR_1	30 7	+99	—	—
La Paz	176·3	314	17 33	?	—	—	39·7	42·4

Additional readings and notes: Manila gives MN = +6·4m. Zi-ka-wei P has been corrected by +10m. Mizusawa SN = +13m.38s. Adelaide e = +5m.6s., and +6m.36s., i = +13m.30s., +15m.12s., +19m.36s., and +21m.24s. Riverview MN = +21·7m. Helwan PN = +21m.30s. De Bilt MN = +59·1m.

ALTERNATIVE SOLUTION WITH DEEP FOCUS.

May 27d. 5h. 49m. 12s. Epicentre 5°·0N. 110°·0E. (as on 1920 Feb. 26d.).

$A = -·341$, $B = +·936$, $C = +·087$; $D = +·940$, $E = +·342$; $G = -·030$, $H = +·082$, $K = -·996$.

The focal depth 0·050 is retained as on Feb. 26d.

	Corr. for Focus	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	−1·3	14·4	48	e 3 20	+ 6	5 42	− 4	6·5	7·0
Hokoto	−2·1	20·7	26	6 12	+108	(6 12)	−101	—	—
Taihoku	−2·3	22·9	28	6 36	+108	(9 12)	+36	9·2	—
Calcutta	−2·9	27·3	312	5 30	− 2	—	—	10·5	—
Zi-ka-wei	−3·0	28·3	21	5 32	− 9	e 10 41	+32	—	—
Colombo	−3·2	30·1	275	7 6	? PR_1	—	—	—	9·3
Kodaikanal	−3·4	32·7	280	14 6	? L	—	—	(14·1)	—
Kobe	−3·8	37·7	36	6 29	−35	—	—	e 12·5	—
Nagoya	−3·9	39·1	36	6 29	−46	—	—	—	—
Tokyo	−4·1	41·1	38	e 7 52	+22	e 11 21	−123	13·2	15·1
Mizusawa	−4·3	44·2	36	7 20	−34	13 58	− 7	—	—
Melbourne	−5·1	53·7	145	(11 54)	? PR_1	—	—	11·9	12·1
Riverview	−5·2	54·9	139	—	—	—	—	e 21·4	27·9
Helwan	−6·1	77·0	300	—	—	20 48	+11	—	—
Pompeii E.	−6·5	90·8	312	14 36	+112	—	—	—	—
Hamburg	−6·5	91·9	325	i 16 20	? PR_1	e 24 32	+69	50·8	—
Rocca di Papa	−6·5	92·1	313	e 16 18	? PR_1	—	—	—	34·1
Strasbourg V.	−6·6	94·3	320	e 16 29	? PR_1	—	—	—	—
De Bilt	−6·6	95·1	324	e 16 42	? PR_1	—	—	—	65·7
Uccle	−6·6	95·9	322	e 16 36	? PR_1	26 6	? SR_1	—	—
Eskdalemuir	−6·7	98·7	329	17 15	? PR_1	23 53	−42	29·7	—
Oxford	−6·7	99·0	324	17 8	? PR_1	—	—	—	—
Victoria	—	109·3	34	—	—	—	—	—	32·0
Chicago	—	130·6	17	20 18	? PR_1	30 25	?	—	—
La Paz	—	168·4	189	i 17 51	[−143]	—	—	40·0	42·7

May 27d. Readings also at 0h. (San Fernando), 3h. (Stonyhurst), 5h. (near Batavia), 6h. (Riverview), 14h. (La Paz), 15h. (Helwan), 16h. (Stonyhurst), 19h. (Moncalieri), 21h. (near Athens), 22h. (near Kobe).

May 28d. 18h. 25m. 0s. Epicentre 36°·1N. 137°·3E. (as on 1919 Sept. 12d.).

$A = -·594$, $B = +·548$, $C = +·589$.

	Δ	P.	O−C.	L.	ME.	MN.
	°	m. s.	s.	m.	m.	m.
Tokyo	2·0	0 31	0	0·9	1·0	1·0
Osaka	2·1	0 33	0	1·0	—	1·7
Kobe	2·3	0 40	+4	1·1	1·1	1·2

No additional readings.

May 28d. Readings also at 0h. (Helwan and San Fernando), 20h. (Helwan), 21h. (near Athens).

May 29d. 12h. 23m. 0s. Epicentre 25°·0N. 119°·5E. (as on 1918 Dec. 18d.).

$A = -·446$, $B = +·789$, $C = +·423$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto	1·5	179	—	—	1 1	+19	1·4	1·5
Taihoku	1·9	89	0 25	− 4	(0 42)	−11	0·7	0·9
Zi-ka-wei	6·4	15	1 39	+ 1	e 2 53	− 2	—	3·8
Manila	10·5	172	2 45	+ 8	—	—	—	—
Hamburg	80·8	325	—	—	—	—	e 44·0	—
De Bilt	84·1	326	—	—	e 22 46	−23	e 47·0	47·6

Zi-ka-wei gives MN = +4·0m., T_0 = 12h.23m.8s. De Bilt MN = +47·8m.

May 29d. 19h. 12m. 30s. Epicentre 43°·0N. 15°·0E.

A = +·706, B = +·189, C = +·682 ; D = +·259, E = −·966 ; G = +·659, H = +·176, K = −·731.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		2·1	233	e 0 44	+11	1 40	+42	—	1·9
Pompeii		2·3	189	0 46	+10	1 21	+18	—	2·2
Florence		2·8	286	1 5	+21	(1 5)	−12	—	2·0
Padova		3·3	317	1 53	+61	2 51	+80	—	—
Vienna		5·3	10	i 1 7	−15	—	—	i 2·0	2·6
Moncalieri		5·6	293	1 29	+ 2	2 51	?L	(2·8)	—
Zurich	E.	6·3	316	1 33	− 3	i 2 48	− 4	i 3·4	3·7
	N.	6·3	316	1 32	− 4	i 2 49	− 3	i 3·4	3·7
Strasbourg		7·5	320	e 1 56	+ 2	—	—	e 4·0	—
Paris		10·4	308	—	—	e 5 53	+73	6·7	7·5
Uccle		10·6	321	e 5 6	?S	(e 5 6)	+21	i 5·7	—
Hamburg		11·0	344	—	—	e 4 54	0	—	7·3
De Bilt		11·2	327	—	—	—	—	e 5·6	6·1
Edinburgh		17·4	324	—	—	—	—	9·5	—
Manila		91·3	69	e 54 30	?L	—	—	(e 54·5)	—

Additional readings :—Padova : Are the readings 1 min. too large ? See May 30. Vienna gives also iZ = +1m.22s., iN = +1m.26s., iE = +1m.32s. Hamburg MZ = +6·9m. De Bilt MN = +6·3m. Manila probably records an independent shock.

May 29d. Readings also at 0h. (Helwan and San Fernando), 2h. and 5h. (La Paz), 6h. (Riverview and Osaka), 8h. (Vienna), 12h. (Vienna, Rocca di Papa, and near Mizusawa), 16h. (near La Paz and near Mizusawa), 17h. (Taihoku, Manila, and De Bilt), 21h. (Vieques), 22h. (Port au Prince), 23h. (near Barcelona (2)).

May 30d. 10h. 11m. 10s. Epicentre 43°·0N. 15°·0E. (as on 1920 May 29d.).

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		2·1	233	e 0 36	+ 3	1 26	+28	—	1·7
Pompeii	E.	2·3	189	0 48	+12	1 30	+27	—	2·0
Florence		2·8	286	0 45	+ 1	—	—	—	1·8
Padova		3·3	317	1 50	+58	2 47	+76	—	—
Vienna		5·3	10	i 1 25	+ 3	—	—	i 1·9	2·6
Moncalieri		5·6	293	1 27	0	2 42	+ 8	—	—
Zurich		6·2	316	e 1 31	− 4	i 2 50	+ 1	e 3·3	3·6
Strasbourg		7·5	320	e 1 44	−10	—	—	e 3·9	—
Paris		10·4	308	—	—	e 4 58	+18	6·6	—
Uccle		10·6	321	—	—	—	—	e 5·4	—
De Bilt		11·2	327	—	—	—	—	e 5·5	6·2

Additional readings : Florence gives its reading as 11h. Padova : Are the readings 1 min. too large ? See May 29. Vienna iPZ = +1m.0s. The P entered is given as i. Zurich ePV = +1m.32s. De Bilt MN = +6·0m.

May 30d. 20h. 51m. 20s. Epicentre 32°·0N. 110°·1W. (as on 1918 Feb. 12d.).

A = −·291, B = −·794, C = +·533 ; D = −·939, E = +·344 ; G = −·183, H = −·500, K = −·846.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	N.	0·6	275	0 6	− 3	—	—	0·6	1·2
	E.	0·6	275	0 20	?S	(0 20)	+ 3	0·6	1·1
Mazatlan		9·6	159	—	—	—	—	—	−1·2
Lick		10·8	302	—	—	—	—	e 4·6	—
Berkeley		11·5	302	—	—	—	—	e 5·0	—
Victoria		19·0	332	7 33	?S	(7 33)	−29	11·5	13·5
Chicago		20·3	56	6 54	?	9 50	+81	10·7	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor		23·2	57	—	—	—	—	12·0	—
Toronto		26·6	56	—	—	—	—	13·0	—
Georgetown		27·5	66	—	—	e 12 59	?L	e 15·0	—
Washington		27·5	66	—	—	—	—	e 13·1	—
Cheltenham		27·7	67	13 28	?L	—	—	15·8	15·0
Ithaca		28·4	59	—	—	—	—	e 15·1	—
Ottawa		29·5	53	—	—	e 13 40	?	e 15·0	16·5
Harvard	N.	32·3	60	e 5 40	−71	—	—	e 15·1	16·0
De Bilt		78·6	34	—	—	—	—	e 38·7	46·8
Paris		79·2	38	—	—	e 37 40	?L	40·7	—

Additional readings: Toronto gives L = +26·8m. Cheltenham PE = +13m.56s. The L and M given are from the E and N component instruments respectively. Ithaca eN = +12m.53s. Harvard ePR$_1$E? = +7m.1s., eE = +10m.44s., and +11m.34s., eLE = +16·1m.

