

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

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The International Seismological Summary for 1919.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number contains the information for January, February, and March, 1919, thus commencing the second year of the International Summary—the successor to the *Shide* and *Oxford Bulletins*.

Attention may be called to the following cases of “deep focus” :—

	Date.				Epicentre.	Focal Depth.
	d.	h.	m.	s.		
Jan.	1	3	0	0	20·5N. 178·5W.	+·030
Mar.	1	18	36	0	9·0N. 141·0E.	+·030
Mar.	2	3	26	40	} 48·7S. 77·0W.	+·020
		11	45	10		
		9	3	16		
	13	14	16	55	8·5S. 124·5E.	(Suggested)
	16	7	33	10	} 9·5N. 127·0E.	+·015
		15	3	0		

In some of these cases a discussion of the evidence is given : in others the figures are left to speak for themselves. Instances of abnormal focal depth are apparently not numerous, but they are steadily accumulating, and fuller discussion may be reserved until a sufficient number have been collected.

The welcome news has been received that the Russian Seismological Observatories are being revived, and a few records have been received from Ekaterinburg. Hence, though the number of stations sending records is already large in 1919 (the year of emergence from the War), we may apparently hope for an increase in subsequent years.

H. H. TURNER.

University Observatory, Oxford.
1925 December 21.

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1919 JANUARY, FEBRUARY, & MARCH.

1919. Jan. 1d. 1h. 33m. 36s. Epicentre 5°4N. 125°2E.

(as on 1918 Oct. 26d. and on many previous occasions.)

A = -0.574, B = +0.813, C = +0.094; D = +0.817, E = +0.576;
G = -0.054, H = +0.077, K = -0.996.

The Epicentre, used so often before, has been retained for convenience of reference, but the residuals suggest one further north.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10.1	336	e 2 48	+17	(4 13)	-19	4.2	—
Taihoku	19.9	350	4 44	+ 4	(8 3)	-18	8.0	12.5
Batavia	21.7	238	5 6	+ 5	i 9 29	+30	—	10.4
Zi-ka-wei	26.0	353	e 5 27	-21	9 50	-32	e 11.6	13.1
Nagasaki	27.7	8	5 49	-16	(10 14)	-40	10.2	12.4
Kobe	30.7	16	5 50	-45	—	—	13.6	14.3
Osaka	30.8	17	6 4	-32	(11 28)	-20	11.5	16.6
Tokyo	33.1	22	6 34	-23	7 18	?	13.6	14.0
Mizusawa	E. 36.6	21	6 56	-31	12 29	-49	—	—
Calcutta	E. 39.5	299	7 48	- 3	14 0	+ 1	20.4	29.0
	N. 39.5	299	7 48	- 3	13 54	- 5	20.0	—
Adelaide	42.3	163	8 16	+ 3	14 24	-15	19.6	31.4
Ootomari	43.9	17	8 8	-17	14 3	-58	17.5	22.4
Colombo	45.2	274	7 42	-52	9 18	?	13.7	14.3
Riverview	46.3	150	e 8 48	+ 6	15 20	-12	e 20.9	24.3
Sydney	46.3	150	8 54	+12	16 30	+58	24.8	27.4
Melbourne	46.9	159	8 48	+ 2	15 48	+ 8	19.4	19.9
Kodaikanal	47.5	277	8 42	- 9	(15 54)	+ 6	15.9	16.4
Simla	51.8	306	e 8 48	-31	16 6	-35	21.1	24.3
Bombay	52.8	290	9 31	+ 6	17 6	+12	—	18.8
Apia	65.4	108	e 10 48	+ 1	e 19 24	- 6	29.1	35.4
Ekaterinburg	71.8	329	i 11 12	-16	i 20 18	-30	29.4	—
Honolulu	75.8	69	11 48	- 6	21 36	+ 1	34.7	48.7
Helwan	90.7	298	13 0	-20	—	—	—	—
Lemberg	93.0	321	e 13 18	-14	i 23 57	-48	e 46.8	63.5
Athens	95.7	309	e 13 36	-11	i 24 14	-59	—	—
Vienna	Z. 98.2	320	e 13 45	-16	i 24 33	-65	e 43.4	—
Victoria	99.9	39	13 56	-14	24 17	-98	38.2	67.5
Hamburg	100.2	326	e 14 16	+ 4	i 24 37	-81	e 42.0	60.5
Pola	100.9	318	i 24 42	?	(24 42)	-82	e 60.7	64.2
Pompeii	101.9	314	18 18	?	PR ₁ 24 44	-90	33.5	54.4
Monte Cassino	102.1	315	—	—	24 47	-89	—	24.9
Rocca di Papa	102.8	315	e 14 11	-13	24 42	-100	e 39.1	—
Florence	103.1	318	14 46	+20	—	—	—	—
De Bilt	E. 103.4	327	14 9	-18	i 24 53	-95	e 47.4	68.2
	N. 103.4	327	—	—	—	—	e 45.4	58.8
Zurich	103.5	321	—	—	i 24 53	-96	—	—
Strasbourg	103.5	321	e 14 24	- 4	i 24 54	-95	e 43.4	—
Berkeley	104.0	49	18 24	?	PR ₁ —	—	—	—
Dyce	104.3	333	—	—	e 24 58	-98	43.4	64.4
Uccle	104.4	326	14 18	-14	24 57	-100	e 44.4	49.5
Ljck	104.7	50	—	—	e 23 24	-195	—	—
Moncalieri	105.0	320	e 14 16	-18	24 53	-109	39.8	45.7
Besançon	105.2	322	25 2	?	(35 2)	-102	—	—
Edinburgh	105.6	332	14 24	-13	—	—	—	—
Eskdalemuir	105.9	331	14 11	-28	26 23	-28	49.9	51.4
Paris	106.5	325	e 18 24	?	PR ₁ 125 9	-108	34.4	34.4
Kew	106.6	328	23 24	?	—	—	—	—
Cape Town	106.9	236	15 12	+28	25 12	-108	51.2	54.7
Bidston	107.0	331	20 54	?	PR ₁ 26 21	-40	—	63.4
	107.0	331	—	—	125 6	-115	45.4	60.9
Oxford	107.0	328	—	—	125 10	-111	—	67.4
Shide	107.6	326	14 24	-22	125 12	-114	—	67.4
Dublin	108.6	334	—	—	125 6	-129	44.9	—
Barcelona	110.1	318	e 19 12	?	PR ₁ 125 21	-128	39.4	62.4
Algiers	111.6	313	19 7	?	PR ₁ 29 2	+80	46.4	73.4
Tortosa	111.6	318	19 37	?	PR ₁ 28 46	+64	40.3	62.9

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Granada	116.1	316	25 30	?S	e 35 28	?SR ₁	—	—
Coimbra	117.7	322	20 5	?PR ₁	29 45	+73	46.2	66.0
Rio Tinto	117.8	318	22 24	?	—	—	—	—
San Fernando	118.3	317	29 36	?S	(29 36)	+60	68.9	82.9
Chicago	124.2	29	20 37	?PR ₁	30 14	+54	50.4	—
Ann Arbor E.	125.6	26	20 18?	?PR ₁	—	—	46.4	—
Ottawa N.	125.8	18	i 20 51	?PR ₁	e 30 8	+36	62.4	—
Toronto	126.2	22	—	—	e 30 6	+32	63.2	82.5
Northfield	127.9	16	—	—	—	—	e 66.4	—
Ithaca N.	128.3	20	e 22 40	?PR	e 31 9	?	e 48.6	—
Harvard E.	128.3	20	e 22 41	?PR ₁	e 32 44	?	e 56.4	—
Georgetown N.	130.0	16	—	—	20 15?	?PR ₁	e 51.5	63.3
Washington E.	131.1	23	e 22 42	?PR ₁	—	—	59.4	—
Cheltenham N.	131.1	23	e 22 43	?PR ₁	—	—	59.7	—
Washington E.	131.1	23	e 19 19?	[-2]	e 22 30	?PR ₁	66.9	—
Cheltenham N.	131.3	23	23 19	?PR ₁	—	—	64.2	83.3
Washington E.	131.3	23	23 23	?PR ₁	—	—	64.1	83.9
Cipolletti	144.3	162	17 6	-22	—	—	—	—
Balboa Heights	151.4	60	19 24	[-34]	—	—	—	—
Pilar	152.4	163	20 42	[+43]	—	—	—	—
Andagala	155.2	155	22 24	?	—	—	—	—
Rio de Janeiro	159.2	212	—	—	—	—	83.1	—
La Paz	162.8	131	20 15	[+5]	34 17	?	e 77.0	—

Additional records: Batavia gives L = +27.4m., T₀ = 1h.33m.11s. Zi-ka-wei
PSE = +10m.9s., PSN = +10m.25s., SR₁E = +11m.8s., MN = +15.3m.,
T₀ = 1h.33m.32s. Osaka MN = +15.6m. Mizusawa SN = +12m.25s.,
T₀ = 1h.33m.37s. Adelaide PR₁ = +9m.56s., SR₁ = +16m.39s., SR₂ =
+17m.49s. Riverview IP = +8m.54s., iPR₁ = +10m.37s., i = +15m.24s.,
and +15m.35s., iPS = +16m.11s., i(SR₁?) = +18m.43s., MZ = +25.9m.,
T₀ = 1h.34m.9s. Sydney PS = +15m.42s.(?S), SR₂ = +21m.54s. Dehra
Dun (Δ = 50°.8) gives records at 1h.17m. and 2h.16m.30s. Apia eSR₁ =
+23m.24s., T₀ = 1h.33m.49s. Hamburg ePR₁ = +18m.5s., MN = +54.8m.,
De Bilt PR₁ = +18m.25s., eE = +34m.19s., T₀ = 1h.34m.59s., Epicentre
8°0N, 127°0E. Dyce PR₁ = +18m.56s., iS = +25m.8s. Eskdalemuir
PR₁ = +18m.38s. Paris i = +26m.24s. Bidston eS = +24m.53s.
Oxford PR₁ = +18m.47s., eS = +25m.5s. Shide PR₁ = +18m.46s., eS =
+25m.2s. Barcelona eLN = +51.0m., eLE = +49.6m.
i = +25m.30s., M = +56.4m. San Fernando MN = +86.4m. Algiers
L = +73.4m. Ann Arbor PN = +20m.54s.? Ottawa eL? = +52.4m.,
L = +66.4m. Toronto eL = +36.5m., L = +80.1m. Chicago
LE = +84.9m. Ithaca eE = +38m.4s., eN = +38m.29s., LE = +64.9m.
Harvard eE = +46m.6s., L = +58.8m., M = +67.7m. Northfield
eL = +51.5m. Washington eL? = +33.4m., L = +81.4m. Georgetown

1919. Jan. 1d. 3h. 0m. 0s. Epicentre 20.5S. 178.5W.

A = -.936, B = -.025, C = -.350; D = -.026, E = +1.000;
G = +.350, H = +.009, K = -.937.

A focal depth of 0-030 has been assumed.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	-0.4	9.2	45	i 2 5	- 8	—	—	2.6	38.0
Riverview	-2.0	29.9	235	e 6 11	+ 4	i 11 1	+ 4	e 13.3	14.2
Sydney	-2.0	29.9	235	(6 42)	+35	6 42	?P	18.5	19.8
Melbourne	-2.3	36.0	231	(7 36)	+34	7 36	?P	14.8	17.6
Adelaide	-2.5	40.3	239	7 35	- 1	13 25	-10	15.9	18.4
Honolulu	-2.9	46.3	26	e 7 36	-45	—	—	14.5	15.0
Tokyo	-3.8	68.7	324	10 50	+ 6	11 15	?	—	20.8
Manila	-3.8	69.1	298	e 10 50	+ 3	(e 19 42)	+13	39.4	41.7
Osaka	-3.8	70.4	321	10 55	0	20 14	+29	28.0	30.6
Kobe	-3.8	70.6	321	10 56	- 1	(19 57)	+9	20.0	21.0
Mizusawa	-3.8	70.6	329	10 44	-13	19 48	0	—	—
Nagasaki	-3.8	70.6	329	10 52	- 5	19 55	+ 7	—	—
Batavia	-3.9	72.6	317	11 4	- 5	(20 18)	+ 8	20.3	21.0
Taihoku	-3.9	73.5	270	i 11 34	+19	i 21 9	+48	49.0	22.0
Taihoku	-3.9	73.9	306	(11 28)	+11	(20 53)	+27	20.9	33.0
Ootomari	-3.9	75.7	334	11 27	- 1	(21 9)	+21	21.2	—
Zi-ka-wei	-3.9	77.4	311	11 34	- 5	20 24	-44	e 32.6	—
Berkeley	-4.0	78.6	41	e 11 45	- 1	e 21 16	- 5	—	25.0
N.	-4.0	78.6	41	e 11 41	- 5	e 21 15	- 6	—	21.5

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Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.		S.		O-C.		L.	M.
				m.	s.	s.	m.	s.	s.	m.			
Lick	-4.0	78.8	42	e 11	42	-6	e 21	22	-2	---	---	---	21.5
Tucson	-4.1	83.4	41	12	27	+13	22	20	+5	---	---	---	22.5
Victoria	-4.1	84.6	32	11	0	-82	13	19	?	---	17.3	---	22.7
Sitka	-4.1	85.4	21	12	12	-15	22	37	-1	(e 34.9?)	---	---	22.8
Cipolletti	-4.2	91.9	133	---	---	---	22	34	-4	(e 34.9?)	---	---	28.4
Pilar	-4.4	98.5	130	18	12	? PR ₁	(23 36)	---	-81	---	---	23.6	27.8
Andagala	-4.4	98.5	130	18	12	? PR ₁	(23 48)	---	-69	---	---	23.8	27.7
Calcutta	-4.4	98.7	125	15	18	+98	(25 36)	---	+37	---	---	25.6	61.1
Balboa Heights	-4.4	98.7	125	14	54	+74	(25 36)	---	+37	---	---	25.6	54.3
La Paz	-4.4	100.5	290	15	18	+88	23 54	---	-83	---	---	31.8	---
Colombo	-4.4	101.4	85	16	0	+126	---	---	---	---	---	---	---
Chicago	-4.4	102.2	114	i 14	4	+5	i 24	4	-90	(39.6)	---	43.3	---
Kodaikanal	-4.5	103.3	272	---	---	---	---	---	---	---	---	23.0	25.4
Ann Arbor	-4.5	104.1	50	15	27	+78	22	30	-202	---	---	28.0	23.8
Toronto	-4.5	106.6	275	---	---	---	---	---	---	---	---	---	27.0
Georgetown	-4.5	107.0	50	18	0?	? PR ₁	23 30	---	-170	---	---	26.0	---
Washington	-4.5	107.0	50	17	42	? PR ₁	22 12?	---	-248	---	---	26.2	---
Cheltenham	-4.6	110.4	49	(16 12)	---	+94	16 12	?	?	---	---	29.4	31.9
Simla	-4.6	111.3	54	e 17	57	? PR ₁	24 37	---	-141	e 28.2	---	---	---
Ithaca	-4.6	111.3	54	e 18	17	? PR ₁	26 39	---	-19	e 28.7	---	---	---
Ottawa	-4.6	111.3	54	e 17	44	? PR ₁	24 42	---	-136	---	---	28.7	---
Bombay	-4.6	111.5	55	19	20	? PR ₁	25 12	---	-108	---	---	29.2	35.3
Northfield	-4.6	111.5	55	19	53	? PR ₁	26 59	---	-1	---	---	---	34.9
Harvard	-4.6	112.3	297	e 19	0	? PR ₁	26 18	---	-46	---	---	34.2	---
Vieques	-4.6	112.3	47	e 19	20	? PR ₁	e 27 45	---	+36	---	---	37.0	---
Rio de Janeiro	-4.6	112.3	50	e 18	50	? PR ₁	e 22 5	---	?	---	---	---	---
Cape Town	-4.6	113.2	282	e 19	10	? PR ₁	i 26 37	---	-38	e 28.5	---	---	---
Edinburg	-4.6	113.2	282	e 19	30	? PR ₁	---	---	---	---	---	---	---
Dyce	-4.7	115.3	49	e 19	30	? PR ₁	26 54	---	-39	---	---	65.5	---
Hamburg	-4.7	116.2	51	e 20	30	? PR ₁	27 17	---	-25	e 34.5	---	---	67.0
Dublin	-4.7	116.2	51	e 20	24	? PR ₁	27 41	---	-1	---	---	---	36.0
Bidston	-4.7	117.2	79	19	18	? PR ₁	30 6	---	+136	---	---	35.6	35.9
Ascension	-4.7	117.2	79	19	15	? PR ₁	29 19	---	+89	---	---	35.6	30.1
De Bilt	-4.7	118.5	132	---	---	---	(26 18)	---	-102	---	---	26.3	29.9
Oxford	-4.7	123.3	197	---	---	---	---	---	---	---	---	37.3	40.5
Kew	-4.7	123.3	325	i 18	20	[-43]	---	---	---	---	---	---	---
Uccle	-4.7	143.2	2	e 19	38	[-7]	29 13	---	-129	---	---	---	---
Edinburg	-4.7	144.5	3	---	---	---	---	---	---	---	---	---	40.7
Lemberg	-4.7	145.7	332	i 19	12	[-37]	21 18	? PR ₁	---	e 67.2	---	---	69.4
Hamburg	-4.7	146.3	350	i 19	20	[-30]	i 29 23	---	-136	---	---	---	41.6
Dublin	-4.7	146.3	350	i 19	17	[-33]	i 33 30	---	+111	---	---	---	47.2
Bidston	-4.7	146.6	9	19	20	[-31]	41 28	? SR ₁	---	---	---	---	---
Ascension	-4.7	146.9	3	21	42	? PR ₁	34 36	---	+174	---	---	---	64.1
De Bilt	-4.7	146.9	3	19	14	[-37]	29 5	---	-157	i 41.5	---	---	---
Oxford	-4.7	147.6	150	19	0	[-52]	---	---	---	---	---	---	28.6
Kew	-4.7	148.0	354	i 19	23	[-30]	i 29 35	---	?	i 47.6	---	---	---
Uccle	-4.7	148.6	2	19	24	[-30]	i 41 50	? SR ₁	---	---	---	---	---
Shide	-4.7	149.0	2	---	---	---	---	---	---	---	---	---	41.0
Vienna	-4.7	149.5	356	e 19	19	[-36]	e 29 24	?	---	---	---	---	---
Helwan	-4.7	149.5	356	i 19	25	[-30]	i 29 41	?	---	---	---	---	---
Strasbourg	-4.7	149.7	3	19	27	[-28]	i 41 58	? SR ₁	---	---	---	---	---
Paris	-4.7	149.8	340	i 19	23	[-33]	e 19 50	?	---	e 47.6	---	---	89.9
Zurich	-4.7	151.5	295	---	---	---	---	---	---	---	---	---	56.6
Besançon	-4.7	151.5	351	e 19	25	[-33]	i 42 17	?	---	---	---	---	---
Pola	-4.7	151.7	359	i 19	33	[-25]	i 29 52	?	---	---	---	---	62.0
Athens	-4.7	152.5	350	e 19	25	[-35]	---	---	---	---	---	---	---
Moncalieri	-4.7	153.0	353	19	48	[-12]	29 48	?	---	---	---	43.0	---
Florence	-4.7	153.6	340	i 20	18	[-17]	30 18	?	---	e 34.3	---	---	43.0
Monte Cassino	-4.7	154.1	317	e 19	31	[-30]	i 26 26	? PR ₁	---	e 36.3	---	---	---
Rocca di Papa	-4.7	155.0	350	e 19	39	[-23]	28 30	?	---	---	---	38.0	46.2
Pompeii	-4.7	155.3	343	19	54	[-8]	30 14	?	---	---	---	37.4	47.0
Coimbra	-4.7	156.6	336	19	43	[-21]	---	---	---	---	---	---	36.0
Barcelona	-4.7	156.7	339	19	54	[-10]	30 3	?	---	e 51.0	---	---	63.1
Tortosa	-4.7	156.9	834	19	48	[-17]	30 8	?	---	---	---	43.0	55.0
Rio Tinto	-4.7	158.5	21	19	55	[-12]	29 37	?	---	i 43.6	---	---	49.8
Granada	-4.7	158.5	21	20	7	0	30 27	?	---	i 43.7	---	---	50.1
Algiers	-4.7	159.0	359	19	49	[-18]	30 .21	?	---	---	---	32.5	50.0
Algiers	-4.7	159.7	2	19	43	[-25]	29 30	?	---	---	---	43.4	50.5
Algiers	-4.7	161.4	20	---	---	---	---	---	---	---	---	---	48.0
Algiers	-4.7	162.7	14	19	37	[-33]	30 22	?	---	---	---	---	---
Algiers	-4.7	163.7	356	19	58	[-13]	30 45	?	---	---	---	45.0	---

For Notes see next page.

