

The scanned images of the 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 collected by SGA Storia Geofisica Ambiente (Bologna) on behalf of the Istituto Nazionale di Geofisica e Vulcanologia (Rome), in the frame of the EUROSEISMOS project.

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## The International Seismological Summary.

1947 January, February, March.

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INTERNATIONAL GEODETIC AND GEOPHYSICAL UNION.  
ASSOCIATION OF SEISMOLOGY.  
FORMERLY THE BULLETIN OF  
THE BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

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The Director of the I.S.S. wishes to express his thanks to U.N.E.S.C.O. and H.M. Treasury for financial support, which has covered the cost and preparation of this volume.

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The number constitutes the beginning of the eleventh volume of the International Seismological Summary in which travel times and Epicentral distances are calculated with reference to "Geocentric" latitudes of epicentres and observing stations. The travel-times used in making determinations are those contained in "Seismological Tables" by H. Jeffreys and K. E. Bullen, Brit. Ass. for Advancement of Science—London, 1950, and residual derived accordingly.

Distances are calculated from modified direction-cosines defined by :

$$\begin{aligned} A &= \cos \phi' \cos \lambda \\ B &= \cos \phi' \sin \lambda \\ C &= \sin \phi' \end{aligned}$$

$\lambda$  being the east longitude from Greenwich and  $\phi'$  the *geocentric* latitude whose relationship to the ordinary *geographic* latitude  $\phi$  is :—

$$\tan \phi' = .99328 \tan \phi.$$

These formulae are used to determine direction-cosines of both epicentre and station, though the position is in every case referred to normal  $\phi$  and  $\lambda$ .

The notation is that generally accepted. P and S stand for the times of onset of the direct longitudinal and transverse waves. Pg, Sg, P\*, S\* for short distances are used for times for these waves transmitted through the superficial "Granitic" and "Intermediate" layers respectively. Reflections of the direct waves at the earth's surface are denoted by PP, PS, PPP, SS . . . and at the outer surface of the central core by PcP, PcS . . .

The refracted longitudinal wave through the central core is known as K. Such waves as PKP, SKS, PKS, SKKS, are frequently recorded at great distances from the epicentre. All times are given as Greenwich Civil Time and are referred to the adopted  $T_0$  as zero.

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The arrangement of the " Summary " consists of :—

- (1) Date and Time at Origin ( $T_0$ ), calculated from the above-mentioned tables, together with the depth of focus where this is assumed not to be in the surface. The time calculated is that at which the P wave leaves the focus, not that when P arrives at the epicentre.
- (2) Epicentre constants :—

$$\begin{array}{lll} A = \cos \phi' \cos \lambda & D = \sin \lambda & G = \sin \phi' \cos \lambda \\ B = \cos \phi' \sin \lambda & E = -\cos \lambda & H = \sin \phi' \sin \lambda \\ C = \sin \phi' & & K = -\cos \phi' \end{array}$$

from which distances,  $\Delta$ , and where necessary Azimuths, of stations with respect to the epicentre may be calculated by means of the formulae :—

$$\begin{aligned} \cos \Delta &= aA + bB + cC \\ 2 - 2 \cos \Delta &= (a - A)^2 + (b - B)^2 + (c - C)^2 \\ 2 + 2 \sin \Delta \sin Az. &= (a - D)^2 + (b - E)^2 + c^2 \\ 2 + 2 \sin \Delta \cos Az. &= (a - G)^2 + (b - H)^2 + (c - K)^2 \end{aligned}$$

$a, b, c$  being related to the observing station in the same way as  $A, B, C$  are to the epicentre.

$\delta$  is defined as the nearest integer to  $10^5(A^2 + B^2 + C^2 - 1)$  and may be used to compare distances calculated by the first two formulae above, whose equivalence depends on the assumption

$$A^2 + B^2 + C^2 = 1$$

$h$  is the height, in kilometres, of the epicentre above the sphere of equal volume concentric with the earth and is given by

$$h = -3.549 + 10.738 \cos 2 \phi$$

- (3) The tabular matter consisting of the station names arranged in order of epicentral distances, followed by this distance and the Azimuth measured round the epicentre from North through East. Other columns give the P phase and its residual, or PKP, in which the residual is shown in brackets [ ]. The S phase or an associated phase follows with its residual. If SKS is entered here the residual is shown in [ ], and if SKKS in { }. Under " Supp " is placed the time of some other, preferably well recorded phase such as PS, SS, or, in the case of deep focus shocks, pP. The final column, L, records the onset, if known, of Rayleigh waves R, or of the horizontally polarised surface waves Q.
- (4) Readings for which space is not available in the tabular part, added at the foot.

The letters E, N, Z after a phase indicate that the reading was taken on an instrument recording East-West, North-South, or Vertical component of motion, though some stations have instruments oriented to record North-East or North-West components. Reflections near

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the epicentre take place, and in the case of deep focus earthquakes can be distinguished from the direct phases. These are distinguished as pP, sS, sP, pPP—the small p and s referring to the initial portion of the path towards the surface.

The letters a, k after a P or PKP phase stand for the terms “Anaseismic” and “Kataseismic,” and indicate whether the first longitudinal motion was one away from the focus or towards it.

The epicentres for earthquakes with abnormal focal depth are calculated from travel times appropriate to them in the tables cited above. The depth to be assumed can be obtained from these tables when the observational data are plentiful, and the epicentre then determined in the usual way. When the data are scanty an indication of depth can be obtained from the evidence of the readings of certain individual stations.

The first quarter for 1947 contains 99 epicentres, 63 of which are repetitions from previous epicentres.

Cases of abnormal depth are noted below :—

Jan.	15d. 19h.	Undetermined shock.		Suggested Deep.
	16d. 17h.	33·8N. 134·2E.		Suggested Deep.
	16d. 22h.	47·5N. 8·9E.		Suggested Deep.
	18d. 2h.	41·9N. 67·3E.		0·025
	26d. 10h.	12·1N. 86·2W.		0·015
	29d. 8h.	26·3S. 63·2W.		0·080
	30d. 12h.	36·3S. 71·0E.		0·025
Feb.	2d. 1h.	27·5S. 70·5W.		0·010
	2d. 18h.	16·1S. 168·3E.		0·015
	2d. 21h.	32·9N. 133·9E.		0·005
	3d. 16h.	Undetermined shock.		Suggested Deep.
	4d. 5h.	36·7N. 70·5E.		0·020
	4d. 23h.	42·3N. 143·0E.		0·005
	6d. 8h.	Undetermined shock.		Suggested Deep.
	6d. 14h.	Undetermined shock.		Suggested Deep.
	6d. 18h.	38·3N. 140·5E.		0·005
	7d. 2h.	12·2N. 59·8W.		0·020
	11d. 10h.	28·4N. 138·0E.		0·080
	17d. 9h.	38·4S. 176·5E.		0·040
	18d. 13h.	32·9N. 136·9E.		0·060
	21d. 6h.	34·7N. 137·9E.		0·005
	21d. 22h.	32·9N. 133·9E.		Suggested Deep.
	24d. 17h.	15·5S. 68·8W.		0·005
	26d. 5h.	39·0N. 15·2E.		0·030

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Mar.	2d. 19h.	5°0S.	144°5E.	Base of Superficial Layers.
	11d. 5h.	34°7N.	137°9E.	Suggested Deep.
	15d. 16h.	39°1N.	141°1E.	0·010
	21d. 16h.	32°5S.	70°0W.	0·020
	22d. 9h.	23°3S.	66°4W.	0·025
	25d. 19h.	36°3N.	141°5E.	Suggested Deep.
	25d. 20h.	38°4S.	176°5E.	0·020

Thanks are also due to the Director of the Meteorological Office and the Superintendent of Kew Observatory for hospitality extended to the Staff and assistance with administration.

July, 1955.

KEW OBSERVATORY,  
Richmond,  
SURREY.

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## 1947 JANUARY, FEBRUARY, MARCH.

Jan. 1d. Readings at 2h. (Tucson), 5h. (Frunse near Andijan, Obi-garm, Stalinabad, and Tchimkent), 6h. (Palomar, Riverside, Tinemaha, and near Bogota), 7h. (Huancayo), 10h. (Frunse, near Andijan, and Tchimkent), 11h. (near Algiers), 13h. (near Almata, Andijan, Frunse, Obi-garm, Stalinabad, Tashkent, and Tchimkent), 14h. (near Alicante, Malaga, Almeria, and Granada), 19h. (near Ottawa), 20h. (Leninakan, Piatigorsk, and near Grozny), 22h. (near Obi-garm and near Stalinabad), 23h. (near Obi-garm).