May 30d. Readings also at 2h. (Manila), 3h. (San Fernando), 6h. (near Mizusawa and Tokyo), 12h. (La Paz), 13h. (Helwan), 14h. (San Fernando), 16h. (De Bilt, Paris, Helwan, Rocca di Papa, and La Paz), 21h. (Tucson).

May 31d. Readings at 6h. (near Pompeii and Rocca di Papa (2)), 7h. (Algiers, Adelaide, and Manila), 9h. (near Adelaide).

June 1d. Readings at 1h. and 7h. (near Manila), 15h. (Lick), 18h. (near La Paz), 22h. (Vienna), 23h. (Lick).

1920. June 2d. 22h. 1m. 40s. Epicentre 21°·0N. 106°·5W.

(as on 1919 Sept. 15d.).

A = −·265, B = −·895, C = +·358 : D = −·959, E = +·284 ; G = −·102, H = −·344, K = −·934.

The Georgetown and Harvard readings suggest a second shock about 15min. later.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mazatlan		2·4	2	—	—	—	—	—	2·3
Tacubaya		7·0	102	2 37	+51	5 25	?	5·8	8·7
Tucson	N.	11·9	342	3 25	+27	5 16	− 1	5·8	6·3
	E.	11·9	342	4 51	?S	(4 51)	−26	5·3	5·8
Lick	E.	20·8	324	—	—	(e 8 22)	−18	e 8·4	—
Berkeley	E.	21·7	324	e 5 1	0	(e 9 21)	+22	e 9·3	15·1
Chicago		26·2	33	5 14	−36	9 41	−45	12·0	13·8
Ann Arbor	E.	28·7	37	6 26	+11	11 14	+ 2	14·4	17·0
	N.	28·7	37	6 14	− 1	11 8	− 4	14·1	16·8
Victoria		30·6	338	8 47	?	11 44	0	15·2	18·1
Washington		30·9	48	7 15	+38	14 40	?L	17·1	—
Georgetown	E.	30·9	48	e 17 6	?L	20 56	?	e 21·8	—
Cheltenham	E.	31·0	48	17 16	?L	—	—	(17·3)	29·0
Toronto		31·9	39	−e 0 16	?	—	—	16·1	18·2
Ithaca		33·0	44	—	—	e 11 50	−34	16·6	—
Ottawa		35·1	39	—	—	e 13 8	+11	e 17·8	—
Northfield		36·3	42	—	—	—	—	e 19·1	—
Harvard	E.	36·5	46	e 19 58	?	20 49	?	22·2	23·7
Honolulu		47·8	280	15 38	?S	(15 38)	−13	21·6	26·1
Edinburgh		79·9	34	—	—	—	—	37·3	47·5
Stonyhurst		81·1	35	—	—	38 20	?	42·0	—
Coimbra	E.	82·5	50	e 12 40	+ 7	—	—	e 43·8	—
Kew		83·2	39	—	—	—	—	—	49·3
Rio Tinto		84·7	52	—	—	—	—	45·3	51·3
San Fernando	E.	85·4	53	45 20	?L	—	—	(45·3)	—
	N.	85·4	53	53 20	?L	—	—	(53·3)	57·3
De Bilt	E.	85·9	35	—	—	e 23 55	+26	—	53·6

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Paris	86·0	39	e 13 30	+37	—	—	39·3	—
Uccle	86·1	37	—	—	e 23 55	+24	e 38·3	49·8
Hamburg	87·7	31	—	—	—	—	e 41·3	53·3
Tortosa	88·4	46	—	—	—	—	e 36·3	55·9
Strasbourg	89·1	38	—	—	—	—	e 41·3	53·4
Moncalieri	91·0	40	—	—	e 24 41	+17	44·3	—
Rocca di Papa	95·8	40	—	—	—	—	e 51·0	64·2
Helwan	114·9	40	—	—	—	—	47·3	—

Additional readings: Lick gives eLN = +8·3m. Berkeley gives eLN = +9·5m., ME = +12·2m., MN = +16·0m. Ann Arbor, Wiechert PE = +15m.26s., PN = +14m.44s., SE = +19m.26s., SN = +20m.2s., LN = +22·4m. The B readings for P, S, and L have been diminished by 9min., and these Wiechert readings require correction also. But see note on p. 99. Georgetown gives eLN = +21·9m., LE = +23·0m., LN = +22·7m. Cheltenham gives PN = +17m.17s. Toronto gives eL = +17·6m. Harvard gives eLE = +22·9m., T_0? = 22h.12m.35s. Eskdalemuir △80°·0 Az. 34° gives L = 22h.38m. Coimbra—the readings have been increased by +4min. gives also eN? = +1m.20s., eLN = +33·3m. San Fernando gives PN = +20h.55m.0s. De Bilt gives eSR_1 = +29m.22s., MN = +47·8m. Strasbourg gives MN = +47·0m.

June 2d. 23h. 55m. 24s. Epicentre 23°·0N. 135°·0E.

A = −·651, B = +·651, C = +·391; D = +·707, E = +·707; G = −·276, H = +·276, K = −·920.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagasaki	10·7	336	e 2 43	+ 3	—	—	6·9	—
Taihoku	12·4	282	3 0	− 5	(5 4)	−25	5·1	—
Zi-ka-wei	14·6	307	e 4 44	+70	e 6 4	−18	—	—
Manila	15·7	240	—	—	—	—	e 8·6	—
Hamburg	90·0	331	—	—	—	—	e 46·6	—
De Bilt	93·1	332	—	—	—	—	e 48·6	53·0
Edinburgh	93·5	338	—	—	—	—	49·6	—
Eskdalemuir	94·0	338	—	—	—	—	51·6	—
Uccle	94·4	331	—	—	—	—	e 47·6	52·8
Strasbourg	94·4	329	—	—	—	—	e 49·6	—
Stonyhurst	94·9	336	—	—	—	—	53·1	—
Kew	95·8	335	—	—	—	—	—	56·6
Rocca di Papa	96·1	321	—	—	—	—	e 51·9	62·2
Paris	96·6	330	—	—	—	—	e 52·6	52·6
Moncalieri	96·8	326	—	—	—	—	e 50·8	—
Tortosa	103·5	327	—	—	—	—	e 51·6	56·0

No additional readings.

June 2d. Readings also at 1h. (Osaka and Kobe), 8h. (near Osaka and Kobe), 13h. (La Paz), 18h. (near Tokyo).

June 3d. Readings at 1h. (Lick and near La Paz), 15h. (San Fernando), 16h. (Zi-ka-wei), 18h. (near Tokyo and near Mizusawa), 20h. (near Oaxaca and Tacubaya and near Mizusawa).

June 4d. 4h. 44m. 57s. (I) / 4h. 49m. 7s. (II) } Epicentre 44°·6N. 13°·3E. (as on 1918 Nov. 6d.).

A = +·693, B = +·164, C = +·702; D = +·230, E = −·973; G = +·683, H = +·162, K = −·712.

	Δ	Az.	P.	O−C.	S.	O−C.	M.
	°	°	m. s.	s.	m. s.	s.	m.
I Padova	1·3	308	0 21	+ 1	0 43	+ 7	—
II	1·3	308	0 24	+ 4	0 45	+ 9	—
I Rocca di Papa	2·9	189	0 45	0	—	—	2·8
II	2·9	189	1 21	?S	(1 21)	+ 1	2·3
I Moncalieri	4·0	276	—	—	e 1 39	−11	—
II	4·0	276	—	—	e 1 25	−25	—
II Zurich	4·3	312	e 1 10	+ 3	1 53	− 5	—
I Strasbourg	5·5	318	2 33	?S	(2 33)	+ 1	—
II	5·5	318	e 2 29	?S	(2 29)	− 2	—

No additional readings.

June 4d. 15h. 29m. 15s. (I) } Epicentre 32°·2N. 110°·1W. (as on 1920 May 30d.).
15h. 36m. 40s. (II) }

A = −·291, B = −·794, C = +·533; D = −·939, E = +·344;
G = −·183, H = −·500, K = −·846.

It seems clear that there was more than one shock near Tucson, but the interpretation of the material is very doubtful.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I Tucson	E.	0·6	275	—	—	—	—	0·3	0·6
I	N.	0·6	275	0 10	+ 1	—	—	0·9	1·4
II	E.	0·6	275	—	—	—	—	0·1	0·7
II	N.	0·6	275	—	—	—	—	0·8	1·4
I Berkeley		11·5	302	0 5	?	(4 54)	−13	e 4·9	—
I Victoria		19·0	332	4 55	+26	—	—	9·8	13·8
I Chicago		20·2	55	4 25	−18	7 19	−68	8·3	—
II		20·2	55	5 22	+39	7 45	−42	—	—
I Ann Arbor		23·2	57	—	—	11 9	?SR_1	—	—
II		23·2	57	—	—	10 38	?SR_1	14·0	—
I Toronto		26·6	56	—	—	—	—	2·0	—
II		26·6	56	—	—	—	—	0·6	—
I Washington		27·5	66	—	—	e 9 22	−88	—	—
I Ithaca		28·4	59	—	—	e 11 45	+39	—	—
I Northfield		31·5	57	—	—	13 45	?SR_1	—	—
I Harvard		32·3	60	—	—	—	—	e 16·6	19·6
II		32·3	60	—	—	—	—	—	18·4
I La Paz		63·2	134	13 1	?PR_1	—	—	—	—

Additional readings:—Ann Arbor: The readings entered as S (I) and S (II) are given as PE and SE with the Bosch instrument, which also gives PN = +11m.3s. ?SR_1 for (I) and SN = +10m.26s. ?SR_1 for (II). With the Wiechert instrument we have further PN = +10m.45s. (=SR_1 for I ?) and LN for (II) = +14·0m. Mazatlan (Δ = 9°·6) gives P = 15h.25m.42s., M = 15h.23m.44s., suggesting some error, or another shock.

June 4d. Readings also at 0h. (La Paz), 2h. (La Paz and Riverview), 10h. (Mizusawa and Cheltenham), 12h. (Manila), 13h. (Berkeley), 18h. and 23h. (Batavia).

1920. June 5d. 4h. 21m. 30s. Epicentre 24°·0N. 120°·0E.

(as on 1919 Sept. 8d.).