NOTES TO JAN. 1d. 3h. 0m. 0s.

Additional records: Riverview gives $iP = +6m.13s.$, $i = +6m.47s.$, $iPR_1 = +7m.18s.$, $iPR_2 = +7m.58s.$, $iS = +11m.16s.$, $MZ = +14.3m.$, $T_0 = 3h.0m.9s.$, Epicentre $22^\circ 0S$, $179^\circ 5W$. Sydney $SR_1 = +13m.0s.$, P is given as S and $P = 2h.58m.18s.$? Melbourne $SR_1 = +11m.0s.$, $SR_2 = +12m.12s.$ Adelaide $PR_1 = +9m.10s.$, $PR_2 = +9m.55s.$ Manila gives the S and L recorded above as Ps of separate shocks, also $L? = +12m.55s.$ and $L = +40m.47s.$ Osaka $MN = +31.8m.$, $T_0 = 2h.59m.35s.$ Kobe $MN = +20.1m.$ Taihoku $L = +12.0m.$ Ootomari $S = +17m.53s.$, $?PR_1$. Zi-ka-wei $PSE = +21m.30s.$, $PSN = +21m.44s.$, $SR_1E = +25m.52s.$, $LE = +33.1m.$, $T_0 = 3h.0m.39s.$ Sitka gives two sets of e? records: $eN = +28m.14s.$, $eE = +28m.18s.$, and the two sets given as L in the table. Pilar $P = +3m.36s.$ La Paz $PR_1 = +18m.11s.$, $SR_1 = +27m.39s.$ Toronto $L? = +25.9m.$, $i = +28m.48s.$ and other Ls. Georgetown $iE = +30m.20s.$, $iN = +34m.20s.$ and $+38m.30s.$ Washington $L = +32.0m.$ and $+39.5m.$ Ithaca $eE = +24m.45s.$ Ottawa $eSE? = +24m.8s.$ and $+29m.24s.$, $+34m.38s.$, $+38m.40s.$, also several Ls, $T_0? = 3h.12m.55s.$ Northfield $L = +28.8m.$ Harvard $PR_1N = 20m.56s.$, $PR_1E = +20m.57s.$, $eE = +22m.34s.$, $SR_1N = +30m.59s.$, $T_0 = 3h.11m.43s.$ Dyce $iP = +19m.46s.$, $PR_1 = +22m.57s.$ Lemberg $i = +19m.39s.$, $M_1 = +20.2m.$ Bidston $PR_1 = +23m.6s.$ De Bilt $iE = +41m.44s.$, $mN = +48m.10s.$, $mE = +55m.3s.$ Uccle $i_1 = +21m.13s.$, $i(PR_1) = +23m.23s.$, $i_2 = +33m.39s.$, $i_3 = +42m.0s.$ Strasbourg $iN = +42m.25s.$ Zurich $i = +19m.33s.$ Athens $i = +19m.58s.$ Moncalieri $i = +19m.52s.$, $MN = +50.3m.$ Monte Cassino, P may be one hour late. Pompeii, manuscript record $L = +43.8m.$ Coimbra $iN = +46m.31s.$, $iE = +46m.33s.$ Barcelona $PR_1 = +24m.23s.$, $PR_2 = +25m.53s.$, $PR_3 = +27m.59s.$, $iE = +37m.18s.$ Algiers $PR_1 = +24m.46s.$, $i = +35m.8s.$

Jan. 1d. Records also at 0h. (Zi-ka-wei), 1h. (Manila), 4h. (La Paz and Mizusawa), 5h. (Bombay, Batavia, and La Paz), 6h. (Taihoku and Manila), 7h. (Helwan and Manila), 14h. (Mizusawa and La Paz), 16h. (Manila, De Bilt, and Ekaterinburg), 18h. (La Paz), 20h. (San Fernando), 21h. (Paris).

Jan. 2d. Records at 0h. (Ekaterinburg and Taihoku), 3h. (San Fernando), 8h. (Athens), 13h. (Manila), 14h. (La Paz and Athens), 19h. (La Paz), 21h. (Athens, De Bilt, Helwan, and Vienna), 22h. (Manila), 23h. (Helwan and Athens).

Jan. 3d. Records at 0h. (Manila, San Fernando, and Nagasaki), 2h. (Andalgala), 3h. (La Paz, Mizusawa, and Zi-ka-wei), 4h. (Manila, Helwan, Ekaterinburg, De Bilt, and Bidston), 6h. (Zi-ka-wei and Taihoku), 8h. (Uccle and Strasbourg), 16h. (La Paz), 19h. (Ekaterinburg), 22h. (Ascension), 23h. (Manila).

Jan. 4d. 14h. 17m. 37s. Epicentre $5^\circ 4N$, $125^\circ 2E$. (as on 1919 Jan. 1d.).

$$A = -574, B = +813, C = +094.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	m. s.	m. s.	s.	m. s.	s.	m.	m.
Manila	10.1	e 2 41	+10	—	—	4.0	5.6
Batavia	21.7	e 5 1	0	—	—	—	12.5
Zi-ka-wei	26.0	e 5 27	-21	e 10 1	-21	—	—
Rocca di Papa	102.8	—	—	e 31 48	?SR ₁	—	33.8

Manila gives also $MN = +4.8m.$

Jan. 4d. Records also at 1h. (Melbourne and Riverview), 2h. (Helwan, Rocca di Papa, San Fernando, and Manila), 3h. (Athens (2) and Zurich), 4h. (Lick), 5h. (La Paz and Batavia), 9h. (Tokyo, Ootomari, Mizusawa, and Pompeii), 20h. (Zi-ka-wei), 21h. (Zi-ka-wei and Riverview).

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Jan. 5d. 15h. 25m. 30s. Epicentre 40°-0N. 20°-0E. (as on 1918 April 27d. 10h.).

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

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	123	o 57	+ 1	1 42	+ 3	2.1	2.6
Pompeii E.	4.2	281	e 1 5	0	e 2 7	+12	—	2.7
Monte Cassino	4.9	290	e 1 8	- 8	—	—	—	2.9
Rocca di Papa	5.8	291	e 1 15	-15	—	—	—	3.7
Pola	6.6	319	e 2 31	?S	(e 2 31)	-29	e 3.6	4.8
Florence	7.5	303	2 9	+15	—	—	—	5.1
Vienna	8.6	344	e 3 7	+57	e 4 51	+58	5.4	6.1
Moncalieri	10.3	303	e 3 24	+50	5 2	+25	6.4	8.0
Strasbourg	12.2	318	—	—	e 4 50	-34	—	—
Helwan	13.7	134	7 30	?L	—	—	(7.5)	—
Hamburg	15.2	337	e 3 30	-12	—	—	e 8.2	10.9
Paris	15.2	311	—	—	—	—	e 8.5	11.5
Uccle	15.3	320	—	—	—	—	e 8.4	—
De Bilt	15.8	325	—	—	—	—	e 8.5	9.1
Eskdalemuir	21.7	322	—	—	—	—	11.3	—
Edinburgh	22.0	324	2 30	?	—	—	(12.5?)	14.5
Ekaterinburg	31.1	44	e 5 51	-48	e 10 55	-58	15.5	19.2

Additional records: Vienna gives MN = +5.7m. Moncalieri MN = +9.8m.
Hamburg MN = +11.3m. De Bilt MN = +9.2m. Pola and Monte
Cassino give their records at 16h., Central European time. Edinburgh
P may be 10min. too small.

1919. Jan. 5d. 19h. 51m. 40s. Epicentre 29°-6S. 71°-5W.

(as on 1918 May 20d.).

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

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Andalgala E.	5.0	67	4 38	?	—	—	5.3	6.6
N.	5.0	67	4 56	?	—	—	5.7	6.4
Pilar E.	6.9	110	2 44	?S	(2 44)	-23	4.8	6.1
La Quiaca E.	9.1	36	5 56	?L	—	—	8.0	8.8
N.	9.1	36	6 8	?S	—	—	(6.1)	9.0
Cipolletti	9.8	164	4 44	— 6	(4 44)	+21	5.8	7.8
La Paz	13.4	14	3 12	—	5 23	-30	6.3	8.2
Rio de Janeiro	26.2	82	e 6 20	+30	15 2	?L	(15.0)	18.1
Ascension	57.5	81	45 20	?	51 20	?	—	—
Georgetown	68.7	355	e 11 20	+11	13 31?	-99	—	—
Chicago	72.9	350	20 39	?S	(20 39)	-22	43.8	—
Cape Town	74.0	121	20 20	?S	(20 20)	-54	—	39.8
Ottawa	75.1	357	—	—	i 21 27	0	e 43.3	—
Berkeley	82.4	322	—	—	—	—	e 43.0	—
San Fernando E.	90.1	47	27 20	?S	(27 20)	+185	—	63.3
Victoria	90.8	328	—	—	e 48 18	?L	48.3	51.8
Coimbra	91.1	43	—	—	(25 44)	+13	46.3	52.3
Honolulu	97.5	291	e 25 44	?S	—	—	—	63.3
Kew	102.1	38	—	—	—	—	—	62.3
Paris	102.4	40	—	—	e 53 20	?L	(58.3)	—
Eskdalemuir	102.8	34	—	—	—	—	45.3	—
Edinburgh	103.2	34	27 50	?S	(27 50)	+84	—	59.3
Moncalieri	103.6	46	—	—	e 26 8	-21	52.9	—
Uccle	104.4	39	—	—	—	—	—	61.3
Riverview	104.8	218	—	—	—	—	e 48.2	57.2
Florence	105.1	49	—	—	—	—	48.3	64.3
De Bilt	105.4	39	—	—	e 27 57	+71	52.3	58.8
Hamburg	108.6	38	—	—	—	—	e 50.3	—
Mauritius	110.2	130	55 14	?L	—	—	(55.2)	—
Helwan	114.3	69	20 20	?PR ₁	—	—	—	72.0
Ekaterinburg	137.1	37	119 40	[+ 6]	1 32 12	+85	59.3	82.6
Batavia	144.2	178	e 20 34	[+47]	—	—	—	21.2
Colombo	144.8	124	84 20	?L	—	—	(84.3)	93.3
Manila	161.1	220	—	—	e 31 56	?	—	—
Taihoku	167.6	252	—	—	37 51	?	(56.4)	—

Additional records: Pilar gives MN = +6.4m. La Paz T. = 19h.52m.11s.
Rio de Janeiro e = +7m.26s., L = +16.8m. and +17.8m. Chicago
S = +28m.45s., ?SR, L = +46.7m. San Fernando PN = 17h.54m.0s.,
MN = +62.3m. Riverview MN = +60.2m. De Bilt MN = +62.3m.,
T. = 19h.52m.11s. Ekaterinburg i = +23m.9s. and +23m.15s.
Taihoku L = +38.1m. The L in the table is the PS of a supposed second
shock.

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Jan. 5d. Records also at 6h. (Nagasaki), 9h. (Tokyo), 21h. and 22h. (Taihoku).

1919. Jan. 6d. 22h. 24m. 10s. Epicentre 11°7S. 162°5E.
(as on 1918 Mar. 19d.).

A = - .934, B = + .294, C = - .203 ; D = + .301, E = + .954 ;
G = + .193, H = - .061, K = - .979.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	24.4	203	15 32	0	19 46	- 6	e 11.9	14.9
Apia	25.1	98	5 44	+ 5	—	—	11.8	13.2
Melbourne	30.5	208	6 32	- 1	11 50	+ 7	15.7	16.8
Adelaide	31.8	219	6 30	-15	11 32	-33	15.8	17.8
Manila	48.9	302	e 9 2	+ 3	15 16	-49	19.0	21.0
Honolulu	50.9	49	8 32	-40	15 50	-40	e 22.7	30.8
Tokyo	52.0	338	—	—	e 16 7	-37	—	—
Osaka	53.0	332	9 16	-10	16 35	-21	22.6	28.8
Taihoku	54.3	314	e 9 32	- 3	—	—	25.8	27.5
Mizusawa	E. 54.6	340	9 29	- 8	15 48	-88	—	—
	N. 54.6	340	9 43	+ 6	16 24	-52	—	—
Batavia	55.2	272	9 33	- 7	—	—	29.7	21.0
Zi-ka-wei	58.3	320	e 9 49	-12	e 17 31	-32	—	—
Colombo	84.3	278	19 50	?	—	—	—	63.8
Berkeley	85.8	50	—	—	e 23 25	- 3	—	—
Lick	86.0	51	—	—	—	—	e 40.8	—
Kodaikanal	E. 87.3	281	23 14	?S	(23 14)	-30	56.1	63.8
Victoria	88.5	40	23 45	?S	(23 45)	-13	39.5	52.3
	Z. 88.5	40	—	—	—	—	41.8	46.8
Bombay	93.5	289	16 50	?PR ₁	—	—	—	54.2
Mauritius	E. 99.4	247	39 56	?	—	—	53.0	54.2
	N. 99.4	247	43 26	?L	—	—	(43.4)	52.7
Ekaterinburg	106.3	326	e 18 15	?PR ₁	i 27 20	+25	47.8	52.9
Cipolletti	110.7	140	58 44	?L	—	—	68.3	70.9
Chicago	112.5	49	—	—	e 52 50	?L	56.8	—
Toronto	118.3	46	—	—	—	—	62.4	69.0
Ottawa	120.4	44	—	—	—	—	e 61.8	—
Washington	120.9	51	—	—	—	—	e 66.3	—
Cape Town	123.0	216	29 44	?S	(29 44)	+32	—	68.4
Harvard	124.4	46	—	—	55 33	?	62.3	—
Helwan	131.3	300	21 50	?PR ₁	—	—	—	—
Hamburg	132.8	339	—	—	—	—	e 58.8	73.8
Edinburgh	134.4	348	52 50	?L	—	—	(52.8)	88.3
De Bilt	E. 135.7	340	—	—	e 39 44	?	e 58.8	62.3
	N. 135.7	340	—	—	e 46 32	?	—	78.0
Bidston	136.7	347	23 20	?PR ₁	28 26	-138	—	49.6
Uccle	137.0	340	—	—	—	—	—	72.8
Kew	137.9	344	71 50	?L	—	—	(71.8)	121.8
Paris	139.3	340	—	—	—	—	e 72.8	80.8
Florence	139.5	329	50 50	?L	—	—	(50.8)	70.8
Moncalieri	140.4	332	e 37 53	?	50 48	?	68.7	85.9
Tortosa	146.9	335	19 43	[- 8]	—	—	74.8	88.0
Algiers	148.8	324	—	—	—	—	e 80.8	85.3
San Fernando	153.3	340	(37 20)	?	—	—	—	110.3

Additional records: Riverview gives eP = +5m.25s., PR₁ = +6m.37s., PS = +10m.4s., MN = +13.8m., MZ = +17.9m., T₀ = 22h.24m.3s., and assigns the epicentre 12°0S. 163°0E. Apia e₁ = +4m.2s. Adelaide gives PR₁ = +7m.47s., SR₁ = +13m.50s., M₂ = +20.0m. Manila MN = +20.8m. Osaka MN = +30.1m., T₀ = 22h.24m.15s. Victoria records S as P and gives S = +29m.39s. Ekaterinburg S = +25m.35s. Chicago L = 60.8m. and +66.8m. Toronto eL = +66.3m. and +74.4m. Ottawa L = +85.8m. and +100.8m. Cape Town S = +38m.32s. (?SR₁). Harvard gives a fictitious T₀? at 23h.4m.15s.; also LE = +66.7m. Hamburg MN = +79.8m. Eskdalemuir (Δ = 135°0) gives 23h.0m. to 0h.50m. De Bilt gives as epicentre 12°0S. 163°0E. Paris MN = +70.8m. San Fernando MN = +109.8m.; P is given an hour too soon. Riverview, Apia, and Zi-ka-wei record their observations as on 7d.

Jan. 6d. Records also at 0h. (Mizusawa), 1h. (La Paz), 2h. (Helwan), 3h. (Taihoku), 7h. (Taihoku), 18h. (Hokoto, San Fernando, and Taihoku (2)), 20h. (Sydney and Perth), 22h. (Mizusawa), 23h. (La Paz).

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Jan. 7d. Records at 0h. (Rio Tinto, Toronto, Harvard, and Victoria), 2h. (Moncalieri and Colombo), 4h. (Riverview), 12h. (Honolulu), 15h. (Taihoku), 18h. (Zi-ka-wei), 22h. (Zi-ka-wei, Apia, and Riverview, but these have been entered in the table for 6d, 22h., and assumed given for the wrong day), 23h. (Helwan and La Paz (2)).

Jan. 8d. 1h. 46m. 50s. Epicentre 25°-0N. 46°-0W.

A = +.630, B = -.652, C = +.423; D = -.719, E = -.695;
G = +.294, H = -.304, K = -.906.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Harvard	27.0	316	—	—	8 1	?	e 11.1	—
Washington	29.6	305	—	—	—	—	e 14.2	—
Georgetown	29.6	305	—	—	e 11 27	+ 0	e 14.2	—
Ottawa	31.1	319	—	—	e 11 28	-25	e 14.2	—
Toronto	33.0	316	—	—	—	—	16.3	21.2
Ann Arbor	35.5	311	—	—	—	—	—	19.2
San Fernando	35.8	61	13 58	?S	(13 58)	+51	—	21.7
Chicago	38.1	309	(8 30)	+51	8 30?	?P	19.2	—
La Paz	46.8	210	8 41	-5	15 39	+ 1	22.3	26.6
De Bilt	46.9	42	—	—	—	—	e 20.2	22.9
Florence	49.7	51	—	—	—	—	—	24.2
Victoria	63.4	315	30 18	?L	—	—	34.8	37.7
Cape Town	85.0	131	39 4	?L	—	—	(39.1)	41.7
Honolulu	99.4	300	—	—	—	—	e 50.2	56.4

Additional records: Harvard LN = +18.2m. Toronto gives eL = +18.6m.
San Fernando MN = +18.7m. Chicago P? = 1h.45m.45s. and eL? = +14.2m.
La Paz T₀ = 1h.46m.44s. Florence P = 1h. 45m.0s.

Jan. 8d. 10h. 12m. 53s. Epicentre 40°-0N. 47°-0E.

A = +.523, B = +.560, C = +.643; D = +.731, E = -.682;
G = +.439, H = +.470, K = -.766.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	16.3	236	7 7	?S	(7 7)	+ 5	—	—
Ekaterinburg	19.0	23	14 30	+ 1	18 4	+ 2	10.1	12.6
Vienna	23.3	301	5 19	- 1	—	—	—	14.4
De Bilt	30.9	308	—	—	—	—	e 16.1	—
Bidston	36.0	308	—	—	—	—	—	20.1
Edinburgh	36.1	313	18 7	?L	—	—	(18.1)	27.6

Additional records: De Bilt gives eLN = +15.1m. Eskdalemuir ($\Delta = 36^\circ$) records from 10h.30m. to 10h.50m.

Jan. 8d. 21h. 45m. 20s. Epicentre 11°-7S. 162°-5E. (as on 1919 Jan. 6d.).

A = -.934, B = +.294, C = -.203.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	24.4	e 6 10	+38	9 54	+ 2	e 11.9	13.7
Honolulu	50.9	—	—	—	—	25.8	30.2
Batavia	55.2	25 34	?L	—	—	(25.6)	25.8
La Paz	122.5	32 16	?SR ₁	—	—	—	—

Riverview gives MN = +12.9m. Malabar gives eP - iS = 17.5s., so apparently this and Batavia give the record of an independent very local earthquake.

Jan. 8d. Records also at 1h. (Harvard records an explosion at Acton), 6h. (Honolulu and Riverview), 8h. (Helwan and La Paz), 12h. (La Paz), 14h. (Rocca di Papa).

Jan. 9d. Records at 0h. (La Paz and San Fernando), 10h. (La Paz), 11h. (Harvard), 19h. (Manila, La Paz, and Ekaterinburg), 22h. (Ekaterinburg).

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Jan. 10d. Records at 1h. (San Fernando), 4h. La (Paz), 5h. (Helwan, Batavia, La Paz, Manila, and Riverview), 6h. and 8h. (Rocca di Papa), 10h. (La Paz), 16h. (Tokyo), 18h. (Melbourne and Riverview), 19h. (Helwan and San Fernando), 23h. (Nagasaki).

Jan. 11d. 9h. 35m. 10s. Epicentre 14°·5N. 145°·5E. (as on 1917 June 18d.).

$$A = -\cdot798, B = +\cdot548, C = +\cdot250; \quad D = +\cdot566, E = +\cdot824;$$

$$G = -\cdot206, H = +\cdot142, K = -\cdot968.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	23·8	274	e 5 34	+ 8	—	—	10·9	—
Taihoku	24·8	299	—	—	(10 26)	+27	10·4	—
Batavia	43·6	244	i 8 9	-14	—	—	—	—
Honolulu	53·9	75	—	—	—	—	25·7	35·0
Ekaterinburg	75·1	327	i 11 56	+ 6	23 37	?	35·8	47·2
De Bilt	105·1	336	—	—	—	—	e 59·8	70·0
La Paz	147·5	98	19 47	{ - 5 }	—	—	—	—

De Bilt gives eLN = +58·8m.