Jan. 2d. 14h. 11m. 3s. Epicentre  $28^{\circ}5N$ .  $51^{\circ}5E$ .

$$A = +.5479, B = +.6889, C = +.4747; \quad \delta = +12; \quad h = +2;$$

$$D = +.783, E = -.623; \quad G = +.296, H = +.372, K = -.880.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Leninakan	13.7	335	c 3 16	- 2	—	—	—	—
Ksara	14.4	296	c 3 35	+ 8	c 6 39	+ 30	—	i 8.0
Grozny	15.5	344	c 3 44	+ 2	c 6 36	+ 1	—	—
Stalinabad	17.5	49	i 4 7	0	7 27	+ 6	—	—
Helwan	17.7	279	i 4 10k	0	i 7 21	- 5	4 30	PP
Obi-garm	18.2	49	4 13	- 3	c 7 41	+ 4	—	—
Tashkent	19.3	44	c 4 26	- 3	c 8 5	+ 3	—	—
Andijan	21.0	49	4 47	0	—	—	—	—
Bombay	N. 21.7	112	c 5 10	+15	—	—	—	—
Istanbul	22.2	311	c 8 51	S	(e 8 51)	- 9	—	— (e 14.8)

Additional readings and note:—

Helwan iZ = 4m.21s., eN = 7m.51s.

Bombay eE = 5m.21s.

Istanbul records S as P and a late L as S.

Jan. 2d. 16h. 54m. 6s. Epicentre  $6^{\circ}2S$ .  $154^{\circ}8E$ . (as on 1941, Sept. 9d.).

$$A = -.8997, B = +.4233, C = -.1073; \quad \delta = +16; \quad h = +7;$$

$$D = +.426, E = +.905; \quad G = +.097, H = -.046, K = -.994.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Brisbane	N. 21.2	184	i 4 45	- 4	i 8 43	+ 2	i 5 6	PP
Riverview	27.7	187	i 5 56a	+ 4	c 10 33	0	i 10 57	SS
Christchurch	40.3	160	—	—	13 56	+ 7	17 9	SS
Vladivostok	53.3	340	i 9 22	- 1	i 16 50	- 4	—	—
Irkutsk	72.3	330	c 10 54	-35	—	—	—	—
Andijan	88.3	311	c 12 53	- 2	c 23 46	+ 7	—	—
Tchimkent	90.6	313	i 13 6	+ 1	24 6	+ 6	—	—
Pasadena	91.0	56	e 13 16	+ 9	—	—	—	—
Mount Wilson	91.1	56	i 13 17	+ 9	—	—	—	—
La Jolla	91.6	57	e 13 19	+ 9	—	—	—	—
Riverside	91.6	56	e 13 19	+ 9	—	—	—	—
Palomar	92.0	57	i 13 20	+ 8	—	—	—	—
Ksara	117.4	304	c 20 2	PP	—	—	c 22 16	PKS
Stuttgart	z. 128.6	332	e 19 12	[+ 3]	—	—	—	—
La Paz	z. 131.9	118	c 19 21	[+ 5]	—	—	i 23 2	PKS

Additional readings:—

Brisbane eSSE = 9m.13s.

Riverview iSN = 10m.38s.

Christchurch eZ = 17m.24s., QE = 18m.54s.

La Paz iPKPZ = 19m.24s.

Long waves were also recorded at Wellington, Arapuni, and Auckland.

Jan. 2d. Readings also at 2h. (Boulder City, La Paz, Santa Lucia, La Plata, and Bergen), 3h. (Boulder City, Piatigorsk, near Grozny, and Leninakan), 5h. (Tucson), 6h. (Boulder City, Pierce Ferry, Tucson, and near Tchimkent), 10h. (Balboa Heights, Tucson, and near Mizusawa), 11h. (Huancayo, Tucson, Pasadena, Palomar, Riverside, and near Obi-garm), 16h. (Helwan and Ksara), 19h. (near Balboa Heights), 20h. (near Almata, Andijan, Obi-garm, Tashkent, and Tchimkent), 23h. (Frunse, near Andijan and Tchimkent).

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Jan. 3d. 0h. 5m. 42s. Epicentre 43°·6N. 148°·9E.

Forerunner of large shock at 2h.

$$A = -\cdot6221, B = +\cdot3753, C = +\cdot6872; \quad \delta = +10; \quad h = -3;$$

$$D = +\cdot517, E = +\cdot856; \quad G = -\cdot588, H = +\cdot355, K = -\cdot726.$$

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Mizusawa	E.	7·4	235	—	—	3 16	- 2	—	—
Vladivostok		12·4	273	e 2 59	- 2	i 5 19	- 2	—	—
Andijan		54·9	295	e 9 36	+ 1	e 17 17	+ 1	—	—
Tashkent		56·6	297	e 9 47	0	—	—	—	—
Stalinabad		58·4	295	e 10 0	0	e 18 1	- 1	—	—
Grand Coulee		60·6	50	e 10 15	0	—	—	i 10 27	pP
Shasta Dam		62·7	58	e 10 29	0	—	—	—	—
Tinemaha		67·4	59	i 11 2	+ 3	—	—	i 11 14	pP
Haiwee		68·2	60	i 11 7	+ 3	—	—	e 11 20	pP
Mount Wilson		69·3	61	i 11 13	+ 2	—	—	i 11 25	pP
Pasadena		69·3	61	i 11 12	+ 1	—	—	i 11 25	pP
Grozny		69·6	310	e 11 9	- 4	—	—	—	—
Riverside		69·9	61	i 11 15	0	—	—	i 11 27	pP
Overton		70·2	58	i 11 18	+ 1	—	—	i 11 29	pP
Boulder City		70·3	58	i 11 18	+ 1	—	—	i 11 30	pP
Palomar		70·7	62	i 11 21	+ 1	—	—	i 11 32	pP
Pierce Ferry		70·7	58	i 11 21	+ 1	—	—	—	—
Leninakan		72·3	309	e 11 43?	+14	—	—	—	—
Copenhagen		74·4	336	e 11 40	- 2	—	—	—	—
Tucson		75·2	59	i 11 47	+ 1	—	—	i 11 57	pP
Cheb		79·3	334	e 16 18?	PPP	e 31 18?	SSS	—	c 41·3
Stuttgart	Z.	81·4	334	e 12 20	0	—	—	—	—
Ksara		81·7	309	e 12 24	+ 2	e 22 43	[+ 5]	—	—
Strasbourg		82·1	335	e 12 23	- 1	—	—	—	—
St. Louis	Z.	82·2	42	i 12 24	0	—	—	i 12 37	pP
Zürich		82·9	334	e 12 26	- 2	—	—	—	—
Basle		83·0	334	e 12 28	0	—	—	—	—
Paris		83·4	338	i 12 30	0	—	—	i 12 43	?
Helwan	Z.	87·2	309	i 12 49	0	—	—	i 13 1	pP
La Paz	Z.	138·6	60	e 19 43	[+15]	—	—	c 23 38	pPP

Additional readings:—

Pierce Ferry i=11m.24s.

Paris i=12m.48s.

Long waves were also recorded at Uccle.

Jan. 3d. 2h. 17m. 3s. Epicentre 43°·6N. 148°·9E.

( as at 0h.).

$$A = -\cdot6221, B = +\cdot3753, C = +\cdot6872; \quad \delta = +10; \quad h = -3;$$

$$D = +\cdot517, E = +\cdot856; \quad G = -\cdot588, H = +\cdot355, K = -\cdot726.$$

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Mizusawa		7·4	235	1 55	+ 3	3 18	0	—	—
Vladivostok		12·4	273	i 2 58	- 3	i 5 19	- 2	—	—
Irkutsk		30·7	302	6 19	0	11 14	- 7	—	—
College		40·5	35	c 7 41	- 1	i 13 49	- 3	c 9 32	PP c 18·6
Sitka		47·5	45	i 8 45	+ 7	i 15 41	+ 7	—	c 23·3
Almata		50·7	296	9 4	+ 1	16 24	+ 6	—	—
Calcutta	N.	53·7	267	e 10 31	+65	i 18 3	+64	—	c 26·7
Sverdlovsk		54·1	317	e 9 23	- 6	i 17 1	- 4	—	—
Andijan		54·9	295	9 37	+ 2	e 17 14	- 2	—	—
Tchimkent		55·9	298	i 9 39	- 3	—	—	—	—
Dehra Dun	N.	56·5	282	—	—	e 18 57	?	—	c 34·8
Tashkent		56·6	297	e 9 41	- 6	i 17 30	- 8	—	—
Obi-garm		57·7	295	9 51	- 4	17 51	- 2	—	—
Stalinabad		58·4	295	i 9 59	- 1	i 18 6	+ 4	—	—
Grand Coulee		60·6	50	e 10 12	- 3	—	—	—	—

Continued on next page.