A = −·457, B = +·792, C = +·407; D = +·866, E = +·500;
G = −·204, H = +·352, K = −·914.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto		0·6	222	0 58	+49	1 7	+50	1·6	2·1
Taihoku		1·8	53	0 30	+ 2	—	—	—	—
Zi-ka-wei		7·3	10	e 1 51	0	e 3 25	+ 7	—	—
Manila		9·5	172	i 2 15	− 8	—	—	i 4·0	4·6
Nagasaki		12·3	42	2 50	−13	(5 23)	− 3	5·4	6·4
Jinsen		14·6	21	3 24	−10	6 9	−13	8·2	—
Kobe		17·0	47	3 53	−12	5 31	?PR_1	7·4	16·5
Osaka		17·2	48	3 37	−30	—	—	7·2	8·7
Nagoya		18·5	49	13 59	?	—	—	—	—
Tokyo		20·7	51	4 26	−23	6 15	?PR_1	7·8	10·4
Mizusawa	E.	23·4	45	4 54	−27	9 0	−33	—	—
	N.	23·4	45	4 55	−26	9 25	− 8	—	—
Sapporo		26·0	37	7 54	+126	12 15	+113	13·2	—
Calcutta	E.	29·1	273	6 18	− 1	11 30	+11	16·9	—
	N.	29·1	273	6 6	−13	11 30	+11	17·0	—
Ootomari		29·1	33	5 55	−24	(10 54)	−25	10·9	14·3
Batavia		32·8	205	i 6 43	−12	14 59	+158	e 21·6	—
Dehra Dun		37·7	289	6 0	−96	—	—	—	—
Simla		38·4	290	7 30	−11	13 36	− 8	22·1	22·9
Colombo		42·1	252	7 36	−36	14 6	−30	17·3	22·0
Kodaikanal		42·8	260	9 48	?PR_1	—	—	25·4	31·1
Bombay		44·1	273	8 34	+ 7	—	—	—	29·8

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Perth		56·1	184	9 40	− 7	15 42	?	22·3	—
Adelaide		61·6	163	i 10 12	−11	i 18 36	− 7	e 24·8	43·6
Riverview		65·0	152	e 10 34	−11	i 19 10	−15	e 26·0	31·6
Sydney		65·0	152	—	—	19 30	+ 5	29·8	38·5
Melbourne		66·1	160	10 6	−46	19 18	−20	30·7	43·5
Honolulu		74·6	75	i 11 54	+ 8	i 21 6	−15	e 37·1	50·1
Lemberg		75·6	320	e 10 44	−69	i 20 29	−64	e 42·3	47·3
Apia		76·6	111	11 42	−17	21 19	−25	36·5	40·5
Helwan	E.	77·2	297	12 24	+22	—	—	—	61·1
	N.	77·2	297	10 48	−74	—	—	—	49·6
Sitka	E.	77·6	33	11 54	−11	21 48	− 8	38·0	—
Athens		80·2	309	e 12 0	−20	22 23	− 2	e 28·5	49·5
Vienna		80·8	320	i 12 23	− 1	i 22 39	+ 6	e 37·9	46·4
Hamburg		81·9	328	i 12 29	− 1	i 22 48	+ 3	e 38·5	46·2
Christchurch		83·1	146	12 30	− 7	22 54	− 4	37·7	43·7
Padova		84·9	320	12 56	+ 9	23 17	− 1	40·1	48·7
De Bilt		85·2	326	12 48	− 1	22 56	−25	e 36·5	49·4
Pompeii	E.	85·4	314	11 48	−62	22 15	−68	34·8	67·5
Dyce		85·6	334	12 50	− 1	23 24	± 2	35·9	—
Strasbourg		85·7	322	i 12 46	− 6	23 10	−17	40·5	49·3
Zurich		85·9	322	e 12 46	− 7	i 23 26	− 3	—	—
Florence		86·1	319	13 10	+16	23 40	+ 9	41·5	48·8
Rocca di Papa	N.	86·1	314	12 52	− 2	23 43	+12	47·3	53·6
Uccle		86·3	327	i 12 50	− 5	23 13	−20	35·5	48·9
Milan		86·5	320	13 28	+32	24 0	+24	44·5	56·5
Edinburgh		86·8	332	12 55	− 3	23 35	− 4	37·5	48·0
Eskdalemuir		87·2	332	12 55	− 5	23 39	− 4	38·1	44·7
Besançon		87·4	322	13 9	+ 8	23 38	− 7	39·5	—
Moncalieri		87·6	319	12 58	− 5	23 36	−12	35·1	50·6
Stonyhurst		87·8	330	12 48	−16	23 18	−32	42·2	51·5
Kew		88·2	329	22 30	?S	(22 30)	−84	—	53·5
Victoria		88·2	37	11 43	−83	22 32	−82	41·7	61·9
	Z.	88·2	37	11 48	−78	22 16	−98	—	—
Paris		88·4	326	i 12 59	− 8	e 23 20	−36	40·5	48·5
Oxford		88·6	329	12 57	−11	23 30	−29	33·7	52·5
Puy de Dôme		90·0	322	17 10	?PR_1	—	—	—	—
Barcelona		93·0	320	e 13 12	−20	23 50	−55	e 41·7	53·4
Tortosa		94·3	320	13 15	−25	24 3	−56	41·1	56·4
Berkeley		95·0	45	e 13 20	−23	e 23 55	−71	e 39·4	—
Algiers		95·1	315	13 44	0	23 56	−71	41·5	55·5
Lick	E.	95·7	45	e 13 25	−22	e 24 0	−73	—	—
	N.	95·7	45	e 13 27	−20	e 24 15	−58	—	—
Granada		99·1	319	e 14 12	+ 6	i 25 15	−32	—	—
Coimbra	E.	99·8	323	13 52	−18	24 32	−82	43·5	56·7
	N.	99·8	323	—	—	24 24	−90	43·0	55·9
San Fernando		101·0	320	17 50	?PR_1	24 54	−71	51·5	60·7
Tucson		105·4	43	17 58	?PR_1	24 57	−109	49·6	54·5
Chicago		109·4	22	16 0	?	23 50	−213	33·3	—
Toronto		110·0	14	14 48	− 9	25 48	−100	i 62·0	63·4
Ann Arbor	E.	110·2	18	17 54	?PR_1	28 18	+48	58·6	60·0
	N.	110·2	18	18 12	?PR_1	28 6	+36	60·1	72·2
Northfield		110·8	9	—	—	e 25 30	−125	e 52·5	—
Ithaca		111·8	13	17 55	?PR_1	—	—	50·8	—
Cape Town		112·2	240	29 58	?S	(29 58)	+110	—	64·5
Harvard	E.	113·1	9	i 19 15	?PR_1	29 0	+65	e 50·6	69·5
	N.	113·1	9	i 19 21	?PR_1	30 15	+140	e 51·2	—
Washington		115·1	12	e 18 30	[− 8]	—	—	e 50·5	—
Georgetown	E.	115·1	12	e 19 18	?PR_1	26 40	−91	56·8	76·8
	N.	115·1	12	e 19 18	?PR_1	26 43	−88	67·0	75·8
Cheltenham	E.	115·3	12	19 47	?PR_1	26 40	−92	56·1	76·9
	N.	115·3	12	19 28	?PR_1	26 40	−92	55·2	78·1
Vieques		137·5	6	21 27	?PR_1	—	—	64·7	78·9
La Paz		169·3	47	i 20 14	[0]	i 31 59	?	70·9	82·2

Additional readings and notes: Manila gives MN = +4·2m. Kobe MN = +10·0m. Osaka MN = +8·3m. Tokyo MN = +12·9m. Sapporo: Readings corrected by −9h. Adelaide i = +12m.18s., e = +14m.18s. and +15m.12s., i = +21m.6s., +22m.6s., and +22m.48s. Riverview iP = +10m.38s., iPR_1 = +13m.18s., i = +19m.18s., PS = +19m.32s., MN = +31·0m., MZ = +36·5m., T_0 = 4h.21m.26s., epicentre 28°·0N. 133°·0E. Sydney SR_1 = +23m.48s., SR_2? = +26m.42s. Melbourne PR_2 = +14m.12s., SR_1 = +23m.36s., SR_2 = +26m.30s. Lemberg e = +37m.34s. Apia readings at +12m.33s. and at +32m.30s. Athens MN = +46·4m., T_0 = 4h.21m.5s. Vienna iPEN = +12m.24s., i = +33m.16s., MN = +49·5m.

Notes continued on next page.

Hamburg $SR_1 = +28m.35s.$, $SR_2 = +32m.49s.$, $MZ = +53 \cdot 0m.$, $T_0 =$ 4h.31m.5s. Padova $PR_1 = +23m.17s.$ De Bilt $PN = +12m.49s.$, E = +2m.22s., iN = +23m.25s., MN = +48·9m., $T_0 = 4h.22m.8s.$ Epicentre 4°·0N. 11°·7E. Dyce LN = +35·8m. Strasbourg MZ = +58·0m., $T_0 = 4h.31m.49s.$ Uccle $PR_1 = +16m.19s.$, $SR_1 = +29m.29s.$, $T_0 =$ 4h.31m.5s. Edinburgh $SR_1 = +29m.30s.$ Eskdalemuir $PR_1 =$ +16m.2s., $T_0 = 4h.22m.34s.$ Moncalieri MN = +54·1m. Stonyhurst P = +16m.30s. (?PR_1). Victoria eL = +70·7m., +101·3m., and +134·6m. $T_0 = 4h.31m.21s.$ Paris $PR_1 = +16m.34s.$, $T_0 = 4h.22m.6s.$ Barcelona E = +17m.16s., iN = +17m.37s., iE = +26m.40s., iN = +26m.52s., $T_0 =$ 4h.22m.3s. Berkeley ePNV = +13m.18s., eLN = +38·0m., eLV = +43·9m. $T_0 = 4h.22m.8s.$ Algiers $PR_1 = +17m.29s.$, L = +47·5m., MN = +48·5m., $T_0 = 4h.23m.0s.$ Lick ePV = +13m.24s., $T_0 = 4h.22m.16s.$ Granada P = +14m.18s., $T_0 = 4h.22m.35s.$ Coimbra PSE = +23m.48s., E = +24m.6s., $T_0 = 4h.22m.47s.$ Chicago L = +46·5m., +60·5m., +65·5m., and +83·3m. Toronto L = +35·9m., and +39·9m., iL = +67·2m. and +74·4m, eL = +86·1m., $T_0 = 4h.23m.12s.$ Ottawa P? = +18m.30s., S? = +2m.30s., L = +46·5m., record fogged. Ann Arbor LEN (Wiechert) = +59·3m. Cape Town S = +33m.16s. Harvard ePE? = +17m.38s., SE,N? = +35m.2s., $T_0 = 4h.21m.26s.$ Washington L = +68·5m. Georgetown eLE = +35·8m. Vieques LE = +77·6m. La Paz $PR_1 =$ +24m.4s, $PR_2 = +26m.56s.$, $SR_1 = +38m.59s.$, $T_0 = 4h.27m.49s.$