Jan. 11d. Records also at 0h. (San Fernando), 5h. (Helwan), 10h. and 13h. (Taihoku), 14h. (Riverview).

Jan. 12d. 13h. 21m. Epicentre close to Tokyo, which gives P = +9s., S = +30s. Kobe gives PSE = +19s., PSN = +13s., LMEN = +59s. Osaka P = +22s., L = +56s., M = +1·5m. Mizuawa PE = +65s., PN = +66s., SEN = +2m.10s.

Jan. 12d. 15h. 25m. 55s. Epicentre 22°·0S. 170°·0E. (as on 1917 Feb. 12d.).

$$A = -\cdot913, B = +\cdot161, E = -\cdot375.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	20·4	230	e 4 41	- 5	e 8 32	0	10·6	12·7
Manila	60·4	303	e 10 29	+14	—	—	—	—
Ekaterinburg	118·4	324	—	—	—	—	57·1	—
De Bilt	147·7	343	—	—	—	—	e 73·1	80·3

Riverview gives also iS = +8m.35s., PS = +8m.45s., MN = +13·1m., T₀ = 15h.25m.47s.

Jan. 12d. Records also at 5h. (Helwan), 6h. (Riverview), 7h. (Taihoku), 11h. (Rocca di Papa, Taihoku, and Pompeii).

Jan. 13d. Records at 11h. (Ekaterinburg and De Bilt), 12h. (Manila), 14h. (La Paz), 17h. (Lick), 20h. (Jamaica), 21h. (San Fernando), 22h. (Taihoku).

Jan. 14d. Records at 15h. (Taihoku), 16h. (Kew), 19h. (San Fernando, Batavia, and Lick), 20h. (Taihoku), 21h. (Pompeii).

Jan. 15d. Records at 2h. (Chicago and Riverview), 10h. (Edinburgh), 12h. (Taihoku (2)), 14h. (San Fernando), 22h. (La Paz).

Jan. 16d. Records at 3h. (La Paz), 8h. (Rocca di Papa), 10h., 14h., and 15h. (La Paz).

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1919. Jan. 17d. 11h. 49m. 50s. Epicentre 16°0N. 96°0W.

(as on 1917 Mar. 6d.).

A = -100, B = -956, C = +276; D = -995, E = +105;
G = -029, H = -274, K = -961.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	21.0	323	4 38	-15	8 50	+ 6	10.6	12.0
	N.	21.0	323	4 27	-26	8 39	- 5	10.5	11.8
Chicago		26.7	14	5 51	- 4	10 35	0	e 14.8	—
Georgetown	E.	28.2	33	e 3 51	?	11 17	+14	27.1	—
	N.	28.2	33	e 4 10	?	11 18	+15	28.1	—
	Z.	28.2	33	e 3 56	?	—	—	28.4	—
Washington		28.2	33	e 5 55	-15	11 17	+14	e 23.5	—
Cheltenham	E.	28.2	33	11 19	?S	(11 19)	+16	—	19.7
	N.	28.2	33	11 27	?S	(11 27)	+24	—	19.7
Ann Arbor	E.	28.3	19	6 10?	-1	10 34	-30	—	10.7
	N.	28.3	19	5 46	-25	10 40	-24	—	10.9
	E.	28.3	19	5 34	-37	10 40	-24	—	10.9
	N.	28.3	19	5 40	-31	10 40	-24	—	11.2
Toronto		31.0	24	—	—	—	—	19.9	27.0
Ithaca		31.2	28	e 7 0	+20	11 46	- 8	e 20.2	—
Berkeley		31.8	318	—	—	e 11 31	-34	—	19.5
Ottawa		33.9	26	1 7 0	- 4	e 12 38	- 1	26.2	—
Harvard	E.	33.9	34	e 7 5	+ 1	12 52	+13	22.0	—
Victoria		39.4	331	19 17	?L	—	—	20.8	22.2
	Z.	39.4	331	19 10	?L	—	—	(19.2)	22.7
La Paz		42.6	138	(8 17)	+ 2	14 56	+13	24.3	26.8
Honolulu		58.7	286	—	—	—	—	e 27.7	31.2
Edinburgh		78.4	35	12 10	+ 1	—	—	—	52.2
Bidston		78.9	37	—	—	27 28	?SR ₁	—	44.4
De Bilt		84.0	37	—	—	23 32	+24	e 48.2	52.6
Helwan		111.6	48	32 10	?	—	—	—	—

Additional records : Chicago gives L = +18.2m. Ithaca SN = +11m.50s.
Berkeley MN = +19.8m. Ottawa e?N = +12m.15s., L = +33.2m. and
+44.2m., T₀ = 11h.49m.44s. Harvard e? = 11h.51m.37s., eE = +8m.8s.,
SE? = +12m.39s., LN = +25.2m. La Paz gives P as PR₁ and T₀ =
11h.49m.23s. De Bilt MN = +61.1m. Helwan PN = +34m.10s.

Jan. 17d. Records also at 2h. (San Fernando), 8h. (La Paz), 13h. (Ekaterinburg),
18h. (La Paz), 19h. (Ekaterinburg), 20h. (La Paz), 21h. (San Fernando),
22h. (La Paz, Zi-ka-wei, and Manila), 23h. (De Bilt and Ekaterinburg).

Jan. 18d. 5h. 52m. 30s. Epicentre 3°5S. 102°5E. (as on 1916 April 15d.).

A = -216, B = +975, C = -061; D = +976, E = +216;
G = +013, H = -060, K = -998.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia		5.1	123	e 0 49	-30	2 18	- 2	—	7.6
Colombo		24.9	294	6 6	+29	(9 24)	-37	9.4	11.2
Manila		25.7	45	e 6 24	+39	11 21	+65	16.0	17.1
Kodakanal		28.5	299	10 48	?S	(10 48)	-20	16.0	17.0
Perth		31.1	158	11 59	?S	(11 59)	+ 6	—	—
Taihoku		34.0	33	—	—	e 12 49	+ 9	19.8	21.5
Bombay		36.8	308	7 7	-21	—	—	—	20.8
Zi-ka-wei		39.1	26	e 7 51	+ 4	e 14 0	+ 7	—	24.9
Adelaide		45.9	138	18 27?	?SR ₁	24 55	-173	30.6	37.6?
Mauritius		46.5	245	12 42	?S	(12 42)	—	—	16.7
Melbourne		51.8	137	17 24	?S	(17 24)	+43	36.3	49.0
Riverview		54.5	130	e 17 54	?S	(17 54)	+39	e 31.6	33.0
Sydney		54.5	130	28 42	?L	32 24	?	33.8	37.3
Ekaterinburg		69.1	337	1 11 12	0	1 20 3	- 12	32.5	35.0
Helwan	E.	75.5	302	21 12	?S	(21 12)	-20	—	49.4
	N.	75.5	302	21 0	?S	(21 0)	-32	—	50.8
Rocca di Papa		92.2	312	—	—	(e 24 6)	-31	e 24.1	—
Hamburg		94.4	324	—	—	e 24 30	-30	e 53.5	62.5

Continued on next page.

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		\circ	\circ	m. s.	s.	m. s.	s.	m.	m.
De Bilt	E.	97.3	322	—	—	24 37	-52	e 54.5	64.0
	N.	97.3	322	—	—	e 25 3	-36	e 49.5	59.2
Uccle		97.9	321	—	—	e 24 48	-47	—	59.5
Kew		100.7	322	—	—	—	—	—	67.5
Eskdalemuir		101.8	326	24 47	?S	(24 47)	-86	51.5	—
Bidston		102.1	324	25 54	?S	(25 54)	-22	—	57.0
Ottawa		138.0	2	—	—	—	—	e 79.5	—
Chicago		140.7	12	—	—	—	—	84.5	—
La Paz		158.0	24	20 43	[+37]	34 53	?	83.1	84.1

Additional records: Batavia gives P 10min. early, $T_0 = 5h.51m.30s.$ Manila MN = +19.6m., $T_0 = 5h.52m.53s.$ Zi-ka-wei MN = +26.9m., $T_0 = 5h.52m.35s.$ Adelaide SR₁ = +27m.30s. Riverview gives S as eP and S = +24m.6s., SR₁ = +27m.30s., MN = +33.3m. Ekaterinburg iSR₁ = +24m.26s., epicentre 1°0'S. 102°23'E.; this station gives all its observations one hour late. Hamburg MN = +58.5m. De Bilt eN = +39m.18s., $T_0 = 5h.52m.40s.$, epicentre 4°0'S. 99°3'E. (Sumatra). Eskdalemuir L = +68.5m. La Paz PR₁ = +24m.54s., $T_0 = 5h.53m.55s.$?

Jan. 18d. Records also at 1h. (Nagasaki), 5h. (La Paz), 9h. (Harvard), 13h. (Batavia), 14h. (Florence), 15h. (Taihoku), 21h. (Manila), 23h. (La Paz).

Jan. 19d. Records at 0h. (San Fernando), 4h. (La Paz), 11h. (Ekaterinburg and Rio Tinto), 12h. (Ekaterinburg and Manila), 15h. (La Paz), 17h. (Manila), 19h. (La Paz), 21h. (Taihoku), 23h. (Helwan, La Paz, and San Fernando).

Jan. 20d. Records at 2h. (Barcelona), 9h. (Lick and Berkeley), 13h. (Manila), De Bilt gives a series of ten e's at 13h., due to an explosion in Belgium.

Jan. 21d. Records at 1h. (San Fernando), 2h. (Manila, Monte Cassino, and Rocca di Papa), 7h. (Batavia, Riverview, and Manila), 8h. (Batavia and Monte Cassino), 9h. (Ekaterinburg), 10h. (Rocca di Papa, Paris, Edinburgh, De Bilt, Helwan, Pompeii, Bidston, and Vienna), 11h. (La Paz and Cape Town), 15h. (Mauritius), 20h. (San Fernando).

Jan. 22d. 3h. 24m. 20s. Epicentre 41°0'N. 24°6'E. (as on 1918 Mar. 31d.).

$$A = +.686, B = +.314, C = +.656.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	\circ	m. s.	s.	m. s.	s.	m.	m.
Athens	3.2	1 0	+10	e 1 32	+ 4	11.7	1.8
Pompeii	7.6	1 49	- 6	3 23	- 3	5.7	—
Rocca di Papa	9.0	4 12	?S	(4 12)	+ 9	—	4.6

Zante ($\Delta = 5.7m.$) gives a record at 3h.24m.

Jan. 22d. Records also at 1h. and 4h. (Helwan), 9h. (La Paz), 13h. (Florence), 15h. (La Paz, Tokyo, and Mizusawa), 18h. (La Paz), 19h. (Tokyo, Mizusawa, and Zurich), 23h. (San Fernando and Manila).

Jan. 23d. Records at 4h. (Tokyo), 9h. and 10h. (Taihoku), 14h. and 15h. (La Paz), 21h. (San Fernando and Riverview), 23h. (La Paz).

Jan. 24d. 3h. 25m. 50s. Epicentre 36°0'N. 139°0'E. (as on 1918 May 7d.).

$$A = -.611, B = +.531, C = +.588.$$

Direct comparison with 1918 May 7d. suggests that the epicentre is very probably the same in both cases; but if Osaka and Kobe record P rather than S, seems likely, the epicentre should be further east, say at 36°0'N. 140°4'E.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	\circ	m. s.	s.	m. s.	s.	m.	m.
Tokyo	0.8	0 12	0	0 30	- 2	—	—
Osaka	3.2	e 1 24	?S	(1 24)	- 4	2.2	2.6
Kobe	3.4	1 12	+19	—	—	2.2	3.5
Mizusawa	3.5	1 2	+ 7	—	—	1.8	—

Kobe gives its record at 13h. instead of 3h., MN = +3.4m.

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Jan. 24d. Records also at 0h. (Helwan, La Paz, Riverview, and Apia), 2h. and 17h. (San Fernando), 18h. (Taihoku).

Jan. 25d. Records at 1h. (San Fernando and Helwan), 13h. (La Paz (2)), 15h., 18h., and 19h. (La Paz), 22h. (Lick), 23h. (San Fernando).

Jan. 26d. Records at 4h. and 5h. (La Paz), 6h. (Mizusawa), 11h. (Manila), 16h. (Paris), 23h. (La Paz).

Jan. 27d. 21h. 38m. 20s. Epicentre 50°-0N. 175°-0W.

A = -640, B = -056, C = +364; D = -087, E = +996;
G = -763, H = -067, K = -643.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	31.6	147	—	—	—	—	—	15.1
Mizusawa	32.6	267	(6 33)	-20	—	—	—	—
Victoria	33.1	71	—	—	(12 27)	+ 1	12.4	19.9
Berkeley	39.0	87	—	—	e 14 40?	+48	—	—
Zi-ka-wei	50.1	273	e 9 2	- 6	e 16 1	-19	—	—
Chicago	57.8	61	10 8	+10	18 10	+14	28.2	—
Ann Arbor	59.6	58	—	—	—	—	33.7	—
Toronto	61.1	55	—	—	(17 46)	-51	e 40.7	19.8
Ottawa	61.7	51	—	—	e 25 10	?SR ₁	e 30.7	—
Manila	62.3	261	e 10 33	+ 6	(e 18 12)	-40	—	—
Ekaterinburg	63.7	330	i 10 20	-16	i 18 52	-?	28.7	39.2
Georgetown	65.6	58	—	—	i 21 5	?	e 38.6	—
Edinburgh	73.9	4	33 20	?L	—	—	(33.3)	46.2
Eskdalemuir	74.4	4	21 19	?S	(21 19)	0	—	—
De Bilt	77.9	359	—	—	e 22 52	+53	37.7	46.9
Paris	81.1	1	—	—	—	—	e 49.7	—
Rocca di Papa	88.0	354	e 13 1	- 4	—	—	e 52.6	62.2
San Fernando	93.0	9	23 40	?S	(23 40)	-65	(52.7)	—
Colombo	94.2	285	60 40	?L	—	—	(60.7)	—
Helwan	96.8	337	26 22	?S	(26 22)	4.58	—	—

Additional records: Mizusawa gives PE = +4m.34s. Zi-ka-wei T₂ = 21h.38m.34s. Chicago L = +33.7m. Ottawa L from 22h.11m. to 22h.25m. Manila gives its S as part of an independent shock. Ekaterinburg iPR₁ = +12m.39s., iPR₂ = +14m.20s. Georgetown eE = +20m.51s. De Bilt MN = +49.5m. Helwan PN = +25m.46s.

Jan. 27d. Records also at 0h. (Mizusawa and Athens), 2h. (San Fernando), 4h. (La Paz and Manila), 5h. (Manila), 6h. (La Paz), 10h. (Colombo), 14h. (Mizusawa), 16h. and 23h. (La Paz).

Jan. 28d. Records at 4h. (Helwan and San Fernando), 9h. (Batavia and La Paz), 13h. and 14h. (La Paz).

Jan. 29d. Records at 1h. (Mizusawa), 3h. (Honolulu), 6h. (La Paz), 9h. (Mizusawa), 18h. (Taihoku and Riverview).

Jan. 30d. Records at 1h., 4h., and 8h. (Helwan), 15h. (Manila), 21h. (Lick), 23h. (La Paz).

Jan. 31d. 23h. 43m. 15s. Epicentre 41°-0N. 127°-0W. (as on 1917 June 10).

A = -453, B = -603, C = +656; D = -799, E = +602;
G = -395, H = -524, K = -755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Berkeley	4.8	130	e 1 12	- 2	—	—	—	6.8
Lick	5.7	132	—	—	e 1 55	-41	—	5.3
Victoria	7.8	17	2 11	+13	—	—	3.7	4.3
	Z.	7.8	1 57	- 1	—	—	3.3	4.1
Tucson	E.	15.5	119	—	—	—	8.7	10.8
	N.	15.5	119	—	—	—	9.2	9.5
Chicago		29.2	75	6 13	- 7	10 28	-52	14.8

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	E. 31.9	75	16 15?	?L	—	—	19.0	20.0
	N. 31.9	75	16 3?	?L	—	—	18.8	19.2
Honolulu	32.8	243	—	—	(e 12 27)	+ 6	e 12.4	19.2
Toronto	34.7	70	(5 33)	-98	(13 39)	+48	18.6	—
Ottawa	36.9	66	e 17 25	?L	—	—	18.2	—
Ithaca	37.1	72	—	—	—	—	e 19.5	—
Washington	37.7	77	—	—	e 16 15	?SR ₁	e 19.5	—
Georgetown	37.7	77	—	—	e 15 7	+93	e 20.2	—
Cheltenham	E. 38.8	77	—	—	—	—	19.1	23.8
	N. 38.8	77	—	—	—	—	19.5	22.9
Harvard	40.9	69	—	—	19 5	?L	20.6	23.3
Edinburgh	72.0	29	20 45	?S	(20 45)	-5	—	43.2
Eskdalemuir	72.4	30	19 31	?S	(19 31)	-84	39.8	—
Kew	76.5	32	—	—	—	—	—	42.8
De Bilt	78.0	29	—	—	—	—	35.8	47.4
Uccle	78.7	29	—	—	—	—	—	41.8
Paris	79.7	31	—	—	—	—	e 38.8	47.8
Strasbourg	81.9	31	45 52	?L	—	—	(45.9)	—
Ekaterinburg	81.9	358	—	—	—	—	(48.8)	—
San Fernando	E. 85.4	45	40 45	?L	—	—	(40.8)	47.8
	N. 85.4	45	37 45	?L	—	—	(37.8)	53.8
Helwan	106.3	20	59 45	?L	—	—	(59.8)	—

Additional records : Berkeley gives MN = +4.7m., MV = +6.5m. Toronto gives all its records as Ls. Ottawa L = +31.8m. Georgetown LE = +22.5m., LN = +24.2m. Harvard T₀ = 23h.53m.34s. De Bilt MN = +38.3m. Helwan PN = +64m.45s.

Jan. 31d. Records also at 2h. (Riverview and San Fernando), 5h. (Helwan), 11h. (Tokyo and Mizusawa), 20h. and 21h. (Taihoku).

Feb. 1d. Records at 4h. and 5h. (Helwan), 6h. (Athens), 16h. (Tokyo), 18h. and 20h. (La Paz), 21h. (Rocca di Papa), 22h. (Mizusawa (2) and Ootomari (2)).

1919. Feb. 2d. 20h. 2m. 50s. Epicentre 72°-0N. 2°-8W.

(as on 1917 Aug. 21d.).