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		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.	
		°	°	m. s.	s.	m. s.	s.	m. s.	m.	
Shasta Dam		62.7	58	i 10 27	- 2	—	—	e 14 0	PPP	—
Hyderabad	N.	64.1	269	10 37	- 1	19 13	- 1	e 12 55	PP	—
Berkeley		64.4	61	10 18	-22	—	—	—	—	c 31.0
Saskatoon		64.6	41	10 51	+10	19 25	+ 4	e 22 47	SS	31.0
Lick	N.	65.1	61	e 9 59	-46	—	—	e 13 18	PP	—
Moscow		65.3	325	10 43	- 3	19 27	- 2	—	—	—
Butte		65.3	48	e 11 27	+41	e 19 34	+ 5	e 24 13	SS	e 29.2
Bozeman		66.4	48	—	—	e 19 39	- 4	e 24 7	SS	e 34.4
Fresno	N.	66.7	60	e 11 17	+22	—	—	—	—	—
Helsinki		66.9	334	—	—	e 19 36	-13	e 24 37	SS	e 33.4
Bombay		67.3	274	e 10 58	- 1	e 20 11	+17	—	—	30.5
Tinemaha		67.4	59	e 10 58	- 1	e 20 4	+ 9	—	—	—
Santa Barbara		68.1	62	e 11 6	+ 2	—	—	—	—	—
Haiwee		68.2	60	e 11 5	+ 1	e 20 5	+ 1	—	—	—
Logan		68.4	52	i 11 7	+ 1	e 20 2	- 5	i 13 44	PP	e 31.5
Salt Lake City		69.0	53	e 11 13	+ 4	e 20 17	+ 3	e 24 55	SS	e 28.2
Baku		69.1	306	i 11 20	+10	20 18	+ 3	—	—	—
Mount Wilson		69.3	61	i 11 11	0	—	—	e 39 25	P'P'	—
Pasadena		69.3	61	i 11 10	- 1	i 20 19	+ 2	e 39 23	P'P'	27.8
Upsala		69.4	336	11 13	+ 1	e 20 19	+ 1	e 14 29	PP	e 32.0
Kodaikanal	E.	69.6	265	e 10 12	-61	e 19 20	-61	23 37	SS	32.6
Grozny		69.6	310	i 11 12	- 1	—	—	—	—	—
Riverside		69.9	61	e 11 13	- 2	—	—	e 39 15	P'P'	—
Colombo	E.	70.1	260	—	—	21 8	PPS	—	—	37.6
Overton		70.2	58	i 11 16	- 1	e 20 26	- 2	—	—	—
Boulder City		70.3	58	i 11 15	- 2	e 20 31	+ 2	—	—	—
Piatigorsk		70.5	313	11 27	+ 9	—	—	—	—	—
La Jolla		70.7	62	e 11 19	- 1	—	—	—	—	—
Palomar		70.7	62	i 11 19	- 1	—	—	i 39 19	P'P'	—
Pierce Ferry		70.7	58	i 11 19	- 1	i 20 39	+ 5	—	—	—
Erevan		72.3	308	e 11 32	+ 3	—	—	—	—	—
Leninakan		72.3	309	e 11 32	+ 3	e 20 54	+ 2	—	—	—
Sotchi		72.6	314	e 11 27	- 4	i 20 53	- 3	—	—	—
Copenhagen		74.4	336	i 11 39	- 3	i 21 12	- 4	—	—	36.0
Warsaw		74.5	330	e 11 39 <sub>a</sub>	- 3	i 21 17	0	21 40	PS	e 37.0
Simferopol		74.5	318	e 11 43	+ 1	—	—	—	—	—
Yalta		75.0	317	e 11 44	- 1	—	—	—	—	—
Tucson		75.2	59	i 11 45	- 1	e 21 29	+ 4	e 14 27	PP	—
Aberdeen	N.	76.7	344	—	—	i 31 43	Q	—	—	e 43.3
Potsdam	E.	77.1	334	e 12 0?	+ 3	—	—	e 15 37	PP	e 41.0
Riverview		77.2	178	e 11 50	- 7	i 21 43	- 4	i 15 15	PP	e 32.4
Bucharest		78.6	322	e 11 3	-62	e 21 10	-52	—	—	31.0
Prague		78.6	332	e 11 51	-14	e 21 52	-10	—	—	e 38.0
Budapest		79.1	328	12 9	+ 1	22 6	- 1	i 15 40	PP	e 42.0
Cheb		79.3	334	e 11 53	-16	e 22 11	+ 2	e 26 52	SS	e 41.0
De Bilt		79.7	339	—	—	e 22 37	+24	—	—	e 36.0
Istanbul		79.8	318	e 12 8	- 4	e 22 11	- 3	—	—	—
Kalossa		79.9	328	e 12 18	+ 6	e 22 15	- 1	—	—	e 45.0
Belgrade		80.7	325	i 12 13	- 3	e 22 25	+ 1	e 15 40	PP	e 36.2
Chicago		81.0	39	—	—	e 22 22	- 5	e 27 47	SS	e 38.0
Uccle		81.2	339	i 12 19 <sub>a</sub>	0	e 22 22	- 7	i 12 40	pPP	e 38.0
Stuttgart	Z.	81.4	334	e 12 19	- 1	—	—	—	—	—
Kew		81.6	341	i 12 19?	- 2	e 22 31?	- 2	i 15 55	pPP	e 50.0
Ksara		81.7	309	i 12 1	-21	22 43	+ 9	i 15 47	PP	—
Zagreb		81.7	329	12 16	- 6	e 22 44	+10	i 15 55	PP	e 45.0
Strasbourg		82.1	335	e 12 20	- 4	e 22 38	0	e 23 25	PS	e 40.0
St. Louis		82.2	42	i 12 22	- 2	i 22 39	0	e 29 10	SSS	—
Triest		82.6	330	e 12 31	+ 5	e 22 39	- 4	e 15 57	PP	—
Ottawa		82.9	29	e 15 27	PP	e 22 45	- 1	—	—	36.0
Zürich		82.9	334	e 12 25 <sub>a</sub>	- 3	e 22 40	- 6	—	—	—

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Basle	83.0	334	e 12 27	- 1	c 22 42	- 5	—	—
Chur	83.0	333	e 12 27	- 1	c 22 45	- 2	—	—
Shawinigan Falls	83.0	27	12 28	0	22 44	- 3	—	55.0
Seven Falls	83.1	25	12 29	0	22 48	0	—	40.0
Paris	83.4	338	i 12 29	- 1	e 23 0	+ 9	c 34 57?	Q e 42.0
Auckland	83.5	158	—	—	i 22 59	+ 7	e 27 17	SS 47.0
Neuchatel	83.7	334	e 12 30	- 2	—	—	—	—
Besançon	83.8	335	e 12 35	+ 3	e 23 0	+ 5	—	41.0
Jersey	84.2	342	e 12 8	-26	c 22 57	- 2	—	—
Florence	85.1	330	i 12 45	+ 6	i 23 10	+ 2	—	—
Clermont-Ferrand	86.0	336	i 12 45	+ 2	e 23 20	+ 3	—	e 45.0
Rome	86.3	328	i 12 47k	+ 2	i 23 12	[+ 3]	i 13 12	pp c 41.3
Harvard	86.9	29	e 12 47	- 1	e 23 26	0	e 16 23	PP e 49.0
Weston	87.1	29	i 12 47k	- 2	e 23 28	0	i 16 10	PP e 36.3
Helwan	87.2	309	i 12 47k	- 2	e 23 15	[ 0]	16 12	PP —
Fordham	87.5	30	e 12 48	- 3	i 23 29	- 2	i 16 25	PP —
Wellington	87.7	161	e 12 57	+ 5	i 23 21	[+ 2]	—	i 43.0
Philadelphia	87.8	32	e 13 1	+ 9	i 23 32	- 2	c 16 34	PP c 36.2
Christchurch	89.3	162	13 6	+ 7	23 29	[ 0]	29 30	SS 36.4
Barcelona	90.2	336	—	—	24 10	+14	29 55	SS c 32.4
Tortosa	N. 91.3	335	13 8	- 1	23 59	- 7	16 33	PP 51.0
Alicante	93.8	336	13 29	+ 9	24 43	+15	18 5	PKP c 46.2
Algiers	94.2	333	e 13 12	-10	c 24 16	-15	—	c 54.0
Almeria	95.8	337	13 22	- 7	24 21	[+16]	13 37	pp 45.4
Granada	95.8	338	i 13 29k	0	24 47	+ 2	i 16 57	PP i 44.8
Malaga	Z. 96.4	339	(e 13 52)	+20	(e 24 12)	[+ 3]	(e 17 16)	PP (40.4)
Bermuda	98.4	28	e 17 28	PP	c 24 20	[+ 1]	e 26 26	PS c 44.7
San Juan	110.5	35	—	—	—	—	e 34 53	SS c 57.9
Huancayo	130.7	63	e 19 17	[+ 4]	c 26 22	[ 0]	e 21 49	PP c 58.2
La Paz	138.6	60	i 19 25	[- 3]	26 25	[-12]	i 22 41	PP 67.0
La Plata	E. 157.6	74	31 9	SKKS	(31 9)	{+ 9}	—	— 78.6