June 3d. Readings also at 0h. (Helwan), 1h. (near Mizusawa), 4h. (Taihoku (4)), 5h. (Taihoku (3), Hokoto (2), and Zi-ka-wei (2)), 6h. (La Paz (2), Taihku (7), Mizusawa, Osaka, Manila, and Batavia), 7h. (Taihoku (4)), 8h. (Taihoku (4)), 9h. (Taihoku (2)), 10h. (Taihoku (4) and Mizusawa), 12h. (Taihoku (3) and Kodaikanal), 13h. (Taihoku), 14h. (Taihoku (4)), 15h. (Taihoku (3) and Zi-ka-wei), 16h. (Taihoku (3), Hokoto, and Batavia), 17h. (Taihoku, Paris, Hamburg, Eskdalemuir, Rocca di Papa, Stonyhurst, Edinburgh, De Bilt, Kew, Helwan, Strasbourg, and Uccle), 18h. (Kodaikanal (2) and Taihoku (2)), 19h. (Taihoku (2)), 20h. (Taihku (4), Zi-ka-wei, La Paz, and Nagasaki), 21h. (De Bilt, Paris, Rocca di Papa, Taihoku, Kew, Stonyhurst, Eskdalemuir, Strasbourg, Vienna, San Fernando, Uccle, Hamburg, Helwan, Tortosa, and Edinburgh), 22h. (Hokoto and La Paz), 23h. (La Paz).

June 4d. Readings at 1h. (2) and 3h. (Taihoku), 5h. (near Ootomari, Osaka, Manila, and near Cape Town), 6h. (Kobe, Helwan, and Taihoku), 7h. (Nagasaki), 8h. (La Paz), 9h. (La Paz and Taihoku), 11h. (Zi-ka-wei, Manila, Taihku, Riverview, and Melbourne), 13h. (Vienna and Rocca di Papa), 15h. (near Osaka), 16h. (Taihoku), 18h. (Tokyo), 19h. (Taihoku (2), Manila, and Zi-ka-wei), 20h. (Strasbourg, San Fernando, Uccle, De Bilt, Taihku (2), and Zi-ka-wei), 21h. (Taihoku), 22h. (Manila, Zi-ka-wei, near Taihoku (2), and near Hokoto), 23h. (De Bilt, Paris, Taihoku (2), and Uccle.)

June 5d. 22h.9m. 20s. Epicentre 21°·0S. 67°·0W. (as on 1919 Aug. 9d.).

A = +·365, B = −·860, C = −·358; D = −·920, E = −·391; G = −·140, H = +·330, K = −·934.

	Δ	Az.	P.	O−C.	L.	M.
	°	°	m. s.	s.	m.	m.
La Paz	4·6	345	i 1 11	0	2·3	2·5
Paris	93·2	38	—	—	49·7	—
Moncalieri	94·3	43	e 46 7	?L	53·9	—
Uccle	95·1	38	—	—	—	56·7
De Bilt	96·1	36	—	—	e 53·7	54·7
Strasbourg	96·1	40	—	—	56·7	—
Rocca di Papa	96·5	49	e 51 46	?L	e 55·1	—
Hamburg	99·4	36	—	—	e 46·7	e 54·7
Taihoku	171·2	299	—	—	—	e 81·5

Additional readings: De Bilt MN = +55·9m.

June 6d. Readings also at 3h. (Taihoku and near Tacubaya and Oaxaca), 4h. (Victoria), 7h. (Taihoku), 9h. (Athens, La Paz, and near Tucson), 10h. (Taihku and Batavia), 11h., 13h., and 14h. (Taihoku), 15h. (La Paz), 16h. (Manila and Coimbra), 17h. (near Athens), 19h., 20h., and 23h. (2) (Taihoku).

June 8d. 16h. 12m. 50s. (I)
17h. 17m. 10s. (II)
18h. 29m. 35s. (III)
} Epicentre 44°·5N. 11°·5E. (as on 1919 Sept. 20d.).

A = +·699, B = +·142, C = +·701.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
I	Florence	0·7	0 14	+ 3	—	—	—	0·4
II		0·7	0 7	− 4	—	—	—	—
III		0·7	0 12	+ 1	—	—	—	—
I	Padova	0·9	0 33	+19	0 48	+23	—	1·2
II		0·9	0 50	?	1 18	?	—	2·2
III		0·9	0 35	+21	1 3	+38	—	1·4
I	Rocca di Papa	2·8	i 0 47	+ 3	—	—	—	2·2
II		2·8	e 1 9	?S	(e 1 9)	− 8	—	2·0
III		2·8	e 0 46	+ 2	1 17	0	—	1·6
I	Zurich	3·5	e 1 7	+12	1 58	+21	—	—
III		3·5	e 1 11	+16	i 1 57	+20	—	—
I	Pompeii E.	4·4	1 10	+ 2	2 20	+19	—	—
III		4·4	2 15	?S	(2 15)	+14	(2·8)	—
I	Strasbourg	4·8	e 1 24	+10	—	—	—	—
III		4·8	e 1 28	+14	(e 2 28)	+17	(e 2·7)	—
I	Vienna	5·0	e 2 9	?S	(2 9)	− 8	i 3·1	—
II		5·0	e 3 30	?L	—	—	(3·5)	4·3
III		5·0	e 2 19	?S	(2 19)	+ 2	i 3·2	3·9
I	De Bilt	8·9	—	—	—	—	e 6·2	e 6·6
I	Hamburg	9·1	—	—	—	—	e 5·2	7·8

Several stations give other alternative readings not very different from those given in this table. Strasbourg gives its readings for III as ePZ, ePN, and ePE respectively. Other shocks felt in this neighbourhood are: 4h. 21m. 55s. Rocca di Papa, 13h. 31m. 57s. Rocca di Papa, 16h. 35m. 15s. Florence, 17h. 44m. 0s. Zurich and Strasbourg, 17h. 59m. 39s. Rocca di Papa, 18h. 5m. 42s. Florence, 19h. 37m. 6s. Rocca di Papa. [These times are as read at the station, not reduced to T_0. They accord closely with a period of 22·8min.]

June 8d. Readings also at 2h., 3h. (2), 4h., and 5h. (Taihoku), 8h. (Helwan and La Paz), 9h. and 11h. (Taihoku), 12h. (near Nagasaki), 13h. (Paris and near Tacubaya), 14h. (Kodaikanal), 16h. (La Paz), 18h. and 23h. (2) (Taihoku).

June 9d. 3h. 9m. 37s. Epicentre 54°·8N. 143°·7E.

A = −·465, B = +·341, C = +·817; D = +·592, E = +·806;
G = −·659, H = +·484, K = −·576.

		Δ	Az.	P.	O−C.	S.	O−C.	M.
		°	°	m. s.	s.	m. s.	s.	m.
Mizusawa	E.	15·8	187	3 49	0	6 50	0	—
Tokyo		19·3	190	3 48	−45	—	—	—
Nagoyá		20·2	196	4 38	− 5	—	—	—
Osaka		20·9	199	4 52	0	—	—	10·9
Manila		43·9	211	e 15 0	?S	(e 15 0)	− 1	—
De Bilt		67·8	332	—	—	e 20 20	+20	—
Paris		71·4	334	e 12 2	+36	—	—	—
Florence		73·5	325	—	—	—	—	17·4
Rocca di Papa		74·8	323	e 11 49	+ 1	—	—	12·6
Helwan		77·5	305	19 23	?S	(19 23)	−152	—
La Paz		134·5	44	e 20 20	[+51]	—	—	—

Additional readings: Mizusawa gives E = +4m.8s. Florence gives P? = 2h.54m.52s. (an error somewhere apparently).

1920. June 9d. 11h. 30m. 35s. Epicentre **3°·5S. 129°·0E.**

(See also 1919 Aug. 29d.).

$A = -\cdot628$, $B = +\cdot776$, $C = -\cdot061$; $D = +\cdot777$, $E = +\cdot629$; $G = +\cdot038$, $H = -\cdot047$, $K = -\cdot998$.