A = +.309, B = -.015, C = +.951; D = -.049, E = -.999;

G = +.950, H = -.046, K = -.309.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Dyce	14.7	179	13 32	- 3	—	—	7.0	9.0
Edinburgh	16.1	184	4 40	+47	—	—	—	9.7
Eskdalemuir	16.7	184	3 57	- 4	17 11	0	—	—
Bidston	18.6	180	—	—	—	—	—	19.2
Hamburg	19.2	156	e 4 42	+11	18 16	+10	11.9	14.8
De Bilt	20.2	166	4 48	+ 5	8 33	+ 6	9.5	15.5
Oxford	20.2	177	4 53	+10	8 30	+ 3	10.9	12.6
Kew	20.6	180	—	—	—	—	—	17.2
Shide	21.3	183	—	—	8 53	+ 3	11.6	13.6
Uccle	21.4	169	e 4 59	+ 1	8 55	+ 2	10.2	12.2
Paris	23.3	174	e 5 26	+ 6	e 9 29	- 2	13.2	15.2
Strasbourg	23.9	163	5 25	- 2	9 46	+ 4	14.4	18.2
Besançon	25.1	166	5 34	- 5	10 14	+ 9	15.2	—
Zurich	25.2	162	e 5 41	+ 1	—	—	—	—
Vienna	25.3	149	e 5 43	+ 2	e 9 58	-11	15.3	17.0
Moncalieri	27.5	164	7 20	? 11 4	—	+14	13.7	19.2
Marselles	29.0	168	e 6 41	+23	—	—	17.2	21.2
Ekaterinburg	29.4	87	16 25	+ 3	11 26	+ 2	16.2	—
Barcelona	30.6	173	—	—	—	—	15.0	21.2
Rocca di Papa	31.2	157	6 36	- 4	—	—	22.7	26.8
Tortosa	31.2	175	7 1	+21	11 15	-39	13.6	20.5
Colmbra	31.9	188	7 43	+57	11 57	-10	15.6	17.1
Algiers	35.3	170	—	—	e 12 38	-22	18.2	23.7
San Fernando	35.6	183	14 40?	PR ₁	—	—	18.2	21.2
Ottawa	42.2	272	—	—	e 14 22	-16	e 21.2	—
Northfield	42.4	268	—	—	—	—	e 23.2	—
Harvard	E. 43.5	266	e 3 33	? 14 45	e 15 6	+11	22.3	—
	N. 43.5	266	13 48	? 14 45	e 14 45	-10	—	—

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Toronto	44.9	274	—	—	21 34	?L	e 24.0	25.6
Ithaca	45.1	271	—	—	—	—	e 22.7	—
Helwan	45.9	138	12 10	?	—	—	—	—
Washington	48.5	270	—	—	e 15 43	-17	24.8	—
Georgetown	48.5	270	—	—	e 14 17	-103	e 22.6	—
Chicago	49.1	279	10 40	+99	15 55	-12	19.8	—
Victoria	52.7	314	21 37	?SR ₁	—	—	26.5	29.0
Colombo	81.2	95	52 10	?L	—	—	(52.2)	57.2
Manila	85.8	53	—	—	—	—	e 46.2	—
Capetown	107.0	162	60 58	?L	—	—	(61.0)	—

Additional records: Eskdalemuir gives $T_0 = 20\text{h.}2\text{m.}46\text{s.}$ Hamburg $i = +4\text{m.}49\text{s.}$, MN = +16.1m., $T_0 = 20\text{h.}2\text{m.}21\text{s.}$ Epicentre $67^\circ 0\text{N. } 18^\circ 0\text{W.}$
 De Bilt MN = +15.0m., $T_0 = 20\text{h.}2\text{m.}57\text{s.}$ Epicentre $70^\circ 6\text{N. } 13^\circ 1\text{W.}$
 Uccle M = +17.2m., $T_0 = 20\text{h.}2\text{m.}54\text{s.}$ Paris $T_0 = 20\text{h.}3\text{m.}12\text{s.}$ Strasbourg $T_0 = 20\text{h.}2\text{m.}47\text{s.}$ Vienna MN = +18.2m. Moncalieri MN = +17.7m.
 Rocca di Papa L = +23.2m. Coimbra MN = +17.7m. San Fernando MN = +19.4m. Ottawa L = +33.2m. Harvard eE = +12m.31s., LE = +22.7m. and +23.7m. Toronto E = +17m.58s. Helwan PN = +10m.10s. Georgetown LE = +26.3m., LN = +27.1m. Chicago L = +24.2m. and +26.2m.

Feb. 2d. Records also at 2h. (Manila), 7h. (Manila, La Paz, and Capetown), 8h. and 9h. (Helwan), 17h. and 22h. (Manila).

Feb. 3d. 2h. 23m. 20s. Epicentre $52^\circ 0\text{N. } 170^\circ 0\text{E.}$ (as on 1917 Nov. 14d.).
 $A = -.606$, $B = +.107$, $C = +.788$; $D = +.174$, $E = +.985$;
 $G = -.776$, $H = +.137$, $K = -.616$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa E.	23.7	249	5 40	+15	9 43	+ 5	—	—
N.	23.7	249	5 28	+ 3	9 29	- 9	—	—
Tokyo	26.9	245	e 5 56	- 1	—	—	—	—
Osaka	30.1	248	6 27	- 2	—	—	—	9.0
Manila	53.9	243	e 10 20	+48	—	—	—	14.7
De Bilt	75.1	351	—	—	—	—	e 53.7	—
La Paz	122.4	78	19 25	[+26]	—	—	—	—

Osaka gives MN = +8.6m.

Feb. 3d. Records also at 1h. (Taihoku), 4h. (Helwan), 8h. (La Paz, Ootomari, and Helwan), 10h. (Ekaterinburg), 12h. (Monte Cassino), 14h. (Taihoku), 15h. (La Paz), 19h. (Ekaterinburg and Manila), 20h. (San Fernando), 23h. (Ekaterinburg (2)).

Feb. 4d. Records at 7h. (Mauritius), 11h. and 22h. (Athens).

Feb. 5d. 20h. 4m. 15s. Epicentre $34^\circ 5\text{N. } 138^\circ 0\text{E.}$ (as on 1916 Sept. 15d.).
 $A = -.613$, $B = +.551$, $C = +.566$; $D = +.669$, $E = +.743$;
 $G = -.421$, $H = +.379$, $K = -.824$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.9	50	0 47	+18	1 27	+34	2.5	3.9
Osaka	2.2	274	0 48	+14	—	—	2.1	7.7
Kobe	2.4	275	—	—	1 5	- 1	3.3	3.8
Mizusawa E.	5.2	28	1 14	- 6	2 47	+25	—	—
N.	5.2	28	1 21	+ 1	2 50	+28	—	—
Zi-ka-wei	14.3	262	3 6	- 24	—	—	—	—
Taihoku	17.1	241	2 45	-81	—	—	—	—
Manila	24.9	222	4 19	-78	—	—	—	—
Honolulu	57.1	85	17 45	?S	(17 45)	- 2	11.9	12.0
Hamburg	81.2	332	—	—	—	—	25.3	34.3
Edinburgh	88.8	339	47 45	?L	—	—	e 45.8	52.8
De Bilt	84.1	333	—	—	—	—	(47.8)	—
Helwan	85.6	304	28 45	?SR ₁	—	—	e 45.8	50.8
Monte Cassino	88.4	322	—	—	—	—	35.8	—
Rocca di Papa	88.7	322	—	—	—	—	79.6	—
La Paz	150.8	60	19 21	[-36]	—	—	e 60.5	—

Additional records: Osaka gives MN = +5.6m. Manila MN = +12.1m. De Bilt MN = +52.0m. Helwan gives its two records as PN and PE respectively.

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Feb. 5d. Records also at 1h. (Melbourne, Riverview, and Adelaide), 2h. (San Fernando and Jamaica), 3h. (Helwan), 10h. (La Paz), 15h. (Manila), 19h. (La Paz), 22h. (Jamaica).

Feb. 6d. Records at 0h. (Helwan), 2h. (La Paz), 4h. (San Fernando), 5h. (Monte Cassino), 7h. (Tokyo and Batavia), 8h. (Helwan), 11h. (Marseilles), 12h. (Helwan), 13h. (Strasbourg), 14h. (Rocca di Papa, De Bilt, Vienna, and Athens), 15h. (Athens), 22h. (San Fernando).

Feb. 7d. Records at 5h. (Taihoku), 23h. (San Fernando).

Feb. 8d. Records at 3h. and 10h. (Helwan), 13h. (La Paz), 14h. (Strasbourg (2)), 16h. (Mizusawa), 17h. (Tokyo), 18h. (La Paz, Tokyo, and Mizusawa), 19h. (Mizusawa (2) and De Bilt), 20h. and 22h. (Mizusawa), 23h. (Mizusawa and San Fernando).

Feb. 9d. 12h. 45m. 20s. (I) | Epicentre 30°·6N. 144°·0E.
15h. 24m. 30s. (II) |

As on 1913 April 7d. Compare also 1917 July 10d. 15h., where 30°·6N. 141°·8E. is adopted, but 31°·5N. 144°·0E. is suggested in the note at end.

$$A = -.696, B = +.506, C = +.509; \quad D = +.588, E = +.809;$$

$$G = -.412, H = +.299, K = -.861.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I	Tokyo	6·2	330	3 2	?S	(3 2)	+13	(5·0)	8·4
II		6·2	330	2 11	+36	3 42	?L	(3·7)	5·1
I	Osaka	8·3	302	2 6	0	—	—	4·5	7·1
II		8·3	302	2 6	0	—	—	4·4	7·9
I	Mizusawa	E.	8·8	345	2 32	+19	4 12	+14	—
II		N.	8·8	345	2 30	+17	4 12	+14	—
I		E.	8·8	345	2 28	+15	3 57	-1	—
II		N.	8·8	345	2 38	+25	4 3	+5	—
II	Nagasaki	12·2	284	4 51	?S	(4 51)	-33	6·1	—
I	Zi-ka-wei	19·4	278	e 4 28	-6	—	—	—	—
II		19·4	278	e 5 9	+35	—	—	—	—
I	Taihoku	20·6	260	e 4 50	+2	—	—	—	—
I	Manila	26·5	238	5 27	-26	—	—	—	—
II		26·5	238	e 6 1	+8	10 8	-24	11·1	11·7
I	Honolulu	52·4	85	18 4	?	—	—	30·2	34·7
II		52·4	85	19 6	?	—	—	31·5	36·0
I	Ekaterinburg	61·2	322	i 10 7	-13	i 18 33	-5	26·7	39·0
I	De Bilt	89·8	336	—	—	—	—	e 53·7	—
II		89·8	336	—	—	—	—	e 51·5	—
I	La Paz	147·5	72	19 59	[+ 7]	—	—	—	—

Additional records: Osaka I gives MN = +6·3m. and Osaka II MN = +9·4m.
Manila I MN = +11·4m. Manila II MN = +11·8m., T₁ = 15h.25m.22s.
De Bilt II eLN = +52·5m.

Feb. 9d. Records also at 1h. (Mizusawa), 2h. (Ekaterinburg), 5h. (Manila), 8h. (San Fernando), 13h. (Mizusawa and Helwan), 14h. (Zi-ka-wei and Kobe), 15h. (Taihoku and Ekaterinburg), 16h. (Mizusawa and Kobe), 18h. (La Paz).

Feb. 10d. Records at 0h. (La Paz), 10h. (La Paz and Balboa Heights), 15h. (La Paz), 17h. (Mizusawa), 18h. (San Fernando), 19h. (Zi-ka-wei), 21h. (Monte Cassino).

Feb. 11d. Records at 4h. (Lick), 5h. (La Paz), 13h. (Jamaica), 14h. and 17h. (La Paz), 21h. (Rocca di Papa).

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1919. Feb. 12d. 12h. 41m. 55s. Epicentre 46°0N. 149°0E.

(as on 1917 April 28d.).

A = -596, B = +358, C = +719; D = +515, E = +857;
G = -617, H = +370, K = -695.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Otomari		4.4	281	1 50	+42	—	—	3.2	3.8
Mizusawa	E.	8.9	223	2 18	+3	3 57	-4	—	—
	N.	8.9	223	2 31	+16	4 9	+8	—	—
Tokyo		12.4	218	—	—	—	—	e 6.0	—
Osaka		15.3	227	3 41	-2	—	—	8.1	14.0
Kobe		15.4	228	3 52	+8	—	—	8.0	11.0
Nagasaki		19.8	235	e 4 47	+8	—	—	—	—
Zi-ka-wei		25.9	245	e 5 41	-6	e 10 35	+15	—	17.7
Taihoku		30.3	235	—	—	e 12 34	+55	—	19.8
Manila		39.2	226	e 7 48	0	—	—	24.4	25.1
Honolulu		49.3	102	15 59	?S	(15 59)	-11	23.1	29.3
Ekaterinburg		52.2	317	1 9 5	-16	17 2	+16	27.1	33.2
Victoria		56.2	53	17 37	?S	(17 37)	+1	—	46.6
Bombay		67.0	275	34 1	?L	—	—	(34.0)	42.5
Kodakanal		69.9	266	44 29	?L	—	—	(44.5)	—
Colombo		70.6	361	43 5	?L	—	—	(43.1)	53.8
Hamburg		74.5	337	11 41	-5	—	—	e 37.1	45.2
Edinburgh		75.5	345	21 25	?S	(21 25)	-7	—	49.1
Eskdalemuir		76.0	345	21 36	?S	(21 36)	-1	43.1	—
De Bilt		77.2	335	11 57	-5	—	—	44.1	—
Vienna		77.2	330	11 53	?S	—	—	—	—
Bidston		77.8	344	22 5	?S	(22 5)	+7	(34.1)	48.1
Uccle		78.5	335	11 59	-11	—	—	e 44.1	—
Kew		79.0	342	12 8	-9	—	—	—	48.1
Strasbourg		79.7	336	—	—	—	—	—	—
Riverview		79.8	178	e 21 53	?S	(e 21 53)	-28	e 39.5	47.7
Toronto		80.6	33	—	—	—	—	43.0	53.6
Paris		80.8	335	—	—	—	—	46.1	—
Florence		82.8	330	37 5?	?L	—	—	(37.1?)	—
Moncalieri		82.9	333	12 30	-5	22 59	+3	38.5	49.1
Rocca di Papa		84.1	327	12 32	-11	23 0	-9	e 48.5	57.9
Harvard		84.8	29	—	—	—	—	43.9	—
Helwan	N.	85.6	310	13 5	+14	—	—	—	—
Barcelona		87.7	336	—	—	1 23 39	-10	e 44.3	52.4
Coimbra		91.6	344	—	—	e 48 28	?L	57.4	—
Algiers		91.8	332	—	—	—	—	e 59.1	60.1
Rio Tinto		93.4	341	49 5	?L	—	—	(49.1)	62.1
San Fernando		94.6	340	50 35	?L	—	—	(50.6)	55.1
La Paz		137.3	53	—	—	—	—	e 78.1	—

Additional records: Osaka gives MN = +11.5m. Zi-ka-wei MN = +16.0m.
 T_1 = 12h.41m.25s. Manila MN = +26.5m. Ekaterinburg i_1 = +10m.12s., i_2 = +14m.6s., SR_1 = +20m.32s., SR_2 = +22m.39s., MN = +24.5m. Epicentre 50°56'N. 169°36'E. Hamburg MN = +41.1m.
 Eskdalemuir eN = +27m.4s., eE = +34m.53s. De Bilt eLN = +45.1m.
 Riverview eS = +28m.34s., MN = +52.0m. Moncalieri MN = +51.3m.,
 T_2 = 2h.41m.54s. Rocca di Papa eL = +52.5m. Harvard LN = +50.4m., L = +45.4m. Helwan PE = +15m.5s. Coimbra eN = +54m.58s. San Fernando MN = +62.1m.

Feb. 12d. 20h. 47m. 30s. Epicentre 46°0N. 149°0E. (as at 12h.).

A = -596, B = +358, C = +719; D = +515, E = +857;
G = -617, H = +370, K = -695.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	8.9	223	2 16	+1	3 44	-17	—	—
	N.	8.9	223	2 36	+21	3 58	-3	—	—
Tokyo		12.4	218	—	—	e 5 33	+4	—	—
Osaka		15.3	227	3 51	+8	—	—	8.0	13.8
Kobe		15.4	228	3 47	+3	—	—	8.2	12.0
Zi-ka-wei		25.9	245	5 38	-9	e 10 30	+10	—	—
Taihoku		30.3	235	—	—	e 13 8	?SR ₁	—	19.5
Manila		39.2	226	e 8 26	+38	—	—	23.6	—
Honolulu		49.3	102	16 12	?S	(16 12)	+2	e 25.5	30.5
Ekaterinburg		52.2	317	1 9 2	-19	17 2	+16	25.5	29.2

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Colombo	70.6	261	49 30	?L	—	—	(49.5)	54.5
Hamburg	74.5	337	—	—	—	e	36.5	44.5
Edinburgh	75.5	345	42 30	?L	—	—	(42.5)	49.0
Eskdalemuir	76.0	345	—	—	—	—	41.5	—
De Bilt	77.2	335	—	—	21 58	+ 7	e 36.5	44.3
Vienna	77.2	335	—	—	—	—	e 42.5	49.4
Uccle	77.2	330	e 11 49	-13	e 22 48	+57	e 51.2	—
Strasbourg	78.5	335	e 11 55	-15	—	—	e 44.5	—
Riverview	79.7	336	12 5	-12	—	—	—	—
Moncalieri	79.8	178	e 33 48	?L	—	—	e 45.9	47.6
Rocca di Papa	82.9	333	—	—	21 26	-90	e 40.6	49.0
Helwan	84.1	327	12 26	-17	—	—	e 49.0	55.0
Coimbra	85.6	310	22 30	?S	(22 30)	-56	—	—
San Fernando	91.6	344	—	—	—	—	e 57.5	—
La Paz	94.6	340	54 30	?L	—	—	(54.5)	56.5
La Paz	137.3	53	19 45	[+10]	—	—	—	—

Additional records : Osaka gives MN = +11.3m. Ekaterinburg i = +10m.8s., SR₁ = +20m.24s., MN = +29.1m. Epicentre 50°33'N, 169°56'E.
 Hamburg MN = +43.5m. De Bilt eSR₁N = +27m.25s. Vienna gives S ten minutes wrong. Riverview e? = +39m.30s., MN = +48.0m.
 Rocca di Papa L = +55.0m.

Feb. 12d. Records also at 2h. (Tokyo), 4h. (Rocca di Papa), 6h. (Manila), 7h. (Rocca di Papa), 10h. (Ekaterinburg), 12h. (Mizusawa), 17h. (Manila), 20h. (Rocca di Papa).

Feb. 13d. Records at 2h. (Rocca di Papa and Pompeii), 3h. (San Fernando), 4h. (Helwan), 8h. (La Paz), 12h. (Mizusawa), 17h. (La Paz), 18h. (Helwan), 21h. (Barcelona), 23h. (Manila).

Feb. 14d. 15h. 9m. 20s. Epicentre 47°.5N, 129°0E. (as on 1918 Jan. 30d.).

A = -.425, B = +.525, C = +.737; D = +.777, E = +.629;
 G = -.464, H = +.573, K = -.676.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	17.3	202	—	—	—	—	e 7.8	—
Taihoku	23.5	197	—	—	—	—	10.6	15.6
Manila	33.6	194	—	—	—	—	(17.7)	—
Ekaterinburg	41.1	309	—	—	e 14 23	+ 1	20.7	28.3
Edinburgh	69.1	333	36 20	?L	—	—	(36.3)	—
De Bilt	69.5	327	—	—	—	—	e 36.7	38.0
Eskdalemuir	69.6	333	—	—	—	—	37.7	—
Helwan	73.3	296	45 40	?L	—	—	(45.7)	—

Additional records : De Bilt gives MN = +45.2m. Helwan PN = +49m.40s.
 Manila gives its record at 7m. This has been corrected to 27m.

Feb. 14d. Records also at 8h. (Ekaterinburg), 10h. (La Paz), 13h. (San Fernando), 14h. (Osaka and Kobe), 18h. (Monte Cassino and Rocca di Papa), 22h. (Tokyo), 23h. (Helwan).

Feb. 15d. 2h. 17m. 17s. Epicentre 68°2N, 13°0W.

A = +.362, B = -.084, C = +.929; D = -.225, E = -.974;
 G = +.905, H = -.209, K = -.371.

The observations were compared with the epicentre adopted on 1917 July 9, and possibly on 1917 Nov. 7, viz., 64°0N, 20°0W.; but it was clear that the change would be in the wrong direction. A better solution would perhaps be T₁ = 2h.17m.3s., 70°0N., 11°0W.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Dyce	12.0	151	—	—	—	—	6.7	11.7
Edinburgh	13.1	155	5 43	?S	(5 43)	- 3	—	9.0
Eskdalemuir	13.7	156	—	—	—	—	7.2	—
Bidstøn	15.5	158	6 43	?S	(6 43)	- 1	—	12.7
Oxford	17.4	155	—	—	—	—	8.1	10.9
Kew	17.9	153	—	—	—	—	—	10.7

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hamburg	18.2	132	e 4 43	+24	—	—	—	—
Shide	18.4	156	—	—	—	—	11.2	13.5
De Bilt	E. 18.3	142	—	—	8 2	+15	10.8	14.8
	N. 18.3	142	4 31	+10	—	—	9.2	10.1
Uccle	19.3	145	e 4 31	- 2	e 8 13	+ 5	e 12.7	—
Strasbourg	22.2	142	4 58	- 9	—	—	—	—
Moncalleri	25.6	145	—	—	e 10 28	+14	15.4	19.6
Barcelona	28.0	155	—	—	e 10 55	- 4	e 15.7	20.0
Coimbra	28.1	173	e 3 13	?	—	—	14.6	17.9
Rio Tinto	30.6	171	18 43	?L	—	—	(18.7)	22.7
San Fernando	32.0	170	16 43	?L	—	—	(16.7)	20.7
Ekaterinburg	33.5	72	—	—	—	—	8.7	15.6
Ottawa	38.6	267	—	—	e 13 43	- 3	e 20.7	—
Harvard	N. 39.6	260	—	—	e 14 5	+ 5	20.5	—
	E. 39.6	260	—	—	e 14 12	+12	20.8	—
Ithaca	41.5	265	—	—	—	—	e 24.2	—
Toronto	41.5	269	—	—	—	—	e 22.0	25.1
Chicago	46.2	275	13 43	?	19 28	?SR ₁	32.7	—
Helwan	46.2	123	15 43	?S	(15 43)	+12	(32.7)	—

Additional records: Hamburg gives other records at +12m.43s. and +16m.43s. De Bilt T₀=2h.17m.25s. Uccle T₀=2h.17m.12s. San Fernando MN = +18.7m. Ottawa e = +17m.19s., L = +27.7m. Harvard eE = +17m.42s., LE = +23.1m., LN = +25.5m. Chicago L = +25.7m. Helwan gives its two records as PE and PN respectively.