Additional readings :—

College eSS = 16m.40s.  
 Calcutta ePPPN = 13m.25s., iSSN = 21m.38s.  
 Grand Coulee i = 10m.19s. and 10m.26s.  
 Hyderabad PSN = 19m.24s.  
 Berkeley eN = 10m.23s., eE = 10m.31s.  
 Lick eE = 10m.3s. and 13m.21s.  
 Butte e = 20m.12s.  
 Bozeman eScS? = 20m.49s.  
 Fresco eN = 14m.29s.  
 Helsinki eSSS = 27m.23s.  
 Logan i = 11m.45s., iPPP = 15m.30s., eScS = 21m.10s., eSSS = 28m.2s.  
 Salt Lake City eScS = 21m.15s.  
 Pasadena i = 11m.16s. and 11m.24s.  
 Upsala eS?N = 19m.57s.?, eSSN = 24m.33s., eSSS = 27m.43s.  
 Boulder City i = 11m.29s.  
 Palomar i = 11m.32s.  
 Copenhagen 27m.33s., 29m.21s., and 30m.27s.  
 Warsaw ePN = 11m.44s., PSE = 21m.43s., PPSN = 22m.0s., PPSE = 22m.7s., eSSE? = 25m.29s., SSN = 26m.2s., SSN = 28m.53s.  
 Tucson i = 12m.8s., 12m.24s., and 12m.30s., eScS = 22m.7s.  
 Aberdeen iE = 32m.0s.  
 Riverview eSSN = 26m.48s.  
 Bucharest eS?E = 21m.28s.  
 Budapest iN = 22m.19s.  
 Cheb e = 20m.11s. and 31m.31s.  
 Belgrade ePcP = 12m.47s., ePPP = 17m.22s., e = 33m.9s.  
 Uccle eSSSE = 32m.8s.  
 Stuttgart iZ = 12m.23s. a and 12m.31s., eZ = 13m.8s.  
 Kew eQ = 44.0m.  
 Zagreb ePNE = 12m.21s., iNE = 12m.41s., e = 12m.48s., e = 22m.32s.  
 Strasbourg i = 12m.30s. and 12m.34s., e = 28m.18s., eSS = 28m.22s., eSSS? = 32m.8s.  
 St Louis iZ = 12m.29s. and 12m.42s.  
 Trieste eS = 22m.57s.  
 Ottawa iZ = 16m.3s.  
 Shawinigan Falls e = 26m.23s.  
 Paris i = 12m.33s.  
 Rome iPPZ = 16m.6s., iPSN = 24m.30s., iN = 26m.38s., iSSN = 28m.58s.  
 Harvard eZ = 34m.35s.

Continued on next page.



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Weston  $i = 16m.23s.$ ,  $eSSS = 32m.54s.$   
 Helwan  $iZ = 13m.15s.$ ,  $13m.36s.$ ,  $16m.27s.$ , and  $23m.42s.$ ,  $eZ = 24m.0s.$   
 Fordham  $iP = 12m.52s.$ ,  $ePS? = 24m.33s.$   
 Philadelphia  $e = 13m.46s.$  and  $18m.7s.$ ,  $eS = 23m.22s.$ ,  $e = 25m.3s.$ ,  $eSS? = 30m.15s.$ ,  
 $eSSS = 33m.27s.$   
 Christchurch  $PPSEN = 25m.9s.$ ,  $iEN = 27m.21s.$   
 Barcelona  $SS? = 27m.10s.$ , true  $SS$  is given as  $SSS?$ .  
 Tortosa  $P_eP?N = 13m.14s.$ ,  $S_eSN = 24m.14s.$ ,  $PS?N = 25m.31s.$ ,  $PPSN = 25m.49s.$ ,  
 $SSSN = 34m.30s.$   
 Alicante  $P_eP = 13m.45s.$ ,  $PPP = 19m.54s.$ ,  $S? = 25m.49s.$ ,  $PS = 26m.39s.$ ,  $PPS = 27m.45s.$ ,  
 $SS = 31m.17s.$ ,  $sPS = 32m.7s.$ ,  $SSS = 35m.49s.$ ,  $Q = 38m.9s.$   
 Almeria  $PP = 17m.5s.$ ,  $SKS = 23m.51s.$ ,  $SS = 24m.40s.$   
 Granada  $SKS = 23m.42s.$ ,  $PPS = 26m.35s.$ ,  $SS = 30m.29s.$ ,  $SSS = 35m.8s.$   
 Malaga  $ePPP?Z = (19m.16s.)$ ,  $iZ = (21m.14s.)$ , readings have been diminished by 10m.  
 Bermuda  $eSS = 31m.49s.$ ,  $e = 38m.0s.$   
 Huancayo  $eSS? = 39m.4s.$   
 La Paz  $iSKP? = 23m.1s.$ ,  $PPP = 25m.37s.$ ,  $SSE = 41m.25s.$   
 Long waves were also recorded at Honolulu, Durham, Lisbon, and Tananarive.

Jan. 3d. 2h. 20m. 27s. Epicentre  $43^{\circ}6N$ .  $148^{\circ}9E$ . (as at 2h. 17m.).

	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
College	40.5	35	e 7 43	+ 1	—	—	—	—
Sitka	47.5	45	—	—	e 15 38	+ 4	—	e 25.7
Grand Coulee	60.6	50	e 10 21	+ 6	—	—	—	—
Shasta Dam	62.7	58	i 10 28	- 1	—	—	—	—
Berkeley	z. 64.4	61	i 10 45	+ 5	—	—	—	—
Bozeman	66.4	48	—	—	e 19 37	- 6	e 23 53	SS e 33.6
Tinemaha	67.4	59	i 10 56	- 3	—	—	—	—
Haiwee	68.2	60	e 11 5	+ 1	—	—	i 11 17	pP
Logan	68.4	52	i 11 14	+ 8	—	—	e 13 43	PP
Salt Lake City	69.0	53	e 11 21	+12	e 20 9	- 5	—	—
Mount Wilson	69.3	61	i 11 12	+ 1	—	—	i 11 24	pP
Pasadena	69.3	61	i 11 11	0	i 20 15	- 2	i 11 22	pP
Riverside	69.9	61	e 11 14	- 1	—	—	i 11 26	pP
Overton	70.2	58	i 11 14	- 3	—	—	—	—
Boulder City	70.3	58	i 11 15	- 2	—	—	—	—
La Jolla	70.7	62	e 11 19	- 1	—	—	i 11 32	pP
Palomar	70.7	62	i 11 19	- 1	—	—	i 11 32	pP
Pierce Ferry	70.7	58	i 11 20	0	—	—	—	—
Copenhagen	74.4	336	i 11 38	- 4	e 21 21	+ 5	11 52	pP
Tucson	75.2	59	i 11 46	0	e 21 5	-20	i 11 59	pP e 31.8
Uccle	81.2	339	e 11 23	-56	e 21 39	-50	—	—
Stuttgart	81.4	334	e 12 19	- 1	—	—	—	e 39.6
Strasbourg	82.1	335	e 12 22	- 2	—	—	—	—
St. Louis	82.2	42	i 12 23	- 1	i 22 33	- 6	i 12 35	pP
Zürich	82.9	334	e 12 25	- 3	—	—	—	—
Basle	83.0	334	e 12 26	- 2	e 22 48	+ 1	—	—
Chur	83.0	333	e 12 19	- 9	—	—	—	—
Paris	83.4	338	i 12 28	- 2	—	—	—	—
Neuchatel	83.7	334	e 12 30	- 2	—	—	—	—
Clermont-Ferrand	86.0	336	e 12 54	+11	—	—	—	—
Harvard	z. 86.9	29	e 12 47	- 1	—	—	—	—
Philadelphia	87.8	32	—	—	e 23 39	+ 5	e 29 5	SS
Bermuda	98.4	28	e 17 39	PP	e 24 14	[- 5]	e 26 38	PS
Bogota	118.4	50	(e 18 53)	[+ 4]	(e 31 7)	PPS	—	(75.6)
Huancayo	130.7	63	e 19 18	[+ 5]	e 26 23	[+ 1]	e 41 18	SS
La Paz	138.6	60	i 19 35	[+ 7]	—	—	—	—

Additional readings :—

Grand Coulee  $i = 10m.26s.$   
 Berkeley  $iZ = 10m.54s.$   
 Tinemaha  $i = 11m.5s.$  and  $11m.13s.$   
 Logan  $i = 11m.35s.$   
 Tucson  $i = 12m.23s.$ ,  $e = 25m.56s.$   
 Stuttgart  $iZ = 12m.30s.$   
 Paris  $i = 12m.40s.$   
 Philadelphia  $e = 25m.51s.$   
 Bermuda  $eSS? = 31m.35s.$   
 Bogota readings increased by 2m.  
 Huancayo  $eSKKS? = 28m.21s.$ ,  $ePPS = 34m.35s.$

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Jan. 3d. 2h. 55m. 22s. I } Epicentre 43°·6N. 148°·9E.  
3h. 31m. 27s. II } (as at 2h. 20m.).