The residuals indicate a displacement of the epicentre 2°·0 to the East, to 3°·5S. 131°·0E. They also suggest a diminution of T_0 by 6sec. or 7sec., to 11h. 30m. 29s., say, which would strengthen the anticentric indications of high focus; but the epicentric stations do not allow of this.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		19·8	336	e 4 42	+ 3	i 7 55	−24	i 8·8	8·9
Batavia		22·2	262	5 5	− 2	e 9 11	+ 2	e 24·4	—
Taihoku		29·4	346	6 15	− 7	—	—	12·2	—
Perth		31·0	201	6 33	− 5	13 5	+74	19·2	—
Adelaide		32·7	165	i 6 19	−35	i 11 25	−54	e 14·8	18·1
Zi-ka-wei		35·4	350	e 7 9	− 8	e 12 49	−12	—	—
Nagasaki		36·3	1	e 7 22	− 2	(e 13 11)	− 3	e 13·2	—
Riverview		36·7	148	e 6 58	−30	i 12 42	−38	e 16·1	21·1
Sydney	E.	36·7	148	6 25	−63	12 55	−25	18·7	19·7
Melbourne		37·3	159	6 43	−49	12 31	−57	18·2	21·4
Kobe		38·6	9	7 22	−21	(13 39)	− 7	13·6	23·8
Osaka		38·7	10	7 43	− 1	13 58	+10	16·6	18·6
Nagoya		39·4	10	7 30	−20	—	—	—	—
Tokyo		40·4	13	8 1	+ 3	(e 14 0)	−13	e 14·0	16·0
Jinsen		41·1	357	7 50	−14	13 34	−48	—	—
Mito		41·3	14	8 5	0	14 16	− 9	—	—
Mizusawa	E.	43·8	14	8 17	− 7	14 50	− 9	—	—
	N.	43·8	14	8 22	− 2	14 57	− 2	—	—
Calcutta	N.	47·5	307	8 49	− 2	(15 55)	− 7	15·9	—
Colombo		50·2	281	9 49	+41	16 49	+28	20·9	22·4
Kodaikanal		53·1	285	13 49	?	—	—	25·0	31·2
Christchurch		55·6	142	9 55	+12	17 25	− 4	25·7	35·4
Bombay		59·6	294	9 25	−44	—	—	—	—
Honolulu		75·5	67	11 49	− 3	i 21 31	− 1	e 37·1	46·7
Helwan	E.	98·3	300	17 55	?PR_1	—	—	—	62·1
	N.	98·3	300	20 37	?PR_1	—	—	—	60·9
Lemberg		102·3	320	e 18 19	?PR_1	e 26 19	+ 1	—	27·8
Victoria		104·3	40	21 44	?	27 30	+54	34·9	56·0
Cape Town		104·8	233	25 44	?S	(25 44)	−56	—	—
Berkeley		106·8	51	—	—	e 25 18	−101	—	—
Vienna		107·5	321	e 17 54	?	29 10	+124	e 53·9	63·4
Hamburg		109·6	326	e 18 49	?PR_1	e 29 47	+143	e 54·9	57·4
Padova		111·2	317	11 25	?	19 41	?PR_1	—	20·6
Rocca di Papa	N.	111·7	312	e 18 20	?PR_1	e 26 30	−73	e 57·0	59·0
Strasbourg		112·8	320	e 19 13	?PR_1	e 29 16	+84	e 57·4	70·0
De Bilt		112·9	325	—	—	—	—	e 54·4	60·0
Uccle		113·9	324	e 19 13	?PR_1	—	—	e 48·4	60·4
Dyce		114·0	333	—	—	—	—	56·4	—
Moncalieri		114·2	318	e 18 34	?	30 26	+142	41·7	—
Edinburgh		115·2	330	e 20 5	?PR_1	—	—	51·4	58·9
Eskdalemuir		115·6	331	20 6	?PR_1	—	—	52·4	59·4
Paris		115·9	322	e 15 15	−10	e 30 16	+119	58·4	61·4
Stonyhurst		116·0	329	31 7	?S	(31 7)	+169	—	—
Kew		116·2	327	37 25	?SR_1	—	—	—	80·4
Oxford		116·5	327	20 0	?PR_1	—	—	—	—
Barcelona		119·3	315	e 20 31	?PR_1	—	—	e 54·6	64·3
Algiers		120·3	310	e 20 19	?PR_1	e 26 18	−153	e 59·4	77·4
Tortosa		120·6	315	20 40	?PR_1	35 21	?SR_1	50·6	80·8
Coimbra		126·9	319	20 55	?PR_1	32 30	?	50·4	—
Rio Tinto		127·0	315	23 25	?PR_1	—	—	—	92·4
San Fernando		127·3	312	21 25	?PR_1	—	—	—	93·9
Chicago		129·7	34	20 30	?PR_1	27 25	−154	43·4	—
Toronto		132·7	27	—	—	—	—	e 75·7	85·0
Ottawa		132·9	21	e 22 34	?PR_1	—	—	—	—
Harvard	E.	137·2	20	e 19 40	[+ 6]	—	—	e 64·1	—
	N.	137·2	20	e 19 52	[+18]	—	—	e 64·1	—
Georgetown		137·4	29	e 22 25	?PR_1	—	—	—	—
Washington		137·4	29	e 19 35	[0]	—	—	—	—
La Paz		153·8	140	20 6	[+ 5]	34 6	?	73·1	88·8

For Notes see next page.

NOTES TO JUNE 9d. 11h. 30m. 35s.

Additional readings: Manila gives also MN = +11·7m., T_0 = 11h.31m.17s. Batavia P_2? = +6m.15s., S_2? = +10m.8s. Adelaide i = +6m.37s., e = +9m.19s., i = +12m.13s., +12m.43s., and +13m.31s. Riverview i = +7m.9s., PR_1 = +8m.41s., PS = +12m.52s., MN = +23·4m., T_0 = 11h.30m.15s. Melbourne SR_1 = +14m.49s. Kobe MN = +13·8m. Osaka MN = +19·6m., T_0 = 11h.30m.24s. Tokyo eS = +9m.55s. (?PR_1), MN = +22·2m. Calcutta LE = +16·0m. Vienna i = +19m.12s., SE = +28m.59s., SR_1? = +34m.41s. Hamburg MZ = +70·4m. Strasbourg MN = +63·0m. De Bilt ePR_1 = +19m.36s., eLN = +53·4m., MN = 59·8m., T_0 = 11h.30m.20s. Epicentre 4°·7S. 130°·3E. Coimbra LN = +61·4m. Chicago L = +51·4m., +59·4m., and +62·9m. Toronto eL = +79·8m. Harvard eN = +22m.46s., eE = +22m.49s., eN = + +23m.54s., LE = +64·8m., LN = +97·4m. La Paz L = +68·3m., T_0 = 11h.33m.13s.

June 9d. Readings also at 0h. (San Fernando), 1h. (La Paz and near Osaka), 5h. and 6h. (Taihoku), 7h. (Apia), 8h. (Taihoku), 11h. (Toronto), 12h. (Taihoku), 13h. (Toronto, Zi-ka-wei, Hokoto, and near Taihoku), 15h. (near Rocca di Papa), 16h. (near Osaka), 19h. (Riverview and Melbourne), 20h. (Helwan and De Bilt), 21h. (La Paz and near Taihoku), 22h. (La Paz), 23h. (Helwan).

June 10d. 2h. 29m. 30s. Epicentre 11°·0N. 127°·0E.

A = −·591, B = +·784, C = +·191; D = +·799, E = +·602; G = −·115, H = +·152, K = −·982.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	6·9	303	e 1 45	0	e 3 1	− 6	3·4	5·4
Taihoku	14·9	341	3 47	+ 9	(6 50)	+20	6·8	—
Zi-ka-wei	20·8	347	4 54	+ 3	e 8 51	+11	—	—
Osaka	24·9	17	5 31	− 6	(9 47)	−14	9·8	12·0
Batavia	26·4	230	i 6 32	+40	9 54	−36	—	12·7
Tokyo	27·2	23	e 6 51	?PR_1	—	—	—	—
Kodaikanal	48·7	275	—	—	—	—	27·4	29·2
Melbourne	51·6	162	e 16 30	?S	(e 16 30)	− 9	—	33·5
Honolulu	72·2	71	20 36	?S	(20 36)	−16	34·0	51·5
Helwan	89·4	301	23 30	?S	(23 30)	−37	—	—
Hamburg	96·4	328	—	—	e 24 30	−50	e 52·5	62·5
De Bilt E.	99·6	329	—	—	e 24 42	−70	e 49·5	62·5
N.	99·6	329	—	—	—	—	e 48·5	56·1
Rocca di Papa	100·0	318	e 18 36	?PR_1	—	—	e 56·1	—
Strasbourg	100·0	324	—	—	e 46 30	?L	e 55·5	—
Uccle	100·8	327	—	—	—	—	e 50·5	—
Edinburgh	101·4	335	—	—	24 55	−74	—	65·0
Eskdalemuir	101·8	335	27 23	?S	(27 23)	+70	48·5	—
Moncalieri	101·8	321	e 2 26	?	—	—	57·6	—
Paris	102·8	327	e 14 7	−17	—	—	52·5	59·5
La Paz	164·3	112	20 19	[+ 8]	25 56	?PR_1	—	—

Additional readings: Manila gives also MN = +4·6m. Helwan PE = +22m.30s. Hamburg MN = +65·5m. Rocca di Papa PR_1 = +27m.6s. La Paz i = +31m.41s., T_0 = 2h.42m.43s.

June 10d. 17h. 53m. 43s. Epicentre 46°·5N. 151°·5E.

A = −·605, B = +·328, C = +·725; D = +·477, E = +·879: G = −·638, H = +·346, K = −·688.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	6·0	274	1 37	+ 5	(2 40)	− 4	2·7	3·9
Sapporo	8·0	248	2 45	+44	5 19	?L	6·7	—
Mizusawa E.	10·6	229	2 30	− 8	4 29	−16	—	—
N.	10·6	229	2 32	− 6	4 31	−14	—	—
Osaka	16·9	232	4 14	+10	—	—	—	12·3
Zi-ka-wei	27·7	247	e 6 6	+ 1	—	—	—	—
Manila	40·0	230	e 7 17	−38	—	—	—	—
Hamburg	74·7	337	—	—	—	—	e 38·3	40·3
Edinburgh	75·4	346	—	—	—	—	30·3	—
Eskdalemuir	76·0	346	—	—	21 17	−20	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
De Bilt	E.	77·3	340	e 17 56	?PR$_2$	e 21 40	−12	e 35·3	47·0
	N.	77·3	340	—	—	—	—	e 41·3	42·6
Stuttgart		77·3	346	44 5	?L	51 5	?	60·0	—
Vienna		77·5	331	—	—	—	—	e 42·3	50·9
Uccle		78·6	340	—	—	—	—	e 41·3	44·3
Kew		79·1	345	—	—	—	—	—	46·3
Strasburg		79·9	337	—	—	—	—	e 40·3	—
Paris		80·9	341	—	—	—	—	e 43·3	45·3
Moncalieri		83·1	336	—	—	e 21 47	−71	45·7	—
Rocca di Papa		84·5	330	e 2 53	?	—	—	e 41·9	—
Helwan		86·5	311	34 17	?	—	—	—	—
Tortosa		88·9	340	23 20	?S	(23 20)	−42	e 46·3	53·4
Rio Tinto		93·5	344	53 17	?L	—	—	(53·3)	58·3
San Fernando		94·7	343	41 47	?L	—	—	(41·8)	57·8

Additional readings: Osaka gives also MN = +11·3m. Hamburg MN = +13·9m. De Bilt eSR$_1$ = +26m.39s., T$_e$ = 17h.54m.47s. Paris MN = +14·9m. Moncalieri S? = +34m.34s. Helwan PN = +29m.17s. Sapporo readings are given as June 11d. 0h. and have been corrected by −7h. instead of −9h., the usual longitude correction for Japan.