Feb. 15d. Records also at 0h. (Manila), 2h. (Rocca di Papa), 10h. (Manila), 17h. (Ekaterinburg).

Feb. 16d. 15h. 57m. 53s. Epicentre 37°·7N. 118°·5W.

A = -378, B = -695, C = +612; D = -879, E = +477;
G = -292, H = -537, K = -791.

Neither the epicentre 41°·0N. 127°·0W. of 1917 June 10, nor 36°·8N. 114°·3W. of 1918 May 6 will fit the records.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Lick	N. 2.5	262	10 45	+ 6	11 20	+11	e 1.7	1.9
Berkeley	N. 3.0	273	e 0 48	+ 1	—	—	—	2.3
	E. 3.0	273	e 0 49	+ 2	—	—	—	2.5
Tucson	E. 8.3	129	3 46	?S	(3 46)	+ 1	—	4.2
Victoria	11.2	343	7 45	?L	—	—	9.2	11.2
Chicago	24.0	71	8 12	?	13 7	?L	20.1	—
Toronto	30.0	67	—	—	—	—	9.1	—
Georgetown	E. 32.3	75	e 17 35	?L	—	—	20.6	—
Washington	32.3	75	—	—	—	—	e 16.9	—
Ottawa	32.5	62	—	—	—	—	e 18.4	—
Harvard	36.1	68	1 22 28	?L	—	—	22.7	22.8
De Bilt	E. 77.7	31	—	—	—	—	e 44.1	—

Additional records: Tucson gives PN = +3m.37s. Ottawa i = +18m.46s. De Bilt eLN = +43.1m.

Feb. 16d. Records also at 6h. and 20h. (La Paz).

Feb. 17d. 17h. 57m. 20s. Epicentre 3°·0S. 128°·0E.

A = -615, B = +787, C = -052; D = +788, E = +616;
G = +032, H = -041, K = -999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	18.9	339	e 3 57	-31	7 22	-38	8.8	9.9
Batavia	21.3	260	4 56	- 1	8 49	- 1	—	9.0
Riverview	37.7	146	e 7 40	+ 4	13 29	- 5	e 21.8	26.9
Melbourne	38.1	159	—	—	13 40	+ 1	22.4	23.7
Colombo	49.1	281	14 40	?S	(14 40)	-87	—	34.7
Kodaikanal	52.1	284	33 10	?L	—	—	(33.2)	—
Ekaterinburg	80.4	330	i 11 57	-34	i 22 34	+ 6	34.7	—
Helwan	97.3	300	24 40	?S	(24 40)	-49	—	—
De Bilt	112.0	324	—	—	—	—	e 56.7	—
Edinburgh	114.3	331	67 40	?L	—	—	—	—
La Paz	154.8	141	20 58	[+56]	—	—	(67.7)	—

Additional records: Manila gives MN = +9.2m., T₀ = -17h.57m.2s. Batavia iP = +5m.1s., T₀ = 17h.57m.25s. Riverview MN = +27.2m., T₀ = 17h.57m.40s. Helwan PN = +27m.40s. De Bilt T₀ = -17h.57m.17s., 1°·0S. 127°·4E.

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Feb. 17d. Records also at 3h. (Manila), 4h. (Strasbourg and Riverview), 6h. (Riverview), 3h. (Ekaterinburg), 13h. (Port au Prince), 14h. (Ekaterinburg), 15h. (La Paz), 19h. (Batavia), 21h. (Edinburgh).

Feb. 18d. 3h. 44m. 15s. Epicentre 37°-2N 139°-0E.

A = -601, B = +522, C = +605.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.7	0 21	- 5	0 45	- 3	—	—
Mizusawa	2.5	0 40	+ 1	1 17	+ 8	—	—
Osaka	3.9	—	—	1 52	+ 5	3.0	4.3
Ekaterinburg	53.5	—	—	—	—	33.8	—

Mizusawa gives PN = +41s.

Feb. 18d. Records also at 6h. (Taihoku), 7h. (La Paz (2)), 8h. (La Paz), 16h. (Kodaikanal and Florence), 17h. (Batavia).

Feb. 19d. Records at 0h. (Mizusawa and Tokyo), 3h. (Riverview), 4h. (Berkeley), 12h. (Jamaica), 22h. (La Paz), 23h. (Helwan).

Feb. 20d. 12h. 32m. 55s. Epicentre 27°-0S. 72°-0W. (as on 1913 May 24d.).

A = +275, B = -847, C = -454; D = -951, E = -309;
G = -140, H = +432, K = -391.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala	E. 5.1	99	1 29	+10	—	—	3.3	3.7
	N. 5.1	99	2 29	?S	(2 29)	+ 9	3.3	3.5
Mendoza	6.7	153	1 41	- 1	—	—	—	3.1
Pilar	N. 8.5	126	2 17	+ 8	—	—	3.9	4.9
La Paz	11.1	19	2 41	- 5	4 55	- 2	5.7	6.6
Cipolletti	12.4	166	—	—	—	—	7.9	8.6
Helwan	113.8	67	64 5	?L	—	—	(64.1)	—

Helwan gives PN = +61m.5s. - Mendoza, the records have been diminished by 6 min. Pilar, the records have been diminished by 3m.30s.

• Feb. 20d. Records also at 14h. (La Paz), 15h. (Manila).

Feb. 21d. Records at 1h. (La Paz), 4h. (Eskdalemuir), 8h. (La Paz), 12h. (Zurich), 19h. (Mizusawa).

Feb. 22d. 4h. 16m. 41s. Epicentre 46°-5N. 151°-4E. (as on 1918 Nov. 22d.).

A = -604, B = +330, C = +725; D = +479, E = +873;
G = -637, H = +347, K = -688.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	5.9	285	1 49	+18	—	—	3.9	4.4
Mizusawa	E. 10.5	229	2 37	0	4 38	- 5	—	—
	N. 10.5	229	2 49	+12	4 37	- 6	—	—
Osaka	16.8	231	4 11	+ 9	—	—	—	13.9
Zi-ka-wei	27.6	247	e 5 59	- 5	e 10 47	- 5	—	—
Taihoku	32.0	238	—	—	e 12 12	+ 4	—	21.1
Manila	40.8	229	e 7 48	-13	12 43	-95	13.7	16.4
Honolulu	47.9	104	16 1	?S	(16 1)	+ 8	23.1	30.3
Victoria	54.6	54	34 36	?L	—	—	(34.6)	40.0
Kodaikanal	71.6	265	48 13	?L	—	—	(48.2)	—
Colombo	72.3	261	48 19	?L	—	—	(48.3)	57.3
Hamburg	74.7	339	11 19	-28	—	—	e 40.3	46.3
Edinburgh	75.4	346	19 19	?S	(19 19)	-131	—	50.8
De Bilt	77.3	340	—	—	e 21 43	- 9	e 41.3	45.8
Chicago	77.3	41	—	—	21 27	-25	28.3	—
Bidston	77.7	345	29 1	?SR ₁	44 55	?L	(44.9)	73.3

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m. s.	m. s.	s.	m. s.	s.	m.	m.
Uccle	78.9	340	e 11 55	-17	—	—	—	48.3
Ottawa	79.2	32	e 43 19	?L	—	—	e 49.3	—
Toronto	79.3	35	—	—	—	—	—	42.2
Paris	80.9	340	—	—	—	—	e 45.3	54.3
Moncalieri	83.1	335	—	—	22 48	-10	41.5	48.7
Harvard	83.5	30	—	—	e 43 22	?L	47.7	56.1
Rocca di Papa	84.4	330	12 32	-12	—	—	—	13.8
Helwan	86.4	311	23 19	?S	(23 19)	-15	—	—

Additional records : Osaka gives MN = +12.5m. Zi-ka-wei T₀ = 4h.16m.37s.
 Manila MN = +14.4m., T₀ = 4h.18m.17s. Hamburg MN = +43.3m. De
 Bilt MN = +52.5m. Ottawa L = +54.3m. Toronto L = +53.5m.
 Moncalieri MN = +54.9m. Harvard LE = +51.5m. Helwan PN =
 +25m.19s.

Feb. 22d. Records also at 2h. (Mizusawa, Osaka, and Tokyo), 4h. (Manila), 5h. (Mizusawa), 11h. (Mizusawa, Osaka, Tokyo, Manila, and Ekaterinburg), 17h. (Manila and Ekaterinburg).

Feb. 23d. Records at 0h. (Zurich), 3h. (Helwan and Ekaterinburg), 5h. (Manila), 6h. (Riverview and Ekaterinburg), 9h. (La Paz), 10h. (Tokyo and Helwan), 11h. (San Fernando), 12h. (La Paz and Tokyo).

1919. Feb. 24d. 1h. 56m. 0s. Epicentre 36°-7N. 21°-0E.

A = +.749, B = +.287, C = +.598; D = +.358, E = -.934;
 G = +.558, H = +.214, K = -.802.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m. s.	m. s.	s.	m. s.	s.	m.	m.
Athens	2.5	60	0 42	+ 3	(1 9)	0	1.2	1.8
Pompei	6.4	310	1 36	- 2	2 24	-31	4.0	4.6
Monte Cassino	7.3	313	1 47	- 4	—	—	—	5.3
Rocca di Papa	8.1	311	2 3	0	4 21	+41	e 8.3	5.5
	8.1	311	2 3	0	e 4 5	+25	e 5.0	7.3
Pola	9.7	329	e 2 21	- 5	—	—	e 6.0	6.9
Florence	10.2	317	4 47	?S	(4 47)	+12	—	7.0
Helwan	11.0	125	3 36	+52	—	—	—	14.2
Vienna	12.0	345	i 2 37	-22	e 7 0	?	e 16.0	—
Milan	12.4	318	4 31	+86	—	—	7.1	10.1
Moncalieri	13.0	314	3 12	- 1	5 33	-11	7.1	11.6
Lemberg	13.3	7	e 3 18	+ 1	e 5 30	-21	e 7.0	7.9
Marseilles	13.6	304	—	—	e 6 37	+39	9.0	—
Zurich	14.0	324	e 3 27	+ 1	e 6 22	+14	e 8.3	—
Algiers	14.3	276	e 3 24	- 6	6 20	+ 5	9.3	13.3
Barcelona	15.3	294	—	—	(6 44)	+ 5	e 6.7	12.0
Besancon	15.3	318	4 20	+37	—	—	10.0	—
Strasbourg	15.3	325	e 3 40	- 3	6 40	+ 1	9.2	9.8
Tortosa	16.4	291	3 55	- 2	7 10	+ 6	8.0	14.7
Paris	18.1	318	i 4 16	- 6	e 7 32	-10	11.0	14.0
Uccle	18.4	325	e 4 16	- 6	e 7 42	- 7	e 10.6	11.4
Hamburg	18.5	339	4 22	- 1	7 48	- 3	10.4	11.4
De Bilt	19.0	329	4 28	- 1	8 0	- 2	10.4	12.0
Granada	19.6	279	4 30	- 6	7 14	-61	—	—
Kew	21.1	321	—	—	—	—	—	12.0
Shide	21.2	319	—	—	8 38	-10	12.0	14.4
Bidston	23.6	323	9 0	?S	(9 0)	-36	—	14.0
Eakdalemuir	24.8	326	—	—	19 48	-11	e 13.4	14.8
Edinburgh	25.2	327	9 0	?S	(9 0)	-67	—	15.0
Dyoc	E. 25.7	330	—	—	10 36	+20	15.7	—
	N. 25.7	330	—	—	i 10 18	+ 2	15.6	22.7
Ekaterinburg	33.1	40	6 54	- 3	11 36	-50	16.0	20.1
Capetown	70.7	182	36 54	?L	39 24	?	(36.9)	45.2
La Paz	99.1	256	58 11	?L	—	—	(58.2)	—

Additional records : Athens gives MN = +1.4m. Pola MN = +7.1m.
 All these records are given one hour late, Central European time. Helwan
 MN = +13.3m. Moncalieri MN = +9.8m. T₀ = 1h.56m.19s. Algiers
 T₀ = 1h.55m.47s. Paris T₀ = 1h.56m.13s. Uccle T₀ = 1h.56m.0s.
 Hamburg MN = +11.3m., T₀ = 1h.56m.6s. De Bilt T₀ = 1h.56m.4s.
 Zante ($\Delta = 2^\circ.1$) gives a record 1h.55m.

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Feb. 24d. Records also at 8h. (San Fernando), 9h. (Athens), 21h. (Manila).

Feb. 25d. 22h. 33m. Slight shock recorded near Berkeley and Lick. Probably not from the same origin as that on Feb. 16d., as the Lick records are so much later than those of Berkeley. Berkeley $iP = +52s.$, $iL = +60s.$, $MEN = +62s.$, and $MZ = +66s.$ Lick $ePEN = +67s.$, $iLN = +81s.$, $eLE = +83s.$, $MN = +83s.$, $ME = +88s.$ La Paz $P = +45m.57s.$

Feb. 25d. Records also at 0h. (San Fernando and Riverview), 1h. (Tokyo and Mizusawa), 8h. (La Paz and Taihoku), 9h. (Athens), 11h. (Helwan), 12h. (Apia), 13h. (Ekaterinburg and Taihoku (2)), 15h. (Helwan and La Paz), 16h. (La Paz), 19h. (San Fernando and Taihoku), 21h. (Rocca di Papa).

Feb. 26d. Records at 9h. (Manila and Ekaterinburg), 10h. (Helwan and Batavia), 23h. (San Fernando).

Feb. 27d. Records at 8h. (Ekaterinburg and Helwan), 9h. (Hamburg), 14h. (Ekaterinburg and Helwan), 22h. (San Fernando).

Feb. 28d. Records at 8h. (Manila), 10h. and 11h. (Ekaterinburg), 13h. (Jamaica), 23h. (La Paz).

Mar. 1d. There are great difficulties in reconciling the records. We have only three records of S and P, viz:—

	P.			S-P.		Δ	T ₀		
	h.	m.	s.	m.	s.		h.	m.	s.
Tokyo	13	39	14	2	47	14.5	13	35	41
Manila	13	40	21	4	12	23.5	34	58	
Ekaterinburg	13	47	40	9	28	73.3	9	28	72

If Manila is 1 minute in error we get fair accordance at 13h.35m.54s. Ekaterinburg gives for the epicentre $13^{\circ}17'N.$ $141^{\circ}24'E.$ On 1917 Nov. 24 an epicentre near that place was adopted, viz., $13^{\circ}5'N.$ $143^{\circ}0'E.$, but the residuals for Riverview are $-25s.$ in P and $-44s.$ in S, shewing that the epicentre should be $3^{\circ}5'$ nearer. An unfortunate slip in computation for Melbourne obscures its evidence: Δ should be $51^{\circ}3'$ instead of $22^{\circ}5'$, and then the P observation $+16m.14s.$ when treated as S gives a residual $-21s.$, or $1^{\circ}9'$ nearer. The Azimuth should moreover be 178° instead of 353° . A re-examination of the adopted T₀ = Nov. 24d.11h.10m.52s., shews that any reasonable alteration of it would emphasise these negative differences. We have 5 determinations in all, and the corrections to T₀ indicated are Manila $+30s.$, Mizusawa $+23s.$, Zi-ka-wei $-2s.$, Riverview $-1s.$, Honolulu $+3s.$; mean $+11s.$; and by laying stress on the stations nearer the epicentre, a case could be made out for increasing T₀ still further. The evidence suggests a deep focus; and the single antipodal residual for La Paz: $[-7s.]$, which becomes $[-18s.]$ if we adopt the mean Correction to T₀, supports this view. If we adopt then a correction of $+11s.$ to T₀, and a focal depth of 0.020 , the computation would stand as follows for the stations concerned:—

	Δ	Corrn.		P.	O-C.	S.	O-C.
		focus.	m. s.				
Manila	21.4	-0.9	e 4 53	+ 5	8 29	- 5	
Osaka	22.3	-1.0	5 3	+ 8			
Mizusawa	25.7	-1.1	5 27	- 7	9 34	-21	
Zi-ka-wei	26.6	-1.2	e 5 40	- 2	e 10 18	+ 7	
Batavia	41.0	-1.7	e 7 40	- 9			
Riverview	47.9	-2.0	i 8 17	-22	e 14 58	-29	
Sydney	47.9	-2.0	13 57	1S	(13 57)	-90	
Melbourne	51.3	-2.1	16 3	1S	(16 3)	- 6	
Honolulu	56.5	-2.3	e 9 45	+11	17 39	+28	
Colombo	62.4	-2.4	19 57	1S	(19 57)	+94	

—and these results may be considered a good approximation. This case has been re-examined thus because, though there seems to be similar evidence of deep focus on 1919 Mar. 1, we have then no record from an antipodal station. But with this support from 1917 Nov. 24 we may adventure the hypothesis of a focus below normal. Trial of the actual epicentre and depth of 1917 Nov. 24d. shewed systematic differences suggesting ultimately a greater depth 0.030 , and the epicentre $9^{\circ}0'N.$ $141^{\circ}0'E.$ Thus—

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1919. Mar. 1d. 13h. 36m. 0s. Epicentre 9°0N. 141°0E.

A = -0.768, B = +0.622, C = +0.156; D = +0.629, E = +0.777;
G = -0.121, H = +0.098, K = -0.988.

A focal depth 0.030 below normal has been assumed.

	Focus		P.	O-C.	S.	O-C.	L.	M.	
	Corrn.	Δ							
Manila	-1.2	20.4	288	e 4 21	-10	8 33	+27	10.5	10.8
Taihoku	-1.6	24.5	313	e 5 16	0	—	—	—	11.7
Osaka	-1.7	26.2	350	5 31	-2	—	—	—	15.3
Tokyo	-1.7	26.7	357	(6 1)	+23	6 1	? P	9.4	—
Zi-ka-wei	-1.9	28.8	323	e 5 36	-21	—	—	—	—
Batavia	-2.4	37.3	247	e 6 27	-45	—	—	—	13.0
Riverview	-2.7	43.9	168	—	—	e 14 30	+ 6	e 25.6	27.0
Sydney	-2.7	43.9	168	9 18	+73	—	—	25.6	26.8
Honolulu	-3.6	59.8	70	—	—	—	—	33.0	37.5
Colombo	-3.7	60.5	274	28 0	? L	—	—	(28.0)	—
Ekaterinburg	-3.9	77.3	328	e 11 40	+ 2	21 8	+ 1	30.0	44.7
Helwan	-4.4	102.2	304	—	—	22 0	?	—	—
Hamburg	-4.5	105.1	332	—	—	—	—	e 60.0	65.0
Edinburgh	-4.6	107.9	340	56 0	? L	—	—	(56.0)	61.0
De Bilt	-4.6	108.2	333	—	—	25 12	-77	53.0	69.2
Eskdalemuir	-4.6	109.2	340	—	—	—	—	58.0	—
Strasbourg	-4.6	109.4	330	—	—	—	—	59.2	—
Uccle	-4.6	109.5	333	—	—	—	—	e 59.0	67.0
Bidston	-4.6	110.6	338	34 24	? SR ₁	46 0	? L	(46.0)	64.0
Rocca di Papa	-4.6	110.7	321	40 20	?	—	—	e 63.0	76.1
Kew	-4.6	111.0	337	—	—	—	—	—	69.5
Moncalieri	-4.6	111.7	326	25 49	? S	(25 49)	-73	51.0	66.8
Paris	-4.6	111.8	333	—	—	e 58 0	? L	65.0	72.0
San Fernando E.	—	125.1	326	65 12	? L	—	—	72.5	75.0

Additional records: Manila gives MN = +11.3m., T₀ = 13h.35m.5s. Osaka
MN = +12.3m. Tokyo gives P = +3m.14s. Riverview MN = +26.4m.
Ekaterinburg iP = +11m.48s., SR₁ = +26m.4s. Epicentre 13°47'N.
141°24'E. De Bilt eE = +33m.54s., MN = +66.3m. Rocca di Papa
(S) = +55m.8s. San Fernando MN = +77.0m.

Mar. 1d. Records also at 3h. (Rio de Janerio), 4h. (Athens and Rocca di Papa),
6h. (Riverview), 7h. (Ekaterinburg), 14h. (Coimbra), 15h. (Rocca di
Papa), 17h. (Ekaterinburg, Calcutta, and Helwan).

1919. Mar. 2d. 3h. 26m. 40s. (I) } Epicentre 41°0S, 74°0W.
11h. 45m. 10s. (II) }

A = +0.208, B = -0.725, C = -0.656; D = -0.961, E = -0.276;
G = -0.181, H = +0.631, K = -0.755.