		Δ	Az.	P.		O - C.	S.		O - C.	Supp.	
				m.	s.		m.	s.		m.	s.
I Mizusawa		7·4	235	1	56	+ 4	c 3	15	- 3	—	—
II	E.	7·4	235	1	59	+ 7	3	15	- 3	—	—
I Grand Coulee		60·6	50	e 10	13	- 2	—	—	—	e 10	30
II		60·6	50	e 10	24	+ 9	—	—	—	—	pP
I Shasta Dam		62·7	58	e 10	28	- 1	—	—	—	—	—
II		62·7	58	e 10	27	- 2	—	—	—	—	—
I Haiwee		68·2	60	e 11	6	+ 2	—	—	—	—	—
I Mount Wilson		69·3	61	e 11	11	0	—	—	—	—	—
I Pasadena		69·3	61	e 11	12	+ 1	—	—	—	—	—
I Riverside		69·9	61	e 11	12	- 3	—	—	—	—	—
I Overton		70·2	58	i 11	17	0	—	—	—	—	—
I Boulder City		70·3	58	i 11	16	- 1	—	—	—	—	—
II		70·3	58	e 11	16	- 1	—	—	—	—	—
I Palomar		70·7	62	i 11	18	- 2	—	—	—	—	—
I Pierce Ferry		70·7	58	i 11	20	0	—	—	—	—	—
II		70·7	58	i 11	19	- 1	—	—	—	—	—
I Copenhagen		74·4	336	11	41	- 1	—	—	—	—	—
II		74·4	336	11	39	- 3	—	—	—	—	—
I Tucson		75·2	59	i 11	47	+ 1	—	—	—	—	—
II		75·2	59	e 11	46	0	—	—	—	i 11	55
I Stuttgart	z.	81·4	334	c 12	20	0	—	—	—	e 12	32
II	z.	81·4	334	e 12	18	- 2	—	—	—	c 12	30
II Strasbourg		82·1	335	c 12	22	- 2	—	—	—	e 12	32
II Zürich		82·9	334	c 12	25	- 3	—	—	—	—	—
II Basle		83·0	334	c 12	27	- 1	—	—	—	—	—
I Paris		83·4	338	i 12	30	0	—	—	—	i 12	43
II		83·4	338	i 12	29	- 1	—	—	—	i 12	40

Jan. 3d. 9h. 10m. 31s. Epicentre 43°·6N. 148°·9E. (as at 2h. and 3h.).

		Δ	Az.	P.		O - C.	S.		O - C.	Supp.		L. m.
				m.	s.		m.	s.		m.	s.	
Mizusawa		7·4	235	1	54	+ 2	3	17	- 1	e 3	13	S
Vladivostok		12·4	273	e 2	14	-47	i 4	34	-47	—	—	—
Irkutsk		30·7	302	—	—	—	c 11	22	+ 1	—	—	—
College		40·5	35	—	—	—	c 13	43	- 9	c 14	10	sS
Almata		50·7	296	e 9	3	0	e 16	18	0	—	—	c 18·8
Sverdlovsk		54·1	317	—	—	—	c 17	1	- 4	c 21	12	SS
Andijan		54·9	295	e 9	33	- 2	c 17	16	0	—	—	—
Tchimkent		55·9	298	i 9	41	- 1	i 17	27	- 2	—	—	—
Tashkent		56·6	297	e 9	45	- 2	e 17	35	- 3	—	—	—
Obi-garm		57·7	295	i 9	54	- 1	e 17	46	- 7	—	—	—
New Delhi	N.	58·1	281	—	—	—	i 17	53	- 5	—	—	c 31·0
Stalinabad		58·4	295	i 10	2	+ 2	i 18	2	0	—	—	—
Grand Coulee		60·6	50	i 10	14	- 1	—	—	—	i 10	37	pP
Shasta Dam		62·7	58	c 10	29	0	—	—	—	—	—	—
Hyderabad	N.	64·1	269	—	—	—	19	11	- 3	19	30	PS
Berkeley	z.	64·4	61	i 10	41	+ 1	—	—	—	i 10	54	pP
Bombay		67·3	274	e 11	4	+ 5	—	—	—	—	—	—
Santa Barbara		68·1	62	i 11	4	0	—	—	—	i 11	17	pP
Haiwee		68·2	60	c 11	6	+ 2	—	—	—	e 11	19	pP
Baku		69·1	306	—	—	—	c 20	22?	+ 7	—	—	—
Mount Wilson		69·3	61	i 11	13	+ 2	—	—	—	i 11	26	pP
Pasadena		69·3	61	i 11	11	0	—	—	—	i 11	25	pP
Riverside		69·9	61	i 11	15	0	—	—	—	i 11	27	pP
Boulder City		70·3	58	i 11	19	+ 2	—	—	—	i 11	31	pP
Palomar		70·7	62	i 11	21	+ 1	—	—	—	i 11	33	pP
Pierce Ferry		70·7	58	i 11	21	+ 1	—	—	—	i 14	7	PP
Leninakan		72·3	309	e 11	32	+ 3	e 20	51	- 1	—	—	—
Copenhagen		74·4	336	24	29	?	25	29	SS	28	59	SS
Tucson		75·2	59	i 11	47 <sup>a</sup>	+ 1	—	—	—	i 12	0	pP
Riverview		77·2	178	e 12	7	+10	e 21	58	+11	—	—	e 39·6

Continued on next page.

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		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Jena	E.	78.8	334	e 12 17	+11	—	—	—	—
Istanbul		79.8	318	e 11 40	-32	c 21 34	-40	—	—
Stuttgart	Z.	81.4	334	i 12 20 <sub>a</sub>	0	—	—	—	—
Ksara		81.7	309	e 12 23	+1	22 41	+7	—	—
Strasbourg		82.1	335	e 12 23	-1	—	—	c 12 37	pP e 41.5
St. Louis	Z.	82.2	42	i 12 24	0	—	—	i 12 37	pP —
Chur		83.0	333	e 12 28	0	—	—	—	—
Paris		83.4	338	i 12 30	0	—	—	i 12 42	pP —
Helwan		87.2	309	12 48	-1	c 23 41	+13	i 13 1	pP —

Additional readings:—

College e = 16m.29s.

Pierce Ferry i = 12m.34s.

Tucson e = 12m.11s., ePP = 14m.57s.

Helwan iZ = 13m.14s.

Long waves were also recorded at Helsinki, Upsala, Malaga, Cheb, Prague, and Christchurch.

Jan. 3d. Readings also at 0h. (Zürich), 1h. (Baku, Piatigorsk, Sochi, near Erevan, Grozny, and Leninakan), 3h. (near Mizusawa), 4h. (La Paz, Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Tucson, Boulder City, Pierce Ferry, Grand Coulee, Shasta Dam, Paris, Stuttgart, and near Mizusawa), 6h. (Tucson, Stuttgart, and Mizusawa), 7h. (Mizusawa and near Bogota), 12h. (Mount Wilson, Riverside, Tucson, Pierce Ferry, and near Apia), 18h. (near Pierce Ferry), 20h. (Ksara and near Ottawa), 22h. (Mizusawa), 23h. (near San Juan).

Jan. 4d. 0h. Undetermined shock.

Mizusawa PE = 39m.51s., SE = 41m.10s.

Shasta Dam iP = 48m.23s., i = 50m.51s., c = 62m.17s.

Boulder City iP = 49m.12s., e = 51m.38s.

Pierce Ferry iP = 49m.15s., i = 49m.24s. and 51m.43s.

Overton iP = 49m.19s., i = 51m.44s.

Tucson eP = 49m.40s., e = 52m.15s.

Copenhagen P = 49m.43s.

Stuttgart eZ = 50m.14s., 52m.40s., and 52m.50s.

Ksara e = 50m.16s. and 59m.34s.

Strasbourg e = 50m.27s. and 52m.41s.

Cheb e = 72m.0s., eL = 80m.0s.

Long waves were also recorded at Rome.

Jan. 4d. 17h. 19m. 17s. Epicentre 7° 8S. 156° 5E. (as on 1942, Jan. 12d.).

A = -0.9087, B = +0.3951, C = -0.1348;  $\delta = +1$ ;  $h = +7$ ;

D = +0.399, E = +0.917; G = +124, H = -0.054, K = -0.991.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Brisbane		19.9	170	e 4 36	0	i 8 25	+10	i 8 50	SSS i 12.0
Riverview		26.4	190	e 5 44	+4	i 10 17	+5	i 11 0	SS c 11.7
Arapuni		34.8	154	—	—	12 55	+30	—	— 16.2
Wellington		37.1	158	7 14	0	13 11	+10	7 23	pP 18.8
Christchurch		38.3	161	7 30	+6	13 28	+9	9 4	PP 19.8
Perth		44.8	232	i 14 48	PS	—	—	—	— i 20.4
Vladivostok		55.4	338	e 8 57	-41	e 15 46	?	—	— —
Calcutta	N.	73.2	296	i 24 19	?	—	—	—	— —
Kodaikanal	E.	80.7	282	e 12 7	-9	—	—	—	— —
Bombay		86.6	290	e 12 36	-10	c 23 11	[ 0 ]	c 23 4	S <sub>c</sub> S —
Pasadena		90.5	56	i 13 2	-3	—	—	—	— e 43.1
Andijan		90.6	311	e 13 3	-2	—	—	—	— —
Mount Wilson		90.6	56	i 13 2	-3	—	—	—	— —
Tchinkent		92.9	312	e 12 48?	-28	—	—	—	— —
Tashkent		93.0	311	e 13 8	-9	e 24 7	[ +17 ]	24 23	S <sub>c</sub> S —

Continued on next page.

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	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Tucson	96.4	59	—	—	c 30 14	?	—	c 39.3
Sverdlovsk	99.7	326	—	—	c 24 17	[- 9]	—	—
Baku	107.6	310	—	—	c 27 31	PS	—	—
Ksara	119.7	304	c 20 10	PP	c 29 49	PS	—	—
Ottawa	121.6	40	c 18 52	[- 4]	—	—	—	61.7
La Paz	129.7	118	19 19	[+ 7]	26 20	[+ 1]	21 31	PP 66.7
Stuttgart	130.8	332	c 19 8	[- 6]	—	—	—	—
Bermuda	134.7	52	c 22 57	PKS	c 26 43	[+13]	c 43 9	SSS c 58.0

Additional readings :—

Brisbane ePE = 4m.40s.