June 10d. Readings also at 0h. (Taihoku), 1h. (Moncalieri), 2h. (Batavia), 3h. and 4h. (Taihoku), 5h. (Taihoku and Manila), 8h. (2), 9h. (2), and 18h. (Taihoku), 20h. (Taihoku and near Mizusawa and Tokyo), 21h. (Taihoku and La Paz), 23h. (Tokyo (2) and Taihoku).

June 11d. Readings at 1h. (San Fernando), 10h. (Batavia), 11h. (Taihoku), 14h. (San Fernando), 17h. and 18h. (Taihoku).

June 15d. 0h. 30m. 0s. Epicentre 37°·0N. 20°·5E. (as on 1919 June 3d.).
A = +·748, B = +·280, C = +·602.

	Δ	P.	O−C.	S.	O−C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Zante	1·6	0 0	−24	—	—	—	—
Athens	2·8	0 39	− 5	—	—	1·1	1·3
Pompeii E.	5·9	1 37	+ 6	3 32	?L	(3·5)	—
Rocca di Papa	7·6	e 1 52	− 3	—	—	—	5·0
Helwan	11·6	7 0	?L	—	—	(7·0)	—
Vienna	11·6	e 5 37	?S	(e 5 37)	+28	e 6·4	7·4
Moncalieri	12·4	—	—	e 6 43	?L	8·0	—
Lemberg	13·1	—	—	—	—	e 6·5	7·9
Strasburg	14·9	—	—	—	—	e 8·6	—
Paris	17·6	—	—	—	—	9·0	—
Uccle	18·0	—	—	—	—	e 10·0	—
Hamburg	18·1	—	—	—	—	e 10·0	—
De Bilt	18·5	—	—	e 7 56	+ 5	e 10·3	10·8

Additional readings: Athens gives MN = +1·4m. Helwan PN = +14m.0s. De Bilt MN = +11·2m.

June 18d. 1h. 26m. 10s. Epicentre 23°·8S. 172°·5E.
A=·907, B=+·119, C=−·404; D = +·130, E = +·992.; G=+·400, H = −·053, K = −·915.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview		21·2	237	e 4 55	0	e 8 48	0	e 9·9	12·1
Sydney		21·2	237	−1 28	?	(8 50)	+ 2	8·8	12·1
Melbourne		27·3	233	—	—	—	—	11·6	16·8
Adelaide		31·4	241	—	—	e 11 44	−14	i 16·0	19·4
Honolulu		53·5	35	21 32	?SR$_1$	—	—	e 26·6	32·8
Manila		63·4	302	e 9 50	−44	—	—	—	—
Batavia		65·3	274	10 46	− 1	—	—	—	20·4
Helwan		145·0	289	82 50	?L	—	—	(82·8)	—
Hamburg	Z.	147·5	341	e 19 50	[− 2]	—	—	—	—
Vienna		149·2	328	e 19 46	[− 8]	—	—	—	21·1
De Bilt		150·1	344	—	—	—	—	e 73·8	80·7
Rocca di Papa		156·5	322	e 20 2	[0]	e 22 50	?PR$_1$	—	24·6

Additional readings: Riverview gives also eP = +5m.8s., PS = +9m.9s., MN = +13m., T$_e$ = 13h.26m.14s. Helwan PN = +80m.50s. Vienna 1 = +9m.1s. Rocca di Papa ePN = +20m.10s., iE = +20m.11s.

June 12d. Readings also at 4h. (near Athens), 5h. (Zante), 11h. (Manila), 14h. (San Fernando), 16h. and 17h. (Taihoku), 20h. (Taihoku, Harvard, near La Paz, and near Mizusawa), 21h. (near Mizusawa), 23h. (Manila and Perth).

June 13d. Readings at 0h. (La Paz), 1h. and 4h. (near Tacubaya), 7h. (near La Paz), 9h. (Apia), 12h. (San Fernando), 15h. (near Tokyo and Barcelona), 18h. (Moncalieri), 19h. (Taihoku).

June 14d. 13h. 6m. 14s. Epicentre 40°·0N. 76°·0E. (as on 1919 July 24d.).

	Δ	Az.	P.	O−C.	S.	O−C.
	°	°	m. s.	s.	m. s.	s.
Vienna	42·5	301	e 8 16	+ 1	—	—
Rocca di Papa	46·8	293	8 46	0	—	—
Moncalieri	49·1	300	—	—	e 15 51	−16
Paris	51·2	308	e 9 30	+16	—	—
Edinburgh	52·2	316	—	—	16 46	0

June 14d. 13h. 8m. 10s. Epicentre 40°·0N. 76°·0E. (as on 1919 July 24d.).

A = +·185, B = +·743, C = +·643; D = +·970, E = −·242; G = +·155, H = +·624, K = −·766.

Direct comparison with 1919 July 24 shows close accordance for some of the following observations: and a discordance of about two minutes for others, collected under the preceding assumed shock.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	9·0	174	2 2	−14	—	—	e 3·7	4·4
Calcutta	20·4	146	7 38	?S	(7 38)	−54	10·6	—
Helwan	37·6	268	17 50	?L	—	—	(17·8)	—
Vienna	42·5	301	e 6 20	−115	—	—	e 21·4	28·5
Hamburg	45·4	310	—	—	e 16 50	+90	—	30·3
Rocca di Papa	46·8	293	6 50	−116	e 16 50	+72	—	38·9
Strasbourg	48·0	302	e 8 50	− 4	—	—	24·8	—
De Bilt	48·6	310	9 5	+ 7	—	—	e 24·8	30·2
Moncalieri	49·1	300	—	—	e 13 55	−132	—	—
Uccle	49·4	309	e 9 14	+11	—	—	e 22·8	—
Paris	51·2	308	e 7 34	−100	—	—	27·8	32·8
Edinburgh	52·2	316	—	—	14 50	−116	—	34·8
Stonyhurst	52·4	313	32 2	?L	—	—	(32·0)	—
Eskdalemuir	52·4	315	—	—	—	—	27·8	—

Additional readings: Calcutta gives also PN = +7m.32s. De Bilt ePE = +8m.46s., MN = +26·5m. Rocca di Papa iE = +7m.13s., probably referring to preceding shock. Hamburg MN = +25·1m.

June 14d. Readings also at 0h. (Taihoku (2)), 7h. (La Paz), 8h. (Helwan), 14h. (near Mizusawa), 15h. (Stonyhurst and Vienna), 19h. (La Paz).

June 15d. 3h. 3m. 0s. Epicentre 24°·5N. 143°·5E. (as on 1919 Sept. 11d.).

A = −·732, B = +·541, C = +·415; D = +·595, E = +·804; G = −·333, H = +·247, K = −·910.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	11·6	345	2 41	−12	—	—	—	18·2
Osaka	12·3	327	3 1	− 2	—	—	—	13·1
Taihoku	20·0	279	4 58	+17	—	—	8·7	—
Zi-ka-wei	20·6	294	e 4 56	+ 8	—	—	—	—
Manila	23·4	249	e 5 0	−21	—	—	—	—
Honolulu	53·6	80	—	—	e 17 36	+32	27·1	36·6
Vienna	93·3	328	13 28	− 6	—	—	e 52·0	61·0
Edinburgh	94·7	342	—	—	24 0	−63	—	—
Helwan	95·1	306	62 0	?	—	—	—	—
De Bilt E.	95·2	344	—	—	e 24 12	−56	e 52·0	59·3
Uccle	96·6	344	—	—	—	—	e 50·0	—
Paris	98·7	335	—	—	—	—	e 54·0	65·0
Moncalieri	99·6	330	—	—	—	—	e 53·3	—
Rocca di Papa	99·7	324	—	—	—	—	e 62·2	—

No additional readings.

June 15d. 14h. 2m. 15s. Epicentre 43°·0N. 15°·0E. (as on 1920 May 30d.).

A = +·706, B = +·189, C = +·682.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	2·1	233	0 23	−10	0 59	+ 1	—	1·2
Pompeii E.	2·3	192	1 6	?S	(1 6)	+ 3	—	—
Padova	3·3	317	0 45	− 7	1 26	− 5	—	1·7
Vienna	5·3	10	e 1 37	+15	—	—	i 2·6	3·1
Zurich E.	6·2	316	e 1 41	+ 6	i 2 11	−38	—	—
Strasbourg	7·5	320	e 2 21	+27	e 3 22	− 2	e 3·8	—

Zurich gives eN = +1m.39s. Strasbourg eN = +2m.50s.

June 15d. Readings also at 0h. (Lick, Vienna, La Paz, and near Apia), 1h. (San Fernando and near Algiers), 2h. (La Paz and Helwan), 5h. (La Paz, Manila, and Batavia), 10h. (San Fernando and near Tokyo), 11h. (near Taihoku), 16h. (Athens), 19h. (Rio Tinto).

June 16d. 16h. 47m. 25s. Epicentre 24°·0N. 120°·0E. (as on June 5d.).

A = −·457, B = +·792, C = +·407; D = +·866, E = +·500; G = −·204, H = +·352, K = +·914.

	Δ	Az.	P.	O−C.	L.	M.
	°	°	m. s.	s.	m.	m.
Taihoku	1·8	53	0 22	− 6	0·6	0·8
Zi-ka-wei	7·3	10	e 2 0	+ 9	—	—
Manila	9·5	172	—	—	e 5·2	—
De Bilt	85·2	326	—	—	e 46·6	56·3
Strasbourg	85·7	322	—	—	e 55·6	—
Uccle	86·3	327	—	—	e 42·6	—
Edinburgh	86·8	332	—	—	48·6	—
Moncalieri	87·6	319	—	—	53·1	—
Paris	88·4	326	—	—	e 55·6	—

De Bilt gives MN = +56·0m.

Jan. 16d. Readings also at 0h. (San Fernando, Helwan, and De Bilt), 12h. (Stonyhurst and near Lick and Berkeley), 13h. (Manila), 14h. (Moncalieri and near Taihoku (2)), 20h. (Harvard).