(See note at end on possible deep focus).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
I	Cipolletti	4.9	66	(1 8)	- 8	1 8	? P	—	3.8
II		4.9	66	—	—	(1 44)	-30	1.7	3.7
I	Mendoza	9.3	31	5 50	? S	(5 50)	+90	8.6	10.1
II		9.3	31	5 14	? S	(5 14)	+64	8.1	10.1
I	Pilar	E. 12.4	44	4 2	+57	—	—	8.1	10.1
I		N. 12.4	44	3 44	+39	—	—	7.9	9.6
II		E. 12.4	44	3 38	+33	—	—	7.7	9.2
II		N. 12.4	44	3 38	+33	—	—	7.9	10.6
I	Andalgala	E. 14.8	27	3 32	- 4	—	—	6.8	9.3
I		N. 14.8	27	3 26	-10	—	—	6.8	11.5
II		E. 14.8	27	4 2	+26	—	—	8.9	11.1
I	La Paz	25.0	13	15 52	+14	1 10 56	+53	12.4	16.1
II		25.0	13	15 42	+ 4	10 20	+17	12.5	15.8
II	Rio de Janerio	E. 31.6	64	e 6 44	+ 1	—	—	16.4	20.7
II		N. 31.6	64	e 6 32	-11	—	—	16.5	20.6
I	Vieques	E. 59.6	10	—	—	—	—	33.0	36.8
I		N. 59.6	10	—	—	—	—	33.9	41.8
II		E. 59.6	10	13 36	? PR ₁	—	—	33.0	36.8
II		N. 59.6	10	—	—	—	—	38.0	40.6

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
II Ascension		62.0	75	—	—	—	—	38.8	—
I Capetown		70.2	118	11 20	+ 2	21 2	+34	37.5	50.5
II		70.2	118	11 2	-16	20 32	+ 4	40.5	50.0
I Cheltenham	E.	79.8	358	13 21	+63	22 53	+32	51.8	23.1
I	N.	79.8	358	19 41	+23	22 53	+32	43.5	—
II	E.	79.8	358	22 37	?S	(22 37)	+16	45.6	46.7
II	N.	79.8	358	22 35	?S	(22 35)	+14	36.0	51.8
I Georgetown		79.9	358	12 25	+ 7	22 38	+16	—	—
II	E.	79.9	358	12 36	+18	—	+13	e 36.0	—
II	N.	79.9	358	12 16	- 2	—	—	e 45.8	—
I Washington		79.9	358	12 20	+ 2	22 31	+ 9	e 41.5	—
II	E.	79.9	358	12 16	- 2	22 18	+ 4	e 42.4	—
II	N.	83.4	1	i 12 39	+ 1	23 9	+ 8	e 42.0	47.2
I Harvard	E.	83.4	1	i 11 50	-48	23 3	+ 2	e 42.1	43.8
II	N.	83.4	1	i 12 41	+ 3	23 3	+ 2	e 42.7	46.8
I Ithaca		83.5	358	12 38	- 1	23 0	- 3	e 35.2	—
II	E.	83.5	358	—	—	e 23 6	+ 3	e 38.2	—
II Chicago		83.6	350	12 41	+ 1	23 0	- 5	44.3	—
II	E.	83.6	350	12 39	- 1	22 54	-11	44.8	—
I Ann Arbor	E.	83.7	354	14 32?	?	23 8	+ 2	36.5?	—
I	E.	83.7	354	—	—	23 8	+ 2	39.6	—
II	E.	83.7	354	—	—	23 2	- 4	35.8	38.2
II	N.	83.7	354	13 20?	+40	23 20	+14	35.1	37.8
II	E.	83.7	354	—	—	23 2	- 4	35.5	38.0
I Toronto		84.8	356	—	—	e 24 2	+45	41.1	73.4
II	E.	84.8	356	15 56	?	i 24 8	+51	e 41.0	60.4
I Ottawa		86.4	359	i 12 56	+ 1	e 23 34	0	48.3	—
II	E.	86.4	359	e 12 50	- 5	23 26	- 8	41.8	—
I Apia		86.7	257	e 12 56	- 1	—	—	e 40.4	—
II	E.	86.7	257	—	—	e 22 26	-72	39.4	—
I Lick		89.6	323	—	—	—	—	e 42.3	—
II	E.	89.6	323	—	—	—	—	e 43.3	—
I Berkeley		90.4	323	—	—	—	—	e 36.8	46.1
II	E.	90.4	323	—	—	e 22 38	-100	—	46.0
I Sydney	E.	94.3	216	22 38	?S	30 50	?SR ₁	42.8	45.3
II	E.	94.3	216	22 32	?S	30 56	?SR ₁	42.7	45.2
I Riverview		94.4	216	e 12 36	-64	e 23 46	-74	42.3	44.8
II	E.	94.4	216	e 13 23	-17	e 23 44	-76	e 41.9	44.8
I Adelaide		98.4	205	12 15	-107	24 27	-73	—	54.2
II	E.	98.4	205	—	—	24 19	-85	—	54.8
I San Fernando		99.2	49	19 20	?PR ₁	—	—	51.3	61.3
II	E.	99.2	49	17 38	?PR ₁	—	—	53.9	60.3
I Victoria		99.5	330	24 6	?S	31 58	?SR ₁	e 50.6	55.1
II	E.	99.5	330	23 50	?S	31 12	?SR ₁	41.6	55.3
I Honolulu		99.5	290	25 8	?S	32 26	?SR ₁	47.8	52.3
II	E.	99.5	290	23 56	?S	31 56	?SR ₁	46.8	51.8
I Rio Tinto		99.9	48	16 20	?	—	—	—	68.3
II	E.	99.9	48	15 50	?	—	—	—	65.8
I Coimbra	N.	100.7	44	e 16 49	+155	27 17	+75	47.1	56.0
II	E.	100.7	44	17 50	?PR ₁	—	—	—	49.8
I	E.	100.7	44	e 17 2	?PR ₁	27 18	+76	48.0	59.3
II	N.	100.7	44	e 17 50	?PR ₁	27 18	+76	46.3	59.7
I Granada		101.2	50	i 16 50	+154	26 54	+47	—	—
II	E.	104.3	133	24 14	?S	(24 14)	-142	49.9	52.2
I Mauritius	N.	104.3	133	25 50	?S	(25 50)	-46	48.6	51.0
II	E.	104.3	133	22 26	?S	42 26	?	48.7	51.3
I Algiers	N.	104.3	133	23 50	?S	43 8	?	48.1	50.3
II	E.	104.9	53	e 17 56	?	25 0	-101	40.3	60.3
I Tortosa		106.1	49	20 27	?PR ₁	—	—	i 48.8	60.8
II	E.	106.1	49	18 40	?PR ₁	28 5	+72	38.3	65.9
I Barcelona		107.4	50	e 18 25	[+12]	27 59	+54	e 47.9	62.3
II	E.	107.4	50	e 17 41	[-32]	—	—	e 32.9	61.8
I Marseilles		110.4	48	—	—	e 51 20	?L	61.3	69.3
II	E.	110.4	48	—	—	e 51 50	?L	63.8	64.8
I Shide		111.5	40	—	—	1 28 56	+74	61.1	66.8
II	E.	111.5	40	—	—	1 28 54	+72	61.2	65.1
I Oxford		112.1	40	—	—	—	—	62.5	64.9
II	E.	112.2	43	—	—	e 29 35	+107	53.3	64.3
I Kew		112.2	43	—	—	—	—	e 53.8	60.8
II	E.	112.4	39	—	—	—	—	—	72.3
II	E.	112.4	39	—	—	—	—	—	74.8

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
I Bidston	112.4	37	—	—	19 26	?PR ₁	—	65.1
II	112.4	37	15 50	+41	—	—	—	62.3
I Moncalieri	112.7	49	19 3	?PR ₁	29 35	+103	51.4	69.2
II	112.7	49	20 28	?PR ₁	i 29 34	+102	38.9	68.4
I Besançon	113.1	45	—	—	—	—	62.3	—
II	113.1	45	—	—	—	—	63.8	—
I Eskdalemuir	113.4	36	—	—	29 28	+91	56.3	66.8
II	113.4	36	—	—	29 25	+88	57.3	62.8
I Edinburgh	113.8	35	19 20	?PR ₁	—	—	—	64.8
II	113.8	35	19 20	?PR ₁	—	—	—	64.3
I Rocca di Papa	113.8	53	e 19 36	?PR ₁	e 29 23	+83	e 55.7	65.4
II	113.8	53	e 19 41	?PR ₁	29 21	+81	e 59.7	65.7
I Florence	114.1	50	e 19 8	?PR ₁	—	—	54.3	62.8
II	114.1	50	e 19 50	?PR ₁	29 50	+107	49.8	54.8
I Uccle	114.3	41	e 19 38	?PR ₁	e 29 44	+100	e 51.3	68.3
II	114.3	41	e 19 40	?PR ₁	e 29 32	+88	e 49.8	67.8
I Pompeii	114.4	55	19 22	?PR ₁	29 20	+75	61.3	65.3
II	114.4	55	19 12	?PR ₁	—	—	56.8	64.8
I Zurich	114.6	48	—	—	—	—	e 62.2	—
I Strasbourg	114.8	46	e 19 55	?PR ₁	—	—	64.3	73.3
II	114.8	46	—	—	—	—	63.8	68.8
I Dyce	115.1	34	—	—	1 41 17	?SR ₁	64.3	68.2
II	115.1	34	—	—	1 30 8	+117	62.8	67.8
I De Bilt	E. 115.4	40	—	—	e 29 51	+98	e 55.3	68.2
I	N. 115.4	40	—	—	e 29 54	+101	—	67.3
II	E. 115.4	40	—	—	e 29 46	+93	e 52.8	67.9
II	N. 115.4	40	—	—	e 29 45	+92	—	67.3
I Hamburg	118.8	40	e 20 20	?PR ₁	—	—	e 61.3	74.5
II	118.8	40	—	—	—	—	e 66.8	71.8
I Helwan	E. 120.0	76	e 20 20	?PR ₁	—	—	—	81.0
II	E. 120.0	76	20 20	?PR ₁	—	—	—	79.6
I Lemberg	124.7	50	—	—	—	—	e 69.7	75.2
I Batavia	132.8	180	e 22 41	?PR ₁	—	—	e 69.4	—
II	132.8	180	e 22 32	?PR ₁	—	—	e 68.8	—
I Colombo	138.6	137	68 38	?L	72 26	?	(68.6)	99.3
I Kodalkanal	140.2	131	75 8	?L	—	—	77.6	93.0
II	140.2	131	75 32	?L	—	—	83.0	90.9
I Bombay	144.1	119	71 41	?L	—	—	(71.7)	88.1
II	144.1	119	19 23	[-24]	—	—	—	88.2
I Ekaterinburg	147.3	44	e 19 46	[-6]	i 33 14	+90	63.3	87.7
II	147.3	44	i 19 46	[-6]	30 16	-88	40.8	51.4
I Manila	150.6	210	e 19 53	[-4]	—	—	—	—
II	150.6	210	e 19 50	[-7]	—	—	—	—
I Osaka	156.0	264	—	—	51 18	?	—	77.8
II	156.0	264	—	—	30 33	?	—	86.7
I Taihoku	159.4	224	e 12 33	?	—	—	—	79.8
I Zi-ka-wel	164.2	237	—	—	e 29 59	?	e 75.0	—
II	164.2	237	e 25 32	?PR ₁	e 37 56	?	55.0	87.0

Additional records: Cipolletti I and Mendoza II appear to record 10m. early. Andalgala II gives MN = +11.4m. La Paz (I), MN = +16.3m, T₀ = 3h.26m.47s. Epicentre 42°-2S. 73°-5W. La Paz II ISE = +10m.21s., LN = +12.4m., T₀ = 11h.45m.4s. Epicentre 42°-2S. 73°-5W. Ascension II gives records at +64m.50s. and +74m.50s. Georgetown II LE = +46.5m., LN = +51.5m., T₀ = 3h.26m.50s., Georgetown II LE = +43.0m., T₀ = 11h.45m.5s. Washington I L = +51.3m., T₀ = 3h.26m.47s. Washington II, SR₁ = +27m.50s., L = +41.8m. and +50.8m., T₀ = 11h.45m.22s. Harvard I IE = +27m.59s. and four other L's, T₀ = 3h.26m.59s. Harvard II IE = +23m.13s., IN = +23m.19s., eE = +28m.3s., T₀ = 11h.45m.27s. Ithaca II eN = +22m.57s., eE = +28m.35s. Chicago I L₁ = +35.5m., L = +48.3m. and +64.3m., T₀ = 3h.27m.0s. Chicago II L = +35.5m., +58.3m., and +64.8m., T₀ = 11h.45m.32s. Toronto I PR₁ = +19m.56s., eL = +67.3m. Toronto II, S = +25m.50s. and +30m.14s., L = +52.2m., IL = +58.4m., eL = +63.6m. Ottawa I eSN = +23m.19s., eL = +43.3m., L = +58.3m. and +63.3m., T₀ = 3h.27m.11s. Ottawa II SR₁ = +29m.32s., L = +44.8m. and +54.8m., T₀ = 11h.45m.21s. Apia II e₂ = +28m.56s. Riverview I MZ = +47.3m. Riverview II PS = +25m.52s., eSR₁ = +30m.27s. and +31m.23s., MN = +44.7m., MZ = +47.0m. Adelaide II, SR₁ = +30m.56s. San Fernando II MN = +61.0m. Victoria I L = +43.8m., MZ = +50.7m. Victoria II MZ = +55.3m. Coimbra I Milne record P = +13m.30s., S = +27m.20s., M = +50.9m. Coimbra II Milne record P = +13m.27s., S = +27m.31s., L = +47.8m., M = +57.3m. Algiers II (?) = +28m.2s. Paris II MN = +67.8m. Moncalieri I MN = +66.9m. Moncalieri II MN = +67.2m. Eskdalemuir I PR₁ = +19m.44s. Dyce I LN = +63.3m. De Bilt I ePR₁ = +20m.7s.

Notes continued on next page.

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De Bilt II ePR₁ = +20m.4s. Hamburg I MN = +75.5m. Helwan I PN = +22m.2s., MN = +72.1m. Helwan II PN = +21m.14s., MN = +80.3m., Lemberg I 74m.2s. Batavia I eL₂ = +78.6m., eL₃ = +83.7m. Batavia II eL₂ = +78.8m., eL₃ = +83.8m. Kodaikanal II gives P = +22m.14s. (IPR₁) as part of an earlier shock. Ekaterinburg I IP = +19m.48s., i₁ = +23m.2s., i₂ = +26m.32s., j₁ = +30m.12s., i₁ = +36m.4s. Epicentre 28°30'S. 160°19'E. Osaka I MN = +87.2m. Osaka II MN = +88.7m. Zi-ka-wei gives its eL one hour early. Zi-ka-wei II SR₁E = +45m.0s., SR₁N = +51m.57s., MN = +83.6m.

NOTE TO 1919 MAR. 2 AND 9.

Some of the residuals for the stations nearest the epicentre are so large as to raise doubts whether the solution is even approximately correct. It seems well therefore to call attention to the following points. The residuals for six N. American stations are as follows:—

	Δ	Az.	P Residuals.			S Residuals.		
			2d.3h.	2d.11h.	9d.	2d.3h.	2d.11h.	9d.
Georgetown	79.9	358	+7	+8	—	+16	+13	+5
Washington	79.9	358	+2	-2	+4	+9	-4	0
Harvard	83.4	1	+1	+3	+1	+2	+2	+3
Ithaca	83.5	358	-1	—	—	-3	+3	-17
Chicago	83.6	350	+1	-1	-7	-5	-11	-2
Ottawa	86.4	359	+1	-5	+2	0	-8	-8
Mean			+2	+1	0	+3	-1	-3

- (1) In view of this concurrent testimony it seems clear that no great alteration of T₀ can be made in any of the three cases.
- (2) The latitude of the epicentre is checked by these stations which lie close to zero azimuth.
- (3) The longitude may be inaccurate, but the residuals for Apia (-1s. for P on Mar. 2d. 3h. and -12s. for S on Mar. 2d. 11h.) in Azimuth 257° are reassuring on this point.
- (4) Nevertheless La Paz has the residuals

	Δ	Az.	P.			S.		
La Paz	25.0	13	+14s.	+4s.	+15s.	+53s.	+17s.	+30s.

The mean value in P is +11s. and in S +33s., indicating that the epicentre should be moved 1°.1 or 1°.8 further away from La Paz. Yet we cannot do this without upsetting the accordance of the N. American stations. As regards other S. American stations:—

Cipolletti and Rio de Janeiro are in azimuths 66° and 64°: they support Apia that the longitude of the epicentre is well determined, but tell us little about latitude. Mendoza is affected by some large error of 3 or 4 min. Pilar in azimuth 44° would support La Paz in requiring a latitude further south; but contradicts Apia, Cipolletti, and Rio de Janeiro as regards the longitude.

Ahdalgala has P residuals -7s. +26s. +57s. The mean value supports La Paz, but the discordances from the mean show that the accidental error is also large.

Vieques gives us no help.

- (5) If we accept the La Paz observations as requiring an epicentre further S. than those of N. America, the only way of reconciling them is by supposing a focus below normal depth. With a depth of 0.020 the epicentre might be moved 2°.7 further South (to 43°.7); and the new Δ for La Paz would be effectively

$$25^{\circ}0 \text{ (above)} + 2^{\circ}7 \text{ (new latitude)} - 1^{\circ}2 \text{ (deep focus)} = 26^{\circ}5;$$

while that of a N. American station, say Washington, would be effectively

$$79^{\circ}9 \text{ (above)} + 2^{\circ}7 \text{ (new latitude)} - 2^{\circ}7 \text{ (deep focus)} = 79^{\circ}9.$$

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- (6) It may be remarked that this alteration of epicentre brings the focus nearer to Riverview and Adelaide, which lie near azimuth 180°. The effective Δ for Riverview is thus doubly altered

$$94^{\circ}.4 \text{ (above)} - 2^{\circ}.3 \text{ (new latitude)} - 2^{\circ}.8 \text{ (deep focus)} = 89^{\circ}.3.$$

The large negative residuals

in P	-64s. -17s. -15s.	now become	-36s. +11s. -23s.
in S	-74s. -76s. -64s.	,,	-20s. -22s. -10s.

which is a considerable improvement.

The residuals are still negative and call for a displacement of the epicentre further West to correct them. And this would be supported by Apia, &c., which lie to the East: the increase in Δ for them would be balanced by the correction for focal depth.

- (7) The only values of [P] are for Bombay, Ekaterinburg, and Manila, and show a mean value [-9s.]. For a focal depth .020 this should be about [-17s.].

The evidence taken together therefore points to a moderate focal depth (0.020), though not very strongly; and to an epicentre at (say) 43° 7S. 77° 0W.

Mar. 2d. 16h. 56m. 50s. Epicentre 34° 0N. 96° 0E. (as on 1915 April 28d.).

$$A = -.087, B = +.824, C = +.559.$$

	Δ	P.	O-C.	S.	O-C.	L.
	°	m. s.	s.	m. s.	s.	m.
Calcutta	E. 12.2	2 58	- 4	5 22	- 2	—
	N. 12.2	2 52	-10	5 22	- 2	—
Zi-ka-wei		e 4 57	—	e 9 11	+16	—
Manila		29.9	—	—	—	e 14.2
Helwan		54.1	38 10	?L	—	(38.2)

Helwan gives PN = +33m.10s.

Mar. 2d. Records also at 2h. (La Paz), 4h. (Colombo), 5h. (Pola), 10h. (Simla), 13h. (Pola), 19h. (La Paz).

Mar. 3d. Records at 1h. (San Fernando), 2h. (Zi-ka-wei, Batavia, and Manila), 3h. (Ekaterinburg and Helwan), 6h. (Ekaterinburg, Helwan, and Calcutta), 10h. (Batavia), 11h. (Bidston), 15h. (Helwan), 16h. (Batavia), 21h. (Pompeii).