Riverview iZ = 10m.36s., iN = 10m.39s., iE = 10m.42s.

Wellington iZ = 7m.49s., PPZ = 8m.50s., pP<sub>c</sub>P = 9m.13s., iZ = 10m.2s., S = 13m.23s., iZ = 15m.8s., i = 15m.49s., iZ = 16m.13s.

Christchurch iNZ = 13m.32s., SS = 16m.34s., QN = 16m.43s.

Tashkent ePS = 25m.6s.,

La Paz SKPE = 24m.39s., PPS = 33m.25s.

Long waves were also recorded at Huancayo, College, Philadelphia, Weston, Harvard, Uccle, and Cheb.

Jan. 4d. Readings also at 0h. (Copenhagen and Mizusawa (2) ), 1h. (Stuttgart and near Mizusawa), 3h. (Almata, Tchinkent, Stalinabad, Obi-garm, Tashkent, near Andijan and near Bogota), 4h. (Tucson, Palomar, Mount Wilson, Weston, Philadelphia, Huancayo, San Juan, and La Paz), 5h. (La Paz, Riverview, Auckland, Christchurch, Mount Wilson, Riverside, Palomar, Shasta Dam, Pierce Ferry, Boulder City, and near Bogota), 6h. (Mizusawa), 9h. (near Barcelona), 10h. (Mizusawa and near Leninakan), 11h. (near Obi-garm), 12h. (Tucson, Santa Lucia, near Balboa Heights, and near Irkutsk), 14h. (near Lick, Fresno, Branner, and Berkeley), 15h. (La Paz and Huancayo), 16h. (Santa Lucia), 17h. (near Mizusawa), 18h. (Harvard), 19h. (Fresno), 20h. (Andijan, near Obi-garm, and near Mizusawa).

Jan. 5d. Readings at 2h. (near Mizusawa), 5h. (Berkeley, Haiwee, Mount Wilson, Pasadena, Riverside, Santa Barbara, Tinemaha, Tucson, Shasta Dam, and Grand Coulee), 8h. (Mizusawa and near Tchinkent), 9h. (Berkeley, Haiwee, Mount Wilson, Pasadena, Riverside, Tinemaha, Boulder City, Shasta Dam, Ksara, New Delhi, and near Andijan), 11h. (near Andijan, Obi-garm, Stalinabad, Tchinkent, Santa Lucia, and Mizusawa), 13h. (Belgrade and Copiapo), 14h. (Tucson, Pasadena, Mount Wilson, Riverside, and Tinemaha), 15. (Strasbourg and Stuttgart), 18h. (Riverview, Bombay, Hyderabad, Kodaikanal, New Delhi, Cheb, Stuttgart, and Mizusawa), 19h. (Copenhagen, Helsinki, Uccle, Warsaw, Prague, Paris, Strasbourg, and Clermont-Ferrand).

Jan. 6d. Readings at 0h. (Riverview), 3h. (Copiapo), 5h. (Bogota, Calcutta, Bombay, and Tucson), 8h. (Tucson, near Malaga, Alicante, and Almeria, near Obi-garm, Andijan, Stalinabad, Tashkent, and Tchinkent), 9h. (Shasta Dam and near Mizusawa), 11h. (La Paz, Huancayo, Tucson, Riverside, Mount Wilson, Pasadena, and Berkeley), 12h. (Andijan, near Obi-garm, and Stalinabad), 14h. (Brisbane), 15h. (Pierce Ferry, Riverside, Mount Wilson, Palomar, Tinemaha, Tucson, Berkeley, and Weston), 19h. (La Paz), 20h. (near Andijan, Stalinabad, Obi-garm, Tchinkent, and Tashkent), 21h. (near Fresno, Branner, and Lick), 22h. (Tucson and near Istanbul (2) ).

Jan. 7d. Readings at 0h. (La Paz), 1h. and 3h. (near Frunse), 5h. (Kodaikanal), 7h. (Brisbane, Riverview, Auckland, Wellington, Christchurch, and Stuttgart), 10h. (San Juan (2), near Harvard and near Obi-garm, Stalinabad, Andijan, Tashkent, and Tchinkent), 11h. (Christchurch), 13h. (near Lick), 17h. (Boulder City, Lick, and near Pierce Ferry), 18h. (Pierce Ferry and Boulder City).

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Jan. 8d. 0h. 4m. 28s. Epicentre  $9^{\circ}5'N$ .  $126^{\circ}7'E$ . (as on 1945, Jan. 27d.).

A = -0.5895, B = +0.7909, C = +0.1640;  $\delta = -7$ ;  $h = +7$ ;  
D = +0.802, E = +0.598; G = -0.098, H = +0.131, K = -0.986.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Mizusawa	32.2	22	(6 47)	+15	6 47	P	—	—
Vladivostok	33.8	9	i 6 46	0	i 12 7	- 3	—	—
Calcutta	N. 38.9	295	e 7 42	+13	e 13 42	+14	—	—
Irkutsk	46.4	341	8 30	0	e 15 13	- 5	—	—
Kodaikanal	E. 48.5	276	i 8 46	0	i 16 44	+56	10 36	PP 24.6
Riverview	49.0	153	i 8 50 <sub>a</sub>	0	e 15 55	0	i 9 2	pP c 25.2
New Delhi	N. 50.1	299	e 9 9	+10	e 19 54	SS	—	c 30.6
Almata	54.7	318	e 9 34	+ 1	—	—	—	—
Andijan	57.1	313	e 9 51	+ 1	—	—	—	—
Tashkent	59.5	314	e 10 1	- 6	e 18 5	-11	—	—
Tchimkent	59.5	315	i 9 57	-10	i 18 5	-11	—	—
Christchurch	67.3	146	10 51	- 8	19 38	-16	24 12	SS 35.3
Sverdlovsk	69.1	329	i 11 8	- 2	i 20 6	- 9	—	—
Baku	73.9	310	—	—	e 21 12	+ 2	—	—
Grozny	77.0	313	e 11 50	- 6	—	—	—	—
Leninakan	78.5	310	e 12 10	+ 6	—	—	—	—
Moscow	81.7	326	12 20	- 2	22 24	-10	—	—
Ksara	85.5	303	i 12 40	- 1	e 23 13	+ 1	16 0	PP —
Helwan	z. 90.0	300	13 0	- 3	—	—	e 16 44	PP —
Copenhagen	95.4	329	13 36	+ 8	—	—	—	46.5
Grand Coulee	98.7	39	e 13 44	+ 2	—	—	e 13 57	PS —
Shasta Dam	99.9	46	e 13 47	- 1	—	—	—	—
Stuttgart	z. 100.3	324	e 13 48	- 2	—	—	—	—
Rome	101.1	315	(e 13 41)	-12	—	—	—	—
Tinemaha	103.6	49	e 14 12	+ 8	—	—	—	—
Haiwee	104.2	50	e 14 22	+15	—	—	—	—
Pasadena	104.8	52	e 14 12	+ 2	—	—	—	c 49.7
Mount Wilson	104.9	52	e 14 13	+ 3	—	—	e 18 33	PP —
Riverside	105.5	52	e 14 15	P	—	—	—	—
Palomar	106.1	52	e 14 18	P	—	—	—	—
Tucson	111.2	50	e 19 17	PP	—	—	e 20 37	? —
Huancayo	158.2	99	e 20 3	[+ 4]	e 44 32	SS	—	—
La Paz	164.0	117	20 2	[- 3]	i 46 20	SSP	23 36	PP 76.5

Additional readings :—

Kodaikanal SSE = 19m.56s.

Riverview eSN = 15m.45s., eE = 19m.17s., eN = 19m.24s., iN = 25m.6s.

Christchurch SSS?N = 27m.10s., QEN = 28m.12s.

Helwan IZ = 13m.13s.

Rome reading increased by 10m.

Long waves were also recorded at Wellington, Berkeley, Alicante, Granada, Malaga, Uccle, De Bilt, Almeria, Cheb, and Strasbourg.

Jan. 8d. 19h. Undetermined shock.

Butte eP? = 37m.30s., iS? = 38m.23s., eL = 38m.37s.

Logan iP = 37m.57s., iS = 38m.24s., iL = 39m.17s.

Rapid City eP = 38m.39s., eS? = 39m.32s., eL = 40m.28s.

Grand Coulee eP = 38m.54s., eS = 40m.47s., iL = 40m.51s.

Boulder City eP = 39m.17s., e = 41m.54s.

Tinemaha e = 39m.54s.

Shasta Dam eP? = 39m.55s., i = 39m.58s., eL = 42m.20s.

Riverside i = 40m.0s.

Mount Wilson e = 40m.1s.

Palomar e = 40m.4s.

Tucson eP = 40m.42s., eL = 43m.26s.

St. Louis eZ = 45m.32s. and 45m.43s.

Jan. 8d. Readings also at 0h. (near Andijan and Tchimkent), 1h. (near Andijan (2), Tchimkent, Tashkent, and Almata), 3h. (near Almata, Andijan, Tchimkent, Obi-garm, and Tashkent), 5h. (near Andijan (2), Frunse, Tchimkent, Tashkent, Almata, Obi-garm, and Stalinabad), 9h. (near Bucharest), 14h. and 15h. (2) (Istanbul), 19h. (Boulder City near Andijan, Obi-garm, Stalinabad, and Tchimkent), 22h. (near Andijan, Obi-garm, Stalinabad, and Tchimkent), 23h. (Ksara).