June 17d. Readings at 0h. (San Fernando), 4h. (La Paz (2)), 5h. and 6h. (Taihoku), 12h. (La Paz and near Nagasaki), 14h. (San Fernando), 17h. (Taihoku and near Berkeley), 18h. (Helwan), 19h. (Rio Tinto).

June 18d. 10h. 8m. 3s. Epicentre 33°·0N. 121°·5W.

A = −·438, B = −·715, C = +·545; D = −·853, E = +·522; G = −·284, H = −·464, K = −·839.

The Georgetown and Harvard observations may refer to another shock some 13min. later.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Lick	N.	4·3	358	e 1 2	− 5	—	—	—	—
Berkeley	Z.	4·9	352	e 1 17	+ 1	e 2 17	+ 3	e 2·6	—
Tucson	E.	9·0	92	3 26	?	4 4	+ 1	—	5·4
Victoria		15·4	356	6 20	?S	(6 20)	−21	9·3	11·2
Ann Arbor		31·0	62	16 57	?L	—	—	(17·0)	—
Toronto		34·3	61	—	—	—	—	29·4	—
Washington		36·1	68	—	—	—	—	e 16·5	—
Georgetown	E.	36·1	68	e 17 40	?L	20 46	?	e 21·6	—
Ithaca		36·3	62	—	—	—	—	e 17·4	—
Ottawa		37·0	59	—	—	—	—	e 17·4	—
Harvard	E.	40·3	62	e 17 39	?SR_1	—	—	e 21·0	23·4
	N.	40·3	62	e 17 46	?SR_1	20 22	?L	e 21·0	21·3
De Bilt	E.	83·[illegible]	30	—	—	—	—	e 45·0	49·1

Additional readings: Berkeley gives eSN = +2m.20s. Tucson SN = +3m.58s. Georgetown ePN = +17m.46s. De Bilt eLN = +42·0m.

June 18d. Readings also at 0h. (San Fernando), 1h. and 4h. (La Paz), 5h. (San Fernando), 6h. (Manila), 9h. (Harvard (2)), 10h. (Harvard), 12h. (San Fernando), 13h. (La Paz and Nagasaki), 16h. (Manila), 18h. (near Tokyo), 23h. (near Tokyo and Taihoku).

June 19d. Readings at 0h. (San Fernando), 1h. (Tokyo), 8h. (Apia and La Paz), 9h. (Taihoku), 10h. (Batavia and near Rocca di Papa), 13h. (Manila), 16h. and 23h. (Taihoku).

June 20d. 12h. 14m. 56s. Epicentre 43°·5N. 17°·0E.

$A = +·694$, $B = +·212$, $C = +·688$; $D = +·292$, $E = -·956$: $G = +·658$, $H = +·201$, $K = -·725$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii E.	3·3	220	1 0	+ 8	1 50	+19	(1·8)	1·9
Rocca di Papa	3·6	243	i 1 4	+ 8	1 52	+13	(1·9)	2·7
Padova	4·1	299	—	—	3 1	?L	(3·0)	4·9
Vienna	4·8	355	i 2 3	?S	(i 2 3)	− 8	e 3·0	3·8
Zurich E.	7·1	307	e 1 53	+ 5	i 3 22	+ 9	—	—
N.	7·1	307	i 1 54	+ 6	i 3 23	+10	—	—
Athens	7·5	135	i 2 7	+13	i 3 44	+20	—	4·4
Lemberg	8·0	35	—	—	—	—	e 4·4	5·0
Strasbourg Z.	8·2	312	2 8	+ 4	e 3 51	+ 9	—	—
Puy de Dôme	10·1	287	4 4	?L	—	—	(4·1)	—
Barcelona	11·1	264	i 1 59	−47	3 57	−60	—	—
Hamburg	11·1	338	i 2 57	+11	—	—	(i 5·3)	—
Uccle	11·3	315	e 4 50	?S	(e 4 50)	−12	—	—
Paris	11·3	303	i 4 35	?S	(i 4 35)	−27	—	—
De Bilt	11·7	321	2 54	− 1	5 14	+ 2	—	—
Algiers	12·5	242	i 2 3	−63	—	—	3·6	3·7
Tortosa	12·5	263	2 14	−52	4 0	−92	4·1	4·1
Helwan	17·8	136	7 4	?S	(7 4)	−32	—	—
San Fernando	19·0	256	5 57	+88	—	—	—	—

Additional readings and notes: Rocca di Papa gives also MN = +2·0m. Zurich gives its S's two minutes early—earlier than the P's. Hamburg gives L as iPE, also L? = +22·1m., T_o = 12h.14m.58s. Helwan PN = +5m.4s.

June 20d. Readings also at 0h. (Riverview, Batavia, and La Paz), 1h. (Manila, De Bilt, Helwan, Paris, and San Fernando), 2h. (Manila), 3h. (Taihoku), 7h. (Florence), 8h. (Riverview), 9h. (De Bilt, Paris, and Manila), 10h. (Rocca di Papa), 12h. (La Paz), 13h. (Apia, Coimbra, and near Mizusawa).

June 21d. 7h. 21m. 35s. Epicentre 43°·0N. 15°·0E. (as on June 15d.).

$A = +·706$, $B = +·189$, $C = +·682$.

(Clearly not from the same focus as June 20d. 12h.).

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	2·1	233	i 0 40	+ 7	0 52	− 6	—	0·9
Pompeii E.	2·3	192	0 47	+11	1 1	− 2	—	1·4
Padova	3·3	317	2 4	+72	3 6	+95	—	3·9
Vienna	5·3	10	e 2 37	? L	—	—	(e 2·6)	4·8
Moncalieri	5·6	293	e 1 13	−14	—	—	—	3·7
Zurich E.	6·2	316	e 2 10	+35	i 2 37	−12	—	—
Hamburg	11·0	345	—	—	—	—	e 7·4	—

Zurich gives eN = +2m.8s.

June 21d. Readings also at 9h. (near Rocca di Papa), 11h. (La Paz and Taihoku), 12h. (Granada), 13h. (Taihoku), 14h. (Chicago, Washington, Harvard, and near Tacubaya), 18h. (Taihoku), 19h. (Manila and Taihoku), 20h. (Helwan), 21h. (Lick).

June 22d. 2h. 48m. 6s. Epicentre 33°·0N. 121°·5W. (as on June 18d.).

$A = -·438$, $B = -·715$, $C = +·545$; $D = -·853$, $E = +·522$; $G = -·284$, $H = -·464$, $K = -·839$.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Lick	E.	4·3	358	e 1 10	+ 3	—	—	e 2·2	2·6
	N.	4·3	358	e 1 15	+ 8	—	—	e 2·1	2·6
Berkeley	E.	4·9	352	e 1 13	− 3	e 2 15	+ 1	2·6	4·3
	N.	4·9	352	e 1 15	− 1	e 2 17	+ 3	2·6	4·4
Tucson	N.	9·0	92	3 18	?	—	—	3·8	4·1
Victoria		15·4	356	—	—	—	—	—	11·1
Chicago		28·1	62	8 58	?PR_1	11 26	+25	12·3	—
Toronto		34·3	61	—	—	—	—	16·8	—
Georgetown	E.	36·1	68	e 16 54	?SR_1	22 38	?	—	—
Washington		36·1	68	e 15 4	?SR_1	17 10	?L	18·1	—
Cheltenham	N.	36·2	68	17 8	?L	—	—	18·0	18·3
Ithaca		36·3	62	—	—	—	—	e 17·4	—
Ottawa		37·0	59	—	—	—	—	e 17·8	—

Additional readings and notes: Point Loma ($\Delta = 3°·1$) gives 2h.67m., probably a misprint for 2h.47s. Lick e?E = +1m.28s. Berkeley e?E = +1m.36s. Tucson PE = +3m.21s., ME = +4·3m.

June 22d. 8h. 9m. 51s. Epicentre 34°·5N. 138°·0E. (as on 1919 Feb. 5d.).

$A = -·613$, $B = +·551$, $C = +·566$.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		1·9	0 33	+ 4	0 53	0	1·1	1·1
Osaka		2·2	—	—	0 56	− 4	1·5	2·2
Mizusawa	E.	5·2	1 21	+ 1	2 23	+ 1	—	—
	N.	5·2	1 22	+ 2	2 24	+ 2	—	—
Taihoku		17·1	2 17	?	—	—	2·5	—

June 22d. Readings also at 2h. (Harvard), 10h. (near Tokyo), 12h. (Stonyhurst), 13h. (La Paz), 15h. (Point Loma), 18h. (Taihoku), 22h. (Ann Arbor).

June 23d. Readings at 13h. (Apia), 16h. (La Paz), 17h. (Helwan and Manila), 19h. (near Algiers and near Mizusawa), 21h. (La Paz and San Fernando), 22h. (Lick).

June 24d. 5h. 48m. 45s. Epicentre 64°·1N. 27°·5W. (as on 1920 May 14d.).

$A = +·388$, $B = -·202$, $C = +·900$; $D = -·462$, $E = -·887$; $G = +·798$, $H = -·415$, $K = -·437$.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	14·5	113	3 27	− 6	—	—	—	8·7
Oxford	18·4	120	4 18	− 4	—	—	8·9	12·5
De Bilt	20·6	110	e 4 47	− 1	e 8 32	− 4	9·8	12·0
Uccle	21·3	113	e 4 51	− 6	e 8 51	+ 1	—	—
Hamburg	21·6	101	e 5 6	+ 6	—	—	e 11·2	15·2
Paris	22·2	119	e 5 6	− 1	—	—	11·2	12·2
Strasbourg	24·4	112	e 4 47	−45	—	—	e 14·4	—
Coimbra	26·4	146	5 52	0	10 9	−21	12·6	—
Tortosa	28·4	131	e 10 15	?S	(e 10 15)	−51	e 13·2	18·2
Rocca di Papa	32·0	114	—	—	—	—	e 18·8	19·4
Helwan	49·9	104	34 15	?L	—	—	(34·2)	—

Additional readings: De Bilt gives MN = +11·4m. Coimbra PE = +6m.5s. Helwan PE = +38m.15s.