Mar 4d. 8h. 1m. 25s. Epicentre 48° 0S. 134° 0E.

$$A = -.465, B = +.481, C = -.743; D = +.719, E = +.695; G = +.514, H = -.535, K = -.669.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Riverview	19.1	49	e 4 30	0	e 8 5	+ 1	e 9.2	9.8
Sydney	E. 19.1	49	4 47	+17	(8 5)	+ 1	8.1	9.7
Colombo	72.5	303	41 35	?L	—	—	(41.6)	47.6
Capetown	79.9	229	38 53	?L	—	—	(38.9)	—
Honolulu	92.1	60	—	—	—	—	46.6	48.6
La Paz	112.5	158	58 12	?L	'59 26	?	60.0	—
Victoria	130.8	59	62 20	?L	—	—	(62.3)	71.2
Rocca di Papa	E. 139.0	284	e 16 53	-14	—	—	—	17.6
	N. 139.0	284	i 17 5	- 2	—	—	—	17.2
Algiers	142.8	270	—	—	—	—	79.6	84.1
Moncalieri	143.7	285	—	—	—	—	37.4	—
De Bilt	147.6	297	—	—	e 41 59	?SR ₁	e 82.6	94.0
Paris	148.4	290	—	—	—	—	81.6	—
San Fernando	148.8	263	76 35	?L	—	—	81.8	86.6
Kew	150.8	294	—	—	—	—	—	81.6
Colmbra	152.2	268	—	—	68 59	?	77.1	80.6
Ekdalemuir	153.0	302	—	—	42 35	?SR ₁	—	—
Toronto	156.5	88	—	—	—	—	77.4	—

Additional records: Riverview gives MZ = +14.2m. La Paz probably records a separate shock. Rocca di Papa ePN = +34m.44s. ePE = +84m.50s., M = +35.7m, also eL = +63.6m. De Bilt MN = +82.4m.

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Mar. 4d. Records also at 0h. (Lick), 3h. (Balboa Heights), 6h. (Helwan), 7h. (Batavia), 10h. (Ekaterinburg), 12h. (Tokyo and Mizusawa), 22h. (Lick and Helwan).

Mar. 5d. Records at 1h. (Helwan and San Fernando), 16h. (Ekaterinburg), 20h. (Honolulu), 21h. (Ekaterinburg and Rocca di Papa), 23h. (Tokyo).

Mar. 6d. 3h. 13m. 53s. Epicentre 3°48. 113°5E. (adopted from Batavia).

A = -476, B = +877, C = -059; D = +879, E = +477;
G = +028, H = -052, K = -998.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	11.9	256	2 58	0	6 30	?L	(6.5)	8.2
Manila	18.1	8	4 19	+ 1	—	—	7.5	8.0
Perth	28.6	185	—	—	12 38	+88	—	—
Colombo	39.9	285	12 7	?	—	—	—	30.1
Ekaterinburg	76.0	331	i 11 49	- 6	i 21 28	- 9	32.1	35.6
De Bilt	106.9	324	—	—	e 28 7	+67	e 58.1	69.3
La Paz	159.1	162	27 43	?	—	—	—	—

Manila gives MN = +7.6m. Batavia records the adopted T, and epicentre.
Ekaterinburg gives its record as 4h. instead of 3h., and records epicentre 8°49'S. 107°5 E. De Bilt MN = +59.8m.

Mar. 6d. 13h. 12m. 4s. Epicentre 36°7N. 21°0E. (as on 1919 Feb. 24d.).

A = +749, B = +287, C = +598.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.5	e 0 38	- 1	e 1 9	0	i 1.6	2.0
Pompei	6.4	2 56	?S	(2 56)	+ 1	6.9	—
Rocca di Papa	8.1	e 2 3	0	—	—	—	3.2
Strasbourg	15.3	e 4 13	+30	—	—	—	—
De Bilt	19.0	—	—	e 8 50	+48	e 13.9	15.3
Ekaterinburg	33.1	—	—	—	—	15.4	—

De Bilt gives MN = +15.1m.

Mar. 6d. Records also at 0h. (Helwan and Ekaterinburg), 4h. (Batavia), 6h. (Paris), 7h. (Batavia, Manila, and Ekaterinburg), 8h. (De Bilt), 21h. (Mizusawa, San Fernando, and Tokyo).

Mar. 7d. Records at 1h. (Ekaterinburg, Batavia, and Manila), 2h. (Helwan), 11h. (Ekaterinburg and La Paz), 19h. (Tokyo and Mizusawa), 20h. (Ekaterinburg), 23h. (Batavia).

Mar. 8d. Records at 0h. (Mizusawa), 1h. (Mizusawa and Ekaterinburg), 4h. (La Paz), 10h. (Rocca di Papa), 12h. (Rocca di Papa and Mendoza), 18h. (Manila and La Paz), 22h. (Rocca di Papa).

1919. Mar. 9d. 3h. 16m. 45s. Epicentre 41°0S. 74°0W.

(As on 1919 Mar. 2d. : See note on that date suggesting 43°7S. 77°0W., with focal depth 0.020).

A = +208, B = -725, C = -656; D = -961, E = -276;
G = -181, H = +631, K = -755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Cipolletti	4.9	66	—	—	—	—	0.1	1.8
Mendoza	9.3	31	5 3	?S	(5 3)	+53	8.0	10.4
Andalgala	E. 14.8	27	7 33	?L	—	—	8.8	12.2
	N. 14.8	27	4 33	+67	—	—	9.0	12.0
La Paz	E. 25.0	13	e 5 55	+17	i 10 31	+28	12.9	16.7
	N. 25.0	13	15 51	+13	i 10 35	+32	12.9	16.4
Rio de Janeiro	E. 31.6	64	e 7 3	+20	12 45	+44	16.8	22.8
	N. 31.6	64	e 6 39	- 4	12 39	+38	17.2	20.6
Vieques	E. 59.6	10	—	—	—	—	33.2	35.1
	N. 59.6	10	—	—	—	—	40.2	40.8

Continued on next page.

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Capetown	70.2	118	11 45	+27	31 45	?	44.8	48.0
Cheltenham	E. 79.8	358	21 59	?S	(21 59)	-22	43.9	—
	N. 79.8	358	22 2	?S	(22 2)	-19	45.0	—
Washington	E. 79.9	358	12 22	+ 4	22 22	0	e 42.2	—
Georgetown	N. 79.9	358	—	—	22 27	+ 5	e 43.2	—
Harvard	E. 83.4	1	—	—	23 7	+ 6	e 42.6	54.9
	N. 83.4	1	12 39	+ 1	23 1	0	—	—
Ithaca	E. 83.5	358	—	—	e 22 46	-17	e 38.9	—
Chicago	83.6	350	12 33	7	23 3	- 2	44.2	—
Ann Arbor	E. 83.7	354	—	—	25 51	+165	46.8	52.2
Toronto	E. 84.8	356	11 57	-50	i 24 15	+58	e 42.8	49.8
Ottawa	86.4	359	12 57	+ 2	23 26	- 8	e 43.2	—
Apia	86.7	257	—	—	—	—	39.6	—
Berkeley	90.4	323	—	—	—	—	e 39.8	—
Sydney	E. 94.3	216	19 45	?PR ₁	—	—	44.6	46.2
Riverview	94.4	216	12 49	-51	23 56	-64	44.2	48.4
Adelaide	98.4	205	—	—	24 59	-41	44.8	55.7
San Fernando	99.2	49	24 27	?S	(24 27)	-21	57.8	64.2
Honolulu	99.5	290	25 51	?S	34 3	?SR ₁	46.2	53.0
Victoria	99.5	330	33 49	?SR ₁	40 16	?	47.7	56.1
Rio Tinto	99.9	48	18 15	?PR ₁	—	—	—	78.2
Coimbra	100.7	44	17 29	?PR ₁	27 23	+81	47.8	50.2
Algiers	104.9	53	e 18 51	?PR ₁	25 8	-93	51.2	59.8
Perth	106.5	189	—	—	37 29	?SR ₁	—	—
Barcelona	107.4	50	—	—	e 26 45	-20	e 50.4	65.2
Marseilles	110.4	48	—	—	—	—	e 61.8	65.2
Shide	111.5	40	19 26?	?PR ₁	29 1	+79	—	69.6
Oxford	112.1	40	—	—	—	—	62.9	65.6
Paris	112.2	43	—	—	e 53 15	?L	62.2	63.2
Bidston	112.4	37	—	—	29 15	+86	—	55.0
Kew	112.4	39	—	—	—	—	—	75.2
Moncalieri	112.7	49	19 33	?PR ₁	29 40	+108	55.2	69.5
Edinburgh	113.8	35	20 15	?PR ₁	—	—	—	64.2
Rocca di Papa	113.8	53	e 19 42	?PR ₁	e 29 31	+91	e 60.9	68.0
Florence	114.1	50	19 42	?PR ₁	—	—	—	59.2
Uccle	114.3	41	—	—	—	—	e 52.2	70.2
Pompeii	114.4	55	19 49	?PR ₁	—	—	63.2	71.3
Strasbourg	114.8	46	—	—	e 22 5	?	—	—
Dyce	115.1	34	—	—	—	—	73.2	—
De Bilt	115.4	40	—	—	e 29 55	+102	e 55.2	68.7
Pola	116.3	50	e 29 52	?S	(e 29 52)	+92	e 58.9	74.0
Hamburg	118.8	40	—	—	—	—	e 65.2	73.2
Vienna	119.5	49	—	—	—	—	e 70.2	71.2
Helwan	120.0	76	21 9	?PR ₁	—	—	—	81.2
Lemberg	124.7	50	—	—	—	—	e 73.6	75.2
Colombo	138.6	137	70 15	?L	—	—	89.2	99.2
Kodalkanal	140.2	131	41 9	?SR ₁	—	—	77.4	93.8
Manila	150.6	210	e 19 59	[+ 2]	—	—	—	—
Simla	154.8	103	e 75 9	?L	—	—	(e 75.2)	—
Taihoku	159.4	224	—	—	—	—	e 74.8	—
Zi-ka-wei	164.2	237	e 24 55	?PR ₁	—	—	—	—

Additional records : La Paz gives iN = +11m.26s., T₁ = 3h.16m.43s., epicentre 42°5S, 73°5W. Harvard LE = +45.5m., T₁ = 3h.17m.0s., Ithaca eN = +22m.55s. Chicago L? = +38.2m. and 62.2m., T₁ = 3h.16m.46s. Ann Arbor SN = +26m.3s., LN = +47.2m. Toronto PR₁ = +18m.21s., iS = +30m.3s., eL = +54.0m. and +57.8m. Ottawa PR₁N = +16m.27s., SE = +23m.40s., L = +55.2m., and four other L's. T₁ = 3h.17m.10s. Riverview PS = +25m.59s., MN = +46.8m., MZ = +47.3m., T₁ = 3h.16m.27s. Adelaide SR₁ = +31m.41s. San Fernando MN = +62.2m. Coimbra LN = +47.2m. Barcelona eL = +28.6m., M = +29.8m. Paris MN = +71.2m. Moncalieri MN = +68.8m. De Bilt ePR₁ = +20m.0s., MN = +68.8m. Pola gives its records at 4h. (Central European time ?). The Taihoku record has been assumed one hour too early.

Mar. 9d. Records also at 4h. (Tucson), 5h. (Ekaterinburg), 8h. (Ekaterinburg and Helwan), 15h. (Ekaterinburg, Batavia, and Helwan), 19h. (Helwan and Ekaterinburg).

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Mar. 10d. 21h. 19m. 45s. Epicentre 27°·5N. 123°·5E.

A = -·490, B = +·740, C = +·462; D = +·834, E = +·552;
G = -·255, H = +·385, K = -·887.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	3·0	216	—	—	1 33	+10	2·4	2·7
Zi-ka-wei	4·1	334	1 53	?S	(1 53)	0	(2·8)	4·1
Kobe	12·2	51	3 6	+ 4	—	—	—	7·8
Osaka	12·5	52	3 8	+ 2	—	—	—	8·1
Manila	13·2	191	3 18	+ 2	5 55	+ 6	6·7	7·2
Tokyo	16·0	56	4 1	+ 9	6 29	-26	—	—
Mizusawa	N. 18·7	47	4 11	-14	7 38	-17	—	—
Batavia	37·4	208	e 7 26	- 7	—	—	—	14·4
Colombo	46·2	251	15 15	?S	(15 15)	-16	—	—
Ekaterinburg	52·6	321	1 9 29	+ 5	16 53	+ 2	25·2	29·9
Riverview	66·7	155	—	—	e 19 16	-30	e 31·6	38·8
Honolulu	70·6	75	18 57	?S	(18 57)	-96	e 35·2	45·2
Lemberg	E. 75·0	319	—	—	—	—	e 39·6	41·2
Helwan	78·5	298	19 15	?S	(19 15)	-171	—	—
Hamburg	80·8	327	—	—	—	—	e 42·2	44·2
De Bilt	84·0	327	—	—	e 29 39	?SR ₁	e 48·2	49·3
Bidston	86·8	331	23 51	?S	(23 51)	+12	—	48·8
Moncalieri	87·0	320	—	—	e 38 1	? 1	50·4	—
San Fernando	N. 100·5	320	24 15	?S	(24 15)	-106	—	—

Additional records: Osaka gives MN = +7·8m. Manila MN = +7·4m., T₁ = 21h.19m.49s., Ekaterinburg i = +17m.41s., PR₁ = +19m.5s., SR₁ = +20m.45s., SR₂ = +22m.4s., i = +23m.29s., epicentre 31°·0'N. 127°·29'E. Helwan PN = +20m.15s. Hamburg MN = +48·2m. De Bilt MN = +51·7m. Bidston gives S = +30m.15s. ?SR₁.

Mar. 10d. Records also at 1h. (Taihoku and San Fernando), 9h. (Mendoza), 17h. (Colombo), 18h. (Helwan), 19h. (Manila, Ekaterinburg, and Nagasaki), 20h. (Helwan).

Mar. 11d. Records at 0h. (Rocca di Papa), 6h. (La Paz), 8h. (Helwan, Ekaterinburg, and Manila), 10h. (Batavia), 14h. (Taihoku).

Mar. 13d. 10h. 31m. 5s. Epicentre 44°·5N. 140°·0E.

A = -·546, B = +·458, C = +·701; D = +·643, E = +·766;
G = -·537, H = +·451, K = -·713.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	2·9	42	1 17	?S	(1 17)	- 3	1·8	1·9
Mizusawa	E. 5·5	170	1 28	+ 3	2 21	-10	—	—
Tokyo	N. 5·5	170	1 27	+ 2	2 22	- 9	—	—
Osaka	8·9	181	3 29	?S	(3 29)	-32	—	—
Zi-ka-wei	10·5	201	3 12	?S	(3 12)	-91	4·9	6·1
Ekaterinburg	19·7	233	e 4 48	+11	e 9 32	+75	—	—
Osaka	48·8	314	e 8 57	- 2	i 16 1	- 3	24·9	—

Osaka gives MN = +6·2m.

Mar. 12d. Records also at 0h. (Ekaterinburg and De Bilt), 3h. (San Fernando), 5h. (Ekaterinburg and De Bilt), 9h. (Ekaterinburg, Strasbourg, and De Bilt), 12h. (La Paz), 13h. (Helwan), 20h. (San Fernando), 22h. (Helwan).

Mar. 13d. 13h. 9m. 30s. Epicentre 45°·0N. 120°·0E. (as on 1917 July 31d.).

A = -·354, B = +·612, C = +·707.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Kobe	15·5	—	—	6 37	- 7	e 8·3	9·1
Osaka	15·6	—	—	6 40	- 6	8·4	9·1
Tokyo	17·0	4 21	+16	7 26	+ 8	—	7·6

No additional records.

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Mar. 13d. 14h. 16m. 55s. Epicentre 8°-5S. 124°-5E.

A = -560, B = +815, C = -148; D = +824, E = +566;
G = +084, H = -122, K = -989.

An extra depth of focus is suggested, but the material is scanty.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	17.6	276	4 13	+ 1	—	—	—	9.6
Manila	23.4	351	e 5 19	- 2	—	—	9.8	9.9
Riverview	35.3	141	1 7 1	-15	12 31	-29	e 14.8	21.5
Colombo	47.1	289	30 5	?L	—	—	(30.1)	—
Ekaterinburg	83.4	331	i 12 22	-16	i 22 30	-31	30.1	—
Helwan	97.0	300	18 5	?PR ₁	—	—	—	—
La Paz	152.0	154	18 54	[-65]	—	—	—	—

Additional records: Manila gives MN = +10.2m. Riverview S = +13m.17s.,
MN = +19.8m., MZ = +19.7m. Helwan PN = +17m.5s.

Mar. 13d. Records also at 9h. (Hamburg, De Bilt, and Ekaterinburg), 15h. (Riverview), 16h. (La Paz), 17h. (Lick and Helwan), 20h. (Helwan), 21h. (Coimbra), 23h. (Osaka and Ekaterinburg).

Mar. 14d. Records at 1h. (Lick and San Fernando), 6h. (Mizusawa), 7h. (Manila), 12h. (Taihoku), 14h. (Mizusawa, Ootomari, and Ekaterinburg), 15h. (Hamburg, Honolulu, De Bilt, and Vienna), 17h. (Ekaterinburg, Apla, and Riverview), 18h. (Denver and De Bilt), 23h. (Nagasaki).

Mar. 15d. Records at 1h. (San Fernando), 9h. (La Paz), 12h. (Osaka), 14h. (Manila), 16h. (La Paz), 18h. (Ekaterinburg and San Fernando), 19h. (Denver), 21h. (Batavia), 22h. (Ekaterinburg and Helwan).

1919. Mar. 16d. 7h. 33m. 10s. Epicentre 9°-5N. 127°-0E.

(as on 1918 July 1d.).

A = -594, B = +788, C = +165; D = +799, E = +602;
G = -099, H = +132, K = -986.

A depth of focus 0.015 has been assumed.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	-0.1	7.8	311	e 2 4	+ 7	4 0	+31	4.6	6.2
Taihoku	-0.5	16.4	342	4 15	+24	(7 25)	+32	7.4	7.7
Zi-ka-wei	-0.7	22.3	347	e 5 1	+ 1	8 19	-38	—	—
Batavia	-0.8	25.5	233	5 22	-13	10 2	+ 5	—	11.9
Kobe	-0.8	28.2	15	5 50	+ 8	—	—	12.7	16.4
Osaka	-0.8	28.4	16	5 59	+15	(10 59)	+45	11.0	19.1
Tokyo	-0.9	28.6	21	9 39	?	12 38	?L	(12.0)	19.3
Mizusawa	E. -1.1	32.2	21	6 42	+ 3	11 50	- 3	—	—
	N. -1.1	32.2	21	6 35	- 4	11 54	+ 1	—	—
Calcutta	N. -1.0	39.3	295	7 32	- 8	13 38	- 4	—	—
Ootomari	-1.3	39.5	17	e 7 49	+ 9	—	—	—	—
Perth	-1.4	42.8	193	—	—	13 54	-33	—	—
Adelaide	-1.4	45.8	167	8 14?	-15	14 84	-33	23.5	27.7
Colombo	-1.4	46.8	271	8 50	+14	15 50	+30	23.8?	33.5
Kodalkanal	E. -1.5	48.8	275	15 14	?S	(15 14)	-31	19.0	35.0
Riverview	-1.5	49.0	153	e 8 49	- 2	15 35	-13	e 24.5	28.4
Sydney	E. -1.5	49.0	153	14 20	?S	(14 20)	-88	25.8	29.0
Apla	-1.9	85.1	110	—	—	e 19 26	+23	31.8	—
Ekaterinburg	-2.0	69.3	329	i 11 3	+ 3	i 20 9	+15	29.8	39.4
Honolulu	-2.0	72.7	70	10 50	-31	20 44	+10	e 32.8	43.6
Helwan	-2.1	90.2	300	13 8	+ 2	—	—	—	62.1
Vienna	-2.2	96.3	321	i 12 11	-88	(25 50)	+53	e 25.8	—
Hamburg	-2.2	87.7	329	—	—	e 24 40	-31	e 51.8	59.8
Berkeley	-2.2	100.0	49	—	—	—	—	e 44.7	—
Rocca di Papa	-2.2	100.8	316	e 17 58	[+ 7]	—	—	—	19.5

Continued on next page.