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Jan. 9d. 12h. 15m. 59s. Epicentre 43°·6N. 148°·9E. (as on 3d.).

		$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Mizusawa	N.	7.4	235	1 54	+ 2	3 11	- 7	—	—
Vladivostok		12.4	273	i 3 0	- 1	i 5 32	+11	—	—
Irkutsk		30.7	302	e 6 17	- 2	e 11 15	- 6	—	—
College		40.5	35	e 8 12	+30	e 13 44	- 8	e 16 57	SS e 19.7
Sitka		47.5	45	—	—	e 15 46	+12	e 19 45	SS e 26.4
Almata		50.7	296	9 3	0	—	—	—	—
Calcutta	N.	53.7	267	—	—	e 15 27	?	e 20 29	SS
Sverdlovsk		54.1	317	i 9 24	- 5	17 0	- 5	—	—
Andijan		54.9	295	9 34	- 1	17 16	0	—	—
Tchimkent		55.9	298	i 9 41	- 1	i 17 28	- 1	—	—
Tashkent		56.6	297	e 9 44	- 3	e 17 30	- 8	—	—
Obi-garm		57.7	295	9 52	- 3	17 49	- 4	—	—
New Delhi	N.	58.1	281	—	—	i 17 57	- 1	i 18 9	PS
Stalinabad		58.4	295	i 9 58	- 2	17 59	- 3	—	—
Grand Coulee		60.6	50	e 10 24	+ 9	—	—	—	—
Shasta Dam		62.7	58	e 10 26	- 3	—	—	—	—
Hyderabad	N.	64.1	269	e 10 38	0	19 15	+ 1	e 23 34	SS
Berkeley	E.	64.4	61	—	—	i 19 27	+ 9	e 29 1	Q
Moscow		65.3	325	10 42	- 4	—	—	—	—
Bombay		67.3	274	e 10 54	- 5	—	—	—	—
Tinemaha		67.4	59	e 11 6	+ 7	—	—	—	—
Santa Barbara		68.1	62	e 11 11	+ 7	—	—	—	—
Haiwee		68.2	60	e 11 11	+ 7	—	—	—	—
Mount Wilson		69.3	61	e 11 8	- 3	—	—	—	—
Pasadena		69.3	61	e 11 5	- 6	—	—	—	e 33.2
Upsala	N.	69.4	336	e 11 24	+12	—	—	e 15 31	PPP e 40.0
Riverside		69.9	61	e 11 11	- 4	—	—	—	—
Boulder City		70.3	58	i 11 15	- 2	—	—	—	—
Leninakan		72.3	309	10 51	-38	—	—	—	—
Copenhagen		74.4	336	11 38	- 4	—	—	—	42.0
Tucson		75.2	59	e 11 44	- 2	—	—	—	e 39.3
Riverview		77.2	178	e 12 13	+16	e 21 52	+ 5	—	e 34.2
Istanbul		79.8	318	e 11 1?	-71	—	—	—	—
Stuttgart	Z.	81.4	334	e 12 18	- 2	—	—	—	—
Ksara		81.7	309	e 10 22	?	e 19 6	?	—	—
Strasbourg		82.1	335	e 12 20	- 4	—	—	—	—
St. Louis		82.2	42	i 12 28	+ 4	i 22 31	- 8	—	—
Zürich		82.9	334	e 12 34	+ 6	—	—	—	—
Basle		83.0	334	e 12 27	- 1	—	—	—	—
Helwan	Z.	87.2	309	12 49	0	—	—	—	—
La Paz		138.6	60	19 9	[-19]	23 31	SKP	—	68.6

Additional readings :—

Grand Coulee i = 10m.29s.  
 Berkeley iN = 20m.5s., eN = 27m.25s.  
 Pasadena i = 11m.26s., e = 12m.10s.  
 Upsala ePPPE = 15m.40s., eN = 30m.1s.?  
 Tucson e = 12m.17s.  
 Stuttgart eZ = 12m.54s.  
 Strasbourg e = 12m.54s.  
 St. Louis iZ = 12m.38s., iN = 22m.43s.  
 Helwan eZ = 13m.4s.

Long waves were also recorded at Salt Lake City, Huancayo, and other European stations.

Jan. 9d. Readings also at 2h. (Boulder City, Basle, Zürich, near Tortosa, near Andijan, Obi-garm, and Stalinabad), 4h. (Santa Lucia), 11h. (Frunse, Almata, near Andijan, Obi-garm, Tashkent, and Tchimkent), 12h. (Christchurch), 13h. (Arapuni and Wellington), 14h. (near Apia), 20h. (Shasta Dam), 21h. (near Harvard), 22h. (Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Santa Barbara, Tinemaha, Tucson, Boulder City, Overton, Shasta Dam, and Grand Coulee (2) ).

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Jan. 10d. 21h. 36m. 4s. Epicentre  $29^{\circ}5S$ ,  $71^{\circ}5W$ . (as on 1945, Jan. 31d.).

A = +.2766, B = -.8267, C = -.4899;  $\delta = -6$ ;  $h = +2$ ;  
D = -.948, E = -.317; G = -.155, H = +.465, K = -.871.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.
Santa Lucia	N.	4.0	171	1 16	+12	2 15	+23	—
La Plata		12.7	119	3 8	+ 3	5 50	+22	6.7
La Paz		13.3	14	3 11	- 2	5 26	-16	6.1
Huancayo		17.8	347	e 4 14	+ 3	(e 7 14)	-14	e 7.2
Tucson		71.9	326	i 11 43	+16	—	—	—
Palomar		75.8	324	e 12 14	+24	—	—	—
Riverside		76.6	322	e 11 54	0	—	—	—
Mount Wilson		77.1	323	e 11 56	- 1	—	—	—
Pasadena		77.2	323	e 12 14	+17	—	—	—
Haiwee		78.6	324	e 12 22	+17	—	—	—
Tinemaha		79.4	324	e 12 27	+18	—	—	—
Shasta Dam		84.3	324	e 12 51	+16	—	—	—
Christchurch		86.6	221	—	—	22 16	[-55]	24.1
Riverview		105.2	215	e 18 44	PP	(e 24 44)	[- 7]	e 24.7

Additional readings :—

La Plata Z = 4m.32s.

La Paz SZ = 5m.29s.

Huancayo e = 4m.20s.

Riverside e = 12m.11s. and 12m.19s.

Mount Wilson e = 12m.15s. and 12m.22s.

Pasadena e = 12m.21s.

Tinemaha i = 12m.35s.

Riverview eE = 23m.11s.

Jan. 10d. Readings also at 0h. (Erevan, Leninakan, near Grozny and Piatigorsk), 2h. (Haiwee, La Jolla, Mount Wilson, Pasadena, Palomar, Riverside, Santa Barbara, Tinemaha, Tucson, Boulder City, Overton, Shasta Dam, Grand Coulee, Ksara, Riverview, Christchurch, Auckland, and Wellington), 3h. (La Paz), 5h. (Riverview), 6h. (near Mizusawa), 9h. (near Andijan and Tchimkent), 10h. (near Mizusawa), 14h. (near Apia), 16h. (Riverview, Tuai, near Christchurch, Kaimata, and Wellington), 18h. (Andijan, Obi-garm, Sverdlovsk, Helwan, Ksara, Florissant, St. Louis, and near Harvard), 19h. (near Lick), 21h. (Riverview), 22h. (near Andijan, Frunse, Tchimkent, and near Grozny).

Jan. 11d. 11h. 57m. 47s. Epicentre  $37^{\circ}5N$ ,  $118^{\circ}5W$ . (as on 1945, Aug. 17d.).

Intensity VI at Owen's River Gorge; V at Tinemaha; IV at Bigpine, Bishop, and Woodlake.

L. M. Murphy.

United States Earthquakes, 1947, Serial No. 730, Washington, 1950, p. 15. Epicentre near that adopted.

A = -.3795, B = -.6989, C = +.6062;  $\delta = -4$ ;  $h = -1$ ;  
D = -.879, E = +.477; G = -.289, H = -.533, K = -.795.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Fresno	N.	1.3	233	i 0 22	- 3	—	—	—	—
Lick		2.5	266	i 0 42	- 1	i 1 15	+ 1	i 0 49	P <sub>g</sub>
Branner		2.9	268	i 0 48	0	i 1 26	+ 2	i 0 58	P <sub>g</sub>
Berkeley	Z.	3.0	277	i 0 48	- 2	—	—	—	—
San Francisco	E.	3.2	275	e 0 50	- 2	i 1 30	- 2	—	—
Boulder City		3.3	117	e 0 59	+ 6	e 1 48	S <sub>g</sub>	i 1 3	P*
Overton		3.4	106	e 0 56	+ 1	e 1 52	S <sub>g</sub>	i 1 3	P*
Shasta Dam		4.4	318	e 1 13	+ 3	i 2 18	S*	i 1 25	P <sub>g</sub>
Tucson		8.2	128	e 2 3	0	—	—	—	e 4.4

Additional readings :—

Lick iSEN = 1m.18s.