June 24d. Readings also at 0h. (near Kobe), 3h. (near Tokyo), 5h. (La Paz), 6h. (near Athens), 9h. (Batavia, La Paz, and Manila), 11h. and 16h. (La Paz), 18h. (Paris and De Bilt), 19h. (San Fernando).

June 25d. 10h. 23m. 45s. Epicentre 42°·0N. 141°·0E. (as on 1919 July 21d.).

A = −·577, B = +·467, C = +·669.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	2·9	0 50	+ 5	1 26	+ 6	—	—
	N.	2·9	0 51	+ 6	1 28	+ 8	—	—
Ootomari		4·8	1 9	− 5	—	—	2·0	—
Tokyo		6·4	e 1 40	+ 2	—	—	e 3·0	4·6
La Paz		144·3	i 19 41	[− 6]	20 51	?	21·2	—

Tokyo gives MN = +4·7m.

June 25d. 10h. 29m. 38s. Epicentre 64°·1N. 27°·5W. (as on June 24d.).

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Eskdalemuir	14·6	112	—	—	—	—	5·4	—
Oxford	18·4	120	—	—	7 25	−24	10·4	—
De Bilt	20·6	110	—	—	—	—	e 11·4	12·9
Uccle	21·3	113	—	—	—	—	e 10·4	—
Paris	22·2	119	e 5 7	0	e 9 9	0	11·4	12·4
Strasbourg	24·4	112	—	—	—	—	15·4	—

Additional readings: De Bilt gives MN = +12·6m. Paris eSE = +9m.4s.

June 25d. 18h. 21m. 45s. Epicentre 64°·1N. 27°·5W. (as at 10h.).

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Stonyhurst	16·4	118	—	—	—	—	8·0	—
Oxford	18·4	120	—	—	7 40	− 9	9·5	—
De Bilt	20·6	110	e 4 55	+ 7	e 8 23	−13	e 9·8	13·0
Uccle	21·3	113	e 5 3	+ 6	e 8 39	−11	e 9·8	—
Hamburg	21·6	101	e 5 15	+15	—	—	e 14·2	—
Paris	22·2	119	e 5 15	+ 8	i 9 3	− 6	11·2	13·2
Strasbourg	24·4	112	e 5 35	+ 3	e 9 15	−37	e 14·2	—
Moncalieri	27·3	117	—	—	—	—	14·4	—
Tortosa	28·4	131	6 17	+ 5	—	—	14·2	19·7
Rocca di Papa	32·0	114	—	—	—	—	e 19·0	22·0

De Bilt MN = +11·8m. Moncalieri gives e = 18h.2m.8s., S? = 18h.20m.58s.

June 25d. 21h. 17m. 10s. Epicentre 43°·0N. 15°·0E. (as on June 21d.).

A = +·706, B = +·189, C = +·682.

		Δ	P.	O−C.	S.	O−C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		2·1	e 0 11	−22	—	—	—	2·5
Pompeii	E.	2·3	0 0	−36	1 5	+ 2	—	—
Padova		3·3	2 7	?S	(2 7)	+36	—	4·8
Vienna	N.	5·3	e 1 22	0	e 2 26	+ 1	e 2·8	3·3
Moncalieri		5·6	—	—	e 4 27	?	6·9	—
Strasbourg		7·5	—	—	—	—	e 4·2	—
Paris		10·4	—	—	—	—	8·8	—
Hamburg		11·0	—	—	—	—	e 6·8	—
De Bilt		11·2	—	—	—	—	e 6·9	—

Additional readings: Vienna gives also ePZ = +1m.19s. Strasbourg e_2N = +4m.57s.

June 25d. Readings also at 2h. (Lick), 9h. (La Paz), 11h. (Uccle, Paris, and Rocca di Papa), 14h. (near Mizusawa), 16h. (Stonyhurst), 20h. (Helwan), 22h. (near Berkeley), 23h. (Apia, Manila, and Paris).

June 26d. 7h. 30m. 34s. Epicentre 18°·5S. 10°·0W.

A = +·934, B = −·165, C = −·317 ; D = −·174, E = −·985 ; G = −·312, H = +·055, K = −·948.

The T_0 is taken from Coimbra which, however, appears badly out in the table.

	Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	55·2	265	9 41	+ 1	—	—	25·4	29·0
Coimbra	58·7	1	8 39	−84	15 26	−161	e 28·6	—
Helwan	62·6	41	19 26	?S	(19 26)	+30	29·4	—
Rocca di Papa	63·8	20	e 10 44	+ 7	—	—	e 35·2	37·2
Moncalieri	65·5	14	—	—	e 18 55	−36	30·7	—
Paris	68·2	10	e 11 3	− 2	—	—	32·4	36·4
Strasbourg	68·9	13	e 11 10	0	—	—	—	34·4
Uccle	70·4	11	e 11 16	− 3	—	—	e 33·4	—
De Bilt	71·8	11	—	—	e 24 52	?SR_1	—	42·5

Additional readings: La Paz gives i = +10m.1s., T_0 = 7h.31m.2s. Rocca di Papa i = +10m.47s. De Bilt MN = +41·7m.

June 26d. Readings also at 0h. (Rocca di Papa), 3h. (De Bilt, Paris, Washington, and Chicago), 13h. (Helwan, Batavia, Manila, Riverview, and near Mizusawa), 14h. (Batavia).

June 27d. Readings at 0h. (Manila), 4h. (Taihoku (2)), 7h. and 8h. (La Paz), 11h. (Eskdalemuir, Rocca di Papa, Paris, Edinburgh, Uccle, and De Bilt), 16h. (Batavia), 17h. (Tacubaya), 18h. (near Oaxaca), 20h. (La Paz).

June 28d. Readings at 0h. (Manila), 3h. (La Paz), 4h. (De Bilt, Uccle, and Helwan), 9h. (near Lick), 10h. (Manila), 16h. (near La Paz), 20h. (San Fernando), 21h. (La Paz), 23h. (Helwan and near Tokyo).

June 29d. Readings at 0h. and 4h. (La Paz), 16h. (Coimbra), 19h. (La Paz, Rocca di Papa, Padova, and Rio Tinto), 21h. (San Fernando).

June 30d. 4h. 15m. 20s. (I) } Epicentre 53°·5N. 159°·0W. (as on 1919 July 31d.).
4h. 24m. 20s. (II) }

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

The hypothesis of two separate shocks from the same epicentre has no direct support, as no station records a double phase. But it seems impossible to reconcile all the readings with a single shock. Similar difficulties were found on 1919 July 31.

		Δ	Az.	P.	O−C.	S.	O−C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
II	Victoria	22·8	89	—	—	—	—	—	13·6
II	Chicago	47·4	76	8 53	+ 3	15 40	− 6	21·2	—
II	Toronto	50·7	67	—	—	—	—	e 32·1	34·3
I	Hamburg	72·5	7	11 33	0	—	—	e 40·7	48·7
I	De Bilt E.	73·6	10	—	—	e 21 19	+10	e 40·7	43·1
I	N.	73·6	10	—	—	—	—	e 38·7	42·4
I	Uccle	74·7	11	—	—	e 21 30	+ 8	e 38·7	40·7
II	Paris	76·5	12	—	—	—	—	39·7	—
I	Rocca di Papa N.	84·4	6	e 12 35	− 9	22 54	−18	e 56·2	—
I	Pompeii E.	85·5	5	14 8	+77	24 8	+43	—	—
I	Helwan	96·1	351	—	—	24 40	−37	—	—
II	La Paz	103·7	99	25 38	?S	(25 38)	−52	41·3	42·4

Additional readings: Chicago L = +24·7m. and = +28·7m. Hamburg I gives also MN = +50·7m. Uccle SR_1 = +26m.48s. Paris gives simply 5h.4m. to 20m. Rocca di Papa. The L may belong to (II). Helwan gives also +23m.40s. La Paz L and M may belong to (I).

June 30d. Readings also at 3h. (Manila), 5h. (Toronto), 8h. (La Paz), 9h. (La Paz and Helwan), 12h. (La Paz), 13h. (Helwan), 15h. (Manila), 16h. (Manila and Lick), 18h. (Rio Tinto), 19h. (Stonyhurst), 22h. (La Paz).

The merest glance at these collated records suggests that there are many cases of mistakes, which could probably be corrected if the records were again scrutinised with the figures given as a guide. But it must be admitted that this suggestion is not always confirmed by experience. A striking example occurs on 1920 June 2d. 22h. The residuals for Ann Arbor shown on p. 84 are satisfactorily small, but (as mentioned in the Notes on p. 85) this result is only attained by subtracting 9 minutes from the published records, which are as follows (for two machines, of which B is given in the text):—

	P.	S.	L.	M.
	h. m.	h. m.	h. m.	h. m.
B —EW	22 17·1	22 21·9	22 25·1	22 17·7
B —NS	22 16·9	22 21·8	22 24·8	22 17·5
W—EW	22 17·1	22 21·1	—	—
W—NS	22 16·4	22 21·7	22 24·1	—

It will be seen that the M readings precede the L, thus independently suggesting a correction to P, S, L of about 9min. The correction was thus made confidently; but at the same time inquiry was made at Ann Arbor for justification. The following letter from the Director, however, shows that *no justification is forthcoming*, according to the ordinary standard of procedure. The readings are a complete puzzle.

Detroit Observatory,
University of Michigan,
Ann Arbor,
September 24, 1924.

My dear Professor Turner,

We have re-examined the Ann Arbor seismograms of June 2, 1920, and find nothing to change in the record as published. We have examined the clock correction, and find that it has been applied correctly. The seismographic record, nine minutes earlier than the published times, is a straight line without any indication of the approaching disturbance.

The seismograms are difficult of interpretation, owing to their peculiarities. The note No. 384 was written by an Assistant, Mr. Carpenter, who is no longer with us. The times for PR_1, PR_2, and SR_1, which he obtained, have not been preserved. Dr. Rufus, who now has this work in hand, thinks that these times cannot be determined with certainty. I am sorry that we cannot furnish them.

I am,
Yours very sincerely,
W. J. HUSSEY.

TABLE.

Degrees.	P sec.	S sec.	S − P sec.	Degrees.	P sec.	S sec.	S − P sec.	Degrees.	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

I. W. County Press. 1883/9/24.