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Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
				m.	s.	s.	s.		m.	s.		
De Bilt	e.	-2.2	101.0	328	—	—	—	e 24 53	-51	e 51.8	56.3	—
	N.	-2.2	101.0	328	—	—	—	—	—	e 48.8	55.4	—
Strasbourg		-2.2	101.4	322	—	—	—	e 34 50	?SR ₁	—	—	—
Uccle		-2.2	102.1	327	—	—	—	—	—	e 54.8	—	—
Edinburgh		-2.2	102.8	334	27 50	?S	(27 50)	+109	—	—	58.8	—
Moncalieri		-2.2	103.0	321	18 36	?PR ₁	—	—	—	51.3	68.8	—
Eskdalemuir		-2.2	103.2	333	—	—	—	28 50	+45.	—	—	—
Kew		-2.2	104.1	329	—	—	—	—	—	—	74.8	—
Bidston		-2.2	104.2	332	34 2	?SR ₁	—	—	—	—	57.5	—
Paris		-2.2	104.2	326	—	—	—	—	—	e 54.8	60.8	—
Shide		-2.2	105.1	328	—	—	—	—	—	56.6	—	—
Rio Tinto		-2.3	115.9	320	28 50	?S	(28 50)	+51	—	—	80.8	—
San Fernando		-2.3	116.4	319	—	—	—	—	—	—	83.8	—
Ottawa		—	121.4	19	—	—	—	37 8	?SR ₁	e 56.8	—	—
Toronto		—	121.7	22	—	—	—	—	—	e 74.4	—	—
La Paz		—	183.7	117	20 14	[+ 3]	—	34 23	?	79.8	81.7	—

Additional records : Manila gives MN = +6.3m., T₀ = 7m.32m.52s. Epicentre 6°.5N. 127° 0E. Osaka MN = +16.1m. Perth gives its record as 6h. instead of 7h. Adelaide SR₁ = +17m.59s. Riverview PR₁ = +10m.42s., eS = +15m.42s., PS = +16m.7s., eSR₁ = +18m.49s. and +19m.19s., MN = +27.7m., MZ = +35.9m., T₀ = 7h.33m.26s., Sydney S = +19m.8s., Colombo L? = +31.8m. Ekaterinburg PR₁ = +13m.43s., PR₂ = +15m.29s., iPS = +20m.57s., SR₁ = +24m.26s. Epicentre 3°51'N. 118°4'E. Helwan PN = +14m.14s., MN = +63.6m. Moncalieri MN = +71.2m.

Mar. 16d. 15m. 3m. 0s. Epicentre 9°.5N. 127° 0E. (as at 7h.).

$$A = -594, B = +788, C = +165; D = +799, E = +602; G = -099, H = +132, K = -986.$$

The deep focus of 7h. is retained, although the evidence itself is in this case insufficient to justify any assumption of the kind.

Station	Corr. for Focus	Δ	Az.	P.		O-C.		S.	O-C.		L.	M.
				m.	s.	s.	s.		m.	s.		
Manila	-0.1	7.8	311	e 1 55	-2	4 32	+63	5.3	6.1	—	—	
Zi-ka-wei	-0.7	22.3	347	e 4 50	-10	e 9 2	+5	—	—	—	—	
Batavia	-0.8	25.5	233	e 5 2	-33	10 15	+18	—	—	12.0	16.0	
Osaka	-1.5	49.0	153	—	—	—	—	—	—	e 33.7	—	
Riverview	-2.0	69.3	329	i 10 44	-16	i 19 56	+2	33.0	38.9	—	—	
Ekaterinburg	-2.1	90.2	300	23 0	?S	(24 0)	+7	—	—	—	—	
Helwan	-2.2	101.0	328	—	—	—	—	—	—	e 62.0	—	
De Bilt												

Additional records : Manila gives MN = +6.3m., T₀ = 15h.1m.41s. Epicentre same as at 7h. 6°.5N. 127° 0E., T₀ = 15h.1m.41s. Osaka gives MN = +15.9m. Helwan, the two records are PE and PN respectively. De Bilt gives eLN = +59.0m.

Mar. 16d. Records also at 0h. (Lick), 2h. (La Paz and San Fernando), 9h. (Algiers), 14h. (La Paz), 19h. (Algiers and Rocca di Papa), 20h. (Pola), 22h. (San Fernando).

Mar. 17d. Records at 3h. (Manila (2) and Taihoku), 4h. (Cape Town), 5h. (Batavia), 8h. (Ottawa and Toronto), 9h. (Ekaterinburg), 11h. (Algiers, De Bilt, and Helwan), 22h. (Lick and San Fernando).

Mar. 18d. Records at 1h. (Algiers), 6h. (Rocca di Papa), 7h. (Zi-ka-wei), 14h. (Manila).

Mar. 19d. Records at 1h. (San Fernando), 2h. (Toronto, Helwan, and Colombo), 5h. (Helwan), 7h. (Rocca di Papa), 8h. (Helwan and Ekaterinburg), 11h. (Ekaterinburg, Honolulu, Mizusawa, and De Bilt), 12h. (La Paz), 14h. (Athens), 18h. (Monte Cassino), 21h. and 22h. (Athens).

Mar. 20d. Records at 2h. (De Bilt, San Fernando, and Ekaterinburg), 5h. (La Paz (2)), 10h. (Bidston), 18h. (La Paz), 19h. (San Fernando), 21h. (Ekaterinburg).

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Mar. 21d. 1h. 2m. 15s. Epicentre 13°-0N. 123°-0E. (as on 1917 May 28d.).

A = -531, B = +817, C = +225; D = +839, E = +545;
G = -123, H = +189, K = -974.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	2-6	309	i 0 47	+ 6	—	—	—	—
Taihoku	12-1	354	3 15	+15	5 46	+25	8-1	8-7
Zi-ka-wei	18-2	356	e 4 24	+ 3	8 14	+30	—	12-5
Kobe	24-3	25	5 34	+ 3	—	—	10-0	10-9
Osaka	24-4	26	5 46	+14	—	—	10-2	10-6
Batavia	25-1	221	5 44	+ 5	12 10	?L	(12-2)	12-4
Tokyo	27-2	31	6 16	+16	10 23	-22	—	15-9
Calcutta	34-3	291	7 3	—	—	—	—	—
Colombo	43-0	269	6 45	-93	20 45	?L	25-2	27-4
Simla	45-8	302	e 14 33	?S	(14 33)	-52	—	—
Bombay	48-5	283	9 0	+ 3	—	—	—	32-4
Riverview	54-0	151	—	—	e 17 57	+48	(22-0)	28-4
Ekaterinburg	64-2	329	i 10 44	+ 5	1 19 16	+ 1	30-8	34-8
Honolulu	75-1	72	e 36 45	?L	—	—	41-8	47-2
Helwan	85-0	300	12 51	+ 3	—	—	—	58-6
Vienna	91-0	322	—	—	—	—	e 53-8	60-2
Hamburg	92-6	329	e 17 3	?PR ₁	—	—	e 48-8	57-8
De Bilt	95-9	328	—	—	24 56	-19	e 50-8	60-5
Strasbourg	96-1	322	—	—	—	—	e 50-1	—
Uccle	96-9	327	13 45	- 9	—	—	e 51-8	53-8
Edinburgh	97-8	333	25 45	?S	(25 45)	+11	—	55-2
Moncalieri	97-8	320	e 17 54	?PR ₁	34 43	?PR ₁	54-0	—
Eskdalemuir	98-2	334	—	—	—	—	47-8	—
Kew	99-0	330	—	—	—	—	—	62-8
Paris	99-0	326	—	—	e 35 14	?PR ₁	52-8	66-8
Shide	100-0	328	—	—	—	—	—	64-0
Coimbra	110-3	322	56 2	?L	60 3	?	66-3	—
Rio Tinto	110-7	319	45 45	?L	—	—	(45-8)	80-8
San Fernando	111-2	318	61 45	?L	—	—	(61-8)	75-2
La Paz	168-7	109	20 11	[- 3]	—	—	—	—

Additional records: Osaka gives MN = +11-0m. Calcutta PE = +6m.51s.
Colombo gives its records to the nearest minute. Riverview MN = +30-6m.; L is given as S.
Ekaterinburg gives epicentre 9°23'N. 115°37'E. Helwan PN = +13m.15s., MN = +60-4m. De Bilt MN = +60-6m. Eskdalemuir LE = +55-8m., LN = +63-8m. Paris MN = +54-8m. San Fernando MN = +74-2m.

Mar. 21d. 16h. 1m. 56s. Epicentre 8°-5S. 149°-0E. (as on 1917 Oct. 29d.).

A = -848, B = +509, C = -148; D = +515, E = +857;
G = +127, H = -076, K = -989.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	25-4	176	e 5 38	- 4	e 10 6	- 5	e 12-1	14-7
Sydney	25-4	176	5 52	+10	10 28	+17	12-9	16-3
Adelaide	28-1	198	6 21	+12	11 21	+20	16-0	17-6
Manila	36-2	310	e 7 16	- 8	—	—	—	—
Perth	38-7	228	8 5	+21	14 27	+39	25-3	28-2
Batavia	41-9	270	e 8 18	+ 8	—	—	24-1	—
Taihoku	42-9	322	—	—	e 14 40	- 7	—	24-8
Zi-ka-wei	47-7	328	e 8 52	0	e 15 47	- 3	—	—
Honolulu	60-0	59	25 4	?SR ₁	27 4	?	28-3	33-1
Colombo	70-7	280	12 4	+43	—	—	—	—
Mauritius	88-1	250	24 10	?S	(24 10)	+17	48-1	51-1
Berkeley	88-1	250	35 34	?	—	—	—	47-6
Victoria	94-1	50	—	—	—	—	e 40-2	—
Ekaterinburg	94-8	42	22 43	?	29 36	?	40-9	52-2
Helwan	96-2	327	13 27	-23	24 45	-33	42-1	51-2
Chicago	118-1	300	21 4	?PR ₁	—	—	—	—
Hamburg	118-1	300	17 4	+90	—	—	—	—
Toronto	127-4	333	—	—	—	—	e 54-1	—
Ottawa	127-4	333	—	—	e 33 4	?SR ₁	e 62-1	69-1
De Bilt	127-6	41	—	—	—	—	e 58-6	71-4
Ithaca	127-6	41	—	—	—	—	e 60-1	—
							e 57-1	60-4
							61-0	—

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	127.8	340	21 4	?PR ₁	—	—	—	—
Eskdalemuir	128.3	340	—	—	—	—	58.1	—
Strasbourg	128.4	328	—	—	—	—	e 65.1	—
Uccle	128.6	330	—	—	—	—	67.1	79.1
Georgetown	128.8	45	—	—	—	—	e 71.3	—
Washington	128.8	45	—	—	—	—	e 61.1	—
Bidston	129.8	339	21 16	?PR ₁	28 28	-92	—	72.7
Paris	130.9	331	—	—	—	—	65.1	81.1
La Paz	135.5	124	19 12	[-19]	—	—	63.7	65.7
Coimbra	142.5	330	—	—	—	—	e 73.1	—
San Fernando	144.1	325	83 4	?L	—	—	(83.1)	112.1

Additional records: Riverview gives $i = +5m.52s.$, PS = +10m.39s., T₀ = 16h.1m.57s. Adelaide PR₁ = +7m.45s., SR₁ = +12m.45s. Perth SR₁ = +17m.46s. Batavia S = M = +15m.27s., T₀ = 16h.1m.14s. Victoria LZ = +42.1m., MN = +46.6m. Ekaterinburg $i = +17m.23s.$ Epicentre 3°19'S. 31°32'W. Chicago L = +69.1m. Toronto eL = +61.1m. and +80.2m. De Bilt MN = +64.9m. Ithaca LN = +59.5m. Georgetown LE = +73.1m. Washington L = +67.1m. Paris MN = +71.1m. San Fernando MN = +95.1m.

Mar. 21d. 17h. 20m. 25s. (I) (Epicentre 8°0N. 128°0E. (as on 1913 April 18d.).
17h. 30m. 10s. (II))

A = -610, B = +780, C = +139; D = +788, E = +616;
G = -086, H = +110, K = -990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Manila	9.5	314	e 2 33	+10	—	—	4.0	5.2
II Taihoku	9.5	314	—	—	e 4 35	+19	—	—
II Zi-ka-wei	18.1	341	e 4 43	+25	—	—	9.2	10.6
II Batavia	24.0	346	e 5 29	+1	e 9 50	+6	—	—
II Mizusawa E.	24.0	346	e 5 6	-22	—	—	—	11.4
I Adelaide	25.5	237	e 5 23	-20	9 44	-29	—	11.2
II Riverview	33.3	19	14 35	?L	—	—	(14.6)	—
II Sydney E.	44.1	167	—	—	—	—	22.6	25.0
II Kodaikanal	47.2	154	—	—	e 14 29	-75	e 21.6	27.5
II Ekaterinburg	47.2	154	—	—	18 20	?SR ₁	(22.5)	29.5
I Honolulu	49.9	277	37 2	?L	—	—	37.0	—
I Victoria	71.0	329	e 20 34	?S (e 20 34)	—	4	42.6	52.7
I Vienna	72.3	70	34 41	?L	37 47	?L	39.6	42.7
II Hamburg	96.1	40	44 34	?L	50 57	?L	60.8	75.0
II De Bilt	98.0	321	—	—	—	—	52.6	—
II Strasbourg	99.4	328	—	—	e 26 50	+60	e 51.8	53.8
II Uccle	102.7	328	—	—	—	—	e 53.8	55.9
II Paris	103.1	322	—	—	—	—	55.8	—
II San Fernando	103.8	327	—	—	—	—	e 55.8	56.8
II Toronto	105.9	325	—	—	e 38 50	?	54.8	57.8
II La Paz	118.3	319	—	—	—	—	—	81.8
II	122.7	21	—	—	—	—	e 67.6	73.9
II	162.1	120	19 13	[-56]	33 23	?	77.4	80.1

Additional records: Manila I gives MN = +5.7m. Mizusawa I PN = +14m.41s. Riverview II MN = +32.1m. Ekaterinburg I S = +30m.32s. De Bilt II MN = +61.0m. San Fernando II MN = +76.8m.

Mar. 21d. Records also at 6h. (Manila (2)), 7h. (Manila and Osaka), 8h. (Taihoku), 10h. and 11h. (Rocca di Papa), 12h. (Batavia), 13h. (Manila), 17h. (Rio Tinto), 19h. (Vienna and Manila).

Mar. 22d. 16h. 18m. 45s. Epicentre 18°0S. 170°1E. (as on 1918 Mar. 24d.).

A = -937, B = +164, C = -309; D = +172, E = +985;
G = +304, H = -053, K = -951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	23.2	223	e 5 23	+4	e 9 27	-2	e 13.2	15.4
Honolulu	50.2	40	—	—	—	—	e 25.2	30.4
Perth	50.6	243	—	—	—	—	23.2	—
Manila	58.4	301	e 9 35	-26	—	—	—	—
Tokyo	60.0	332	18 59	?S	(18 59)	+24	(24.2)	25.0
Victoria	89.0	38	—	—	—	—	43.0	49.8

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	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Chicago	110.9	51	—	—	27 45	+ 9	e 55.2	—
Ekaterinburg	115.6	325	e 16 18	+55	e 25 33	-162	44.2	58.6
Ottawa	119.6	47	—	—	—	—	e 65.2	—
Harvard	123.1	50	—	—	e 39 5	?SR ₁	45.7	—
Edinburgh	141.8	354	70 15	?L	—	—	(70.2)	—
De Bilt	E. 143.9	342	—	—	—	—	e 58.2	60.6
	N. 143.9	342	—	—	—	—	e 62.2	74.8
Bidston	144.2	353	63 15	?L	—	—	(63.2)	—

Additional records : Riverview gives PS = +9m.51s. Tokyo records S as P and L as S, and gives all its records as 17h. instead of 16h. Harvard gives LN? = +45.9m.

Mar. 22d. Records also at 1h. (Strasbourg), 3h. (San Fernando), 7h. (San Fernando and Ekaterinburg), 8h. (Ekaterinburg, Helwan, and Hamburg), 12h. (Sydney and Riverview), 13h. (Helwan, Manila, and Ekaterinburg), 14h. (De Bilt and Riverview), 16h. (Manila), 18h. (Helwan), 20h. (Vienna), 22h. (Monte Cassino).

Mar. 23d. 22h. 51m. 35s. Epicentre 9°-5N. 123°-0E.

A = -.537, B = +.827, C = +.165 ; D = +.839, E = +.545 ;
G = -.090, H = +.138, K = -.986.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	h.	m.
Manila	5.5	339	e 1 27	+ 2	2 33	+ 2	3.4	3.8
Batavia	22.5	226	e 5 10	- 1	—	—	—	—
Colombo	42.7	270	21 25	?L	—	—	(21.4)	—
Ekaterinburg	67.1	328	e 10 40	-19	e 19 34	-17	30.4	67.7
De Bilt	98.8	326	—	—	—	—	e 54.4	55.9

Additional records : Manila gives T₀ = 21h.51m.41s. and an epicentre 11°-7N. 126°-4E. Ekaterinburg i = +10m.42s. De Bilt MN = +55.7m.

Mar. 23d. Records also at 1h. (San Fernando), 2h. (Manila and Denver), 14h. (Mizusawa), 19h. (Lick), 21h. (Mizusawa).

Mar. 24d. Records at 4h. (San Fernando), 8h. (Helwan), 20h. (Helwan and Vieques), 21h. (Helwan).

Mar. 25d. Records at 0h. (San Fernando), 2h. (Taihoku), 3h. (Chicago and Ottawa), 9h. (La Paz), 11h. (Helwan), 14h. (Manila and La Paz), 15h. (Helwan), 18h. and 20h. (Paris).

Mar. 26d. 13h. 34m. 50s. Epicentre 30°-6N. 141°-8E. (as on 1917 July 10d.).

A = -.677, B = +.532, C = +.509.

Identification very uncertain : for instance, the epicentre 44°-0 131°-0E., as used with deep focus on 1918 April 10d., would suit equally well.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	5.4	2 38	?S	(2 38)	+ 10	—	—
Osaka	6.7	1 36	- 6	—	—	2.7	4.1
Mizusawa	E. 8.5	2 18	+ 9	3 53	+ 3	—	—
	N. 8.5	2 16	+ 7	3 59	+ 9	—	—

Osaka gives MN = +3.3m. Manila ($\Delta = 25^{\circ}$) gives e = 13h.38m. = +3m.10s.

Mar. 26d. Records also at 0h. (Taihoku), 5h. (Balboa Heights), 6h. (La Paz), 10h. (Taihoku, Ottawa, Toronto, Chicago, Bidston, and La Paz), 19h. (Batavia), 23h. (San Fernando).

Mar. 27d. Records at 4h. (Coimbra), 8h. (Sydney), 9h. (Helwan).

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Mar. 28d. 22h. 40m. 18s. Epicentre 37°0N. 138°5E.

A = -599, B = +529, C = +602.

		Δ	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		1.6	0 17	- 7	0 39	- 6	—	2.2
Mizusawa	E.	2.9	0 44	- 1	1 24	+ 4	—	—
Osaka		3.5	1 3	+ 8	—	—	2.0	2.7
Kobe	N.	3.6	0 57	+ 1	—	—	2.0	2.2

Additional records: Mizusawa gives PN = +40s. Osaka MN = +2.4m.
Kobe MN = +1.8m., earlier than L.

Mar. 28d. Records also at 1h. (San Fernando), 17h. (Helwan), 20h. (Helwan and Mizusawa), 23h. (Tokyo).

Mar. 29d. Records at 0h. (San Fernando), 1h. (Helwan, Batavia, and Manila), 2h. (Manila, La Paz, and De Bilt), 14h. (Rocca di Papa and La Paz), 15h. (Helwan), 18h. (La Paz), 23h. (Rocca di Papa).

Mar. 30d. 10h. 39m. 52s. Epicentre 9°0N. 141°0E. (as on 1919 Mar. 1d.).

A = -768, B = +622, C = +156; D = +629, E = +777;
G = -121, H = +098, K = -988.

The focal depth of 0.030 of Mar. 1d. is retained in spite of the La Paz residual.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	-1.2	20.4	288	e 4 45	+14	8 30	+24	10.0	10.7
Taihoku	-1.6	24.5	313	—	—	9 39	+16	—	—
Osaka	-1.7	26.2	350	5 17	-16	—	—	9.7	10.8
Zi-ka-wei	-1.9	28.8	323	e 5 45	-12	—	—	—	—
Batavia	-2.4	37.3	247	e 7 14	+2	—	—	—	12.9
Riverview	-2.7	43.9	168	e 10 17	+132	16 17	+113	26.3	27.3
Honolulu	-3.6	59.8	70	—	—	—	—	e 30.1	35.6
Helwan	-4.4	102.2	304	60 20	?L	—	—	(60.3)	71.0
Hamburg	-4.5	105.1	332	—	—	—	—	e 56.1	65.1
Edinburgh	-4.6	107.9	340	57 38	?L	—	—	(57.6)	69.6
De Bilt	-4.6	108.2	333	—	—	e 43 10	?	e 57.1	64.6
Paris	-4.6	108.2	333	—	—	e 43 23	?	—	67.4
La Paz	-4	150.6	108	19 56	[- 1]	—	—	67.1	—

Additional records: Manila gives MN = +10.4m., T_s = 10h.39m.56s. Osaka MN = +12.8m. Riverview MN = +30.3m. Helwan MN = +62m.8s.

Mar. 30d. Records also at 0h. (Riverview), 4h. (San Fernando), 13h. (Rocca di Papa), 14h. (Bidston).

Mar. 31d. Records at 0h. (Riverview), 3h. and 10h. (Helwan), 12h. (Denver), 13h. (Manila), 18h. (Mizusawa), 19h. (Manila).

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TABLE.

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