Branner iN = 1m.1s. and 1m.36s.

San Francisco iE = 1m.16s.

Shasta Dam i = 2m.21s.

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Jan. 11d. Readings also at 3h. (Tucson, Riverview, and near Apia), 7h. (near Almata, Andijan, Frunse, Obi-garm, Samarkand, Stalinabad, Tchimkent, and Tashkent), 11h. (Boulder City, Overton, and near Tucson), 12h. (Haiwee, Mount Wilson, Palomar, Riverside, Tucson (2), Shasta Dam, and near Algiers), 14h. (Tucson, Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Boulder City, Overton, Montezuma, and La Paz), 15h. (Tucson, 16h. (Mount Wilson, Palomar, Riverside, Boulder City, Tucson, Bermuda, San Juan, Stuttgart, Tchimkent, near Andijan and Obi-garm), 17h. (Andijan, Tchimkent, near Almata and Frunse), 19h. (Brisbane), 20h. (Mount Wilson, Riverside, Tinemaha, Shasta Dam, Christchurch, Wellington, Riverview, near Obi-garm and near Mizusawa), 21h. (Tucson and near Ottawa).

Jan. 12d. Readings at 0h. (Shasta Dam), 1h. (Tucson), 4h. (St. Louis), 6h. (Shasta Dam, Andijan, Erevan (2), near Grozny (2), Leninakan (2), and Piatigorsk (2)), 13h. (near Obi-garm, Samarkand, Stalinabad, Andijan, and Tchimkent), 15h. (Mizusawa), 17h. (Santa Lucia), 18h. (Boulder City, Belgrade, and near Grozny), 22h. (Boulder City).

Jan. 13d. Readings at 0h. (near Mizusawa and near Tananarive), 1h. (Andijan, near Obi-garm, Samarkand, Stalinabad, and Tchimkent), 5h. (near La Paz), 6h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, and Tucson), 7h. and 8h. (near Obi-garm), 9h. (Bozeman), 11h. (near Granada), 12h. (Kew), 14h. (near Mizusawa), 16h. (near Andijan, Frunse, Samarkand, and Tchimkent), 17h. (Erevan, Piatigorsk (2), near Grozny (2), and Leninakan (2)), 20h. (near Ottawa, near Branner, near Almata, Andijan, Frunse, Obi-garm, Samarkand, Stalinabad, Tashkent, and Tchimkent).

Jan. 14d. 4h. Off coast of British Columbia.

Grand Coulee iP = 45m.37s., i = 45m.42s., iS = 47m.52s.

Shasta Dam eP = 46m.30s.

Berkeley eNZ = 47m.5s., eEN = 47m.9s., eE = 47m.18s., iE = 48m.52s., iN = 50m.0s., eN = 51m.18s.

Logan eP = 47m.25s., eS = 52m.3s., iS = 52m.12s., i = 52m.49s., iL = 53m.15s.

Butte e = 47m.31s., eS? = 50m.14s., eL = 50m.40s.

Fresno ePN = 47m.34s.

Salt Lake City eP? = 47m.34s., eS? = 51m.8s., eL = 52m.5s.

Tinemaha iP = 47m.36s., i = 47m.42s.

Haiwee eP = 47m.48s.

Santa Barbara eP = 47m.56s.

Overton iP = 47m.57s.

Boulder City eP = 47m.58s., eS = 55m.12s.

Pasadena iP = 48m.4s., i = 48m.9s., eL = 51.4m.

Mount Wilson iP = 48m.5s.

Riverside iP = 48m.9s.

Rapid City iP? = 48m.13s., e = 51m.55s., eL = 53m.45s.

Palomar iP = 48m.18s., i = 48m.25s.

Tucson iP = 48m.53s., i = 49m.2s. and 49m.42s., e = 50m.18s. and 53m.16s., eL = 57m.10s.

St. Louis ePZ = 49m.57s., eZ = 50m.42s., eE = 55m.4s., eSE? = 59m.39s., eN = 60m.0s.

Bozeman e = 50m.4s., eL = 51m.7s.

Lincoln eS = 53m.55s., e = 56m.50s., eL = 59m.0s.

Philadelphia e = 58m.51s., eL = 62m.50s.

Florissant iZ = 59m.9s., eZ = 61m.19s., eN = 61m.47s.

Columbia e = 64m.12s., eL = 67m.16s.

Weston e = 64m.13s., i = 64m.49s., e = 66m.3s. and 66m.20s.

Long waves were also recorded at Honolulu, Uccle, and other American stations.

Jan. 14d. Readings also at 1h. (near Almata, Andijan, Obi-garm, Samarkand, Stalinabad, and Tashkent), 2h. (Berkeley, Tucson, Shasta Dam, near Fresno (2), Boulder City, Overton (2), Branner, and Lick (2)), 3h. (Boulder City and near Overton), 6h. (Boulder City and near Overton), 7h. (Boulder City and near Overton), 18h. (near Obi-garm and near Tananarive), 20h. (Tucson), 21h. (near Mizusawa), 23h. (Branner).



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Jan. 15d. 18h. 27m. 54s. Epicentre 26°·5N. 112°·0W.

A = -·3357, B = -·8308, C = +·4438;  $\delta$  = -12;  $h$  = +3;  
D = -·927, E = +·375; G = -·166, H = -411, K = -·896.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Tucson	5·8	10	i 1 21	- 8	i 2 32	- 6	i 1 41	P* i 2·7
La Jolla	7·8	326	e 2 3	+ 5	i 3 50	S*	—	—
Palomar	8·0	329	i 2 0	0	—	—	—	—
Riverside	8·8	330	i 2 16	+ 5	—	—	—	—
Mount Wilson	9·3	327	e 2 23	+ 6	—	—	—	—
Pasadena	9·3	327	e 2 21 <sub>a</sub>	+ 4	(e 4 7)	+ 2	—	— e 4·1
Boulder City	9·7	346	e 2 19	- 3	e 4 43	+28	—	— i 5·4
Overton	10·2	349	e 2 29	- 2	—	—	—	—
Santa Barbara	10·3	322	e 2 23	- 9	—	—	—	—
Haiwee	10·9	334	e 2 41	+ 1	—	—	—	—
Tinemaha	11·8	335	e 2 57	+ 4	—	—	—	—
Lick	E. 13·6	325	e 3 28	+11	e 5 58	+ 8	—	— e 6·8
	N. 13·6	325	e 3 21	+ 4	e 5 28	-22	—	— e 6·8
Santa Clara	13·7	324	i 3 26	+ 8	e 6 16	+24	—	— e 6·8
Branner	13·9	324	e 3 38	+17	—	—	—	— e 7·1
Salt Lake City	14·2	1	e 3 23	- 1	—	—	—	— e 6·4
Berkeley	14·3	325	e 3 30	+ 4	e 7 4	+58	e 7 30	Q e 8·4
San Francisco	E. 14·3	324	e 3 23	- 3	—	—	—	— e 7·3
Denver	14·5	22	—	—	e 6 24	+13	—	— i 7·3
Logan	15·2	1	i 3 35	- 3	i 6 38	+10	i 3 46	PP i 7·4
Shasta Dam	16·6	331	e 3 58	+ 2	e 7 11	+11	—	— e 8·9
Ferndale	17·3	326	e 4 25	+21	e 7 36	+20	—	— e 9·4
Rapid City	18·9	19	e 4 23	- 1	e 7 44	- 9	e 4 47	PP e 9·5
Lincoln	19·1	36	—	—	e 7 44	-13	—	— e 9·6
Bozeman	19·2	2	e 4 26	- 2	e 7 57	- 2	—	— e 9·7
Butte	19·5	359	e 4 31	0	e 8 10	+ 4	—	— e 8·7
Mobile	21·3	71	—	—	8 57	+14	—	— 12·2
Florissant	21·9	50	e 4 55	- 2	e 8 48	- 6	—	— i 11·5
St. Louis	21·9	50	i 4 55	- 2	i 8 48	- 6	—	— i 10·9
Grand Coulee	22·1	346	i 4 57	- 2	—	—	—	— e 11·6
Chicago	25·2	44	e 5 32	+ 3	e 9 46	- 6	—	— e 11·9
Saskatoon	25·9	6	—	—	e 10 6	+ 2	—	— 13·1
Columbia	27·7	65	—	—	10 26	- 7	e 11 30	SS e 13·8
Philadelphia	33·4	56	—	—	e 11 53	-10	—	— e 14·1
Fordham	34·5	54	—	—	e 12 2	-18	—	— e 17·3
Ottawa	34·5	46	e 6 53	+ 1	—	—	—	— 17·1
Harvard	Z. 36·6	53	e 7 11	+ 1	—	—	—	— e 19·1
Seven Falls	38·3	46	e 7 28	+ 4	e 13 18	- 1	—	— e 19·1
Bermuda	41·4	69	e 9 31	PP	—	—	—	— e 19·3
Huancayo	52·3	132	—	—	e 17 6	+26	—	— e 29·1
Cheb	89·2	32	—	—	—	—	e 33 6?	SSS e 45·1
Ksara	112·7	29	e 19 59	PP	29 33	PS	—	—

Additional readings :—

Tucson i = 1m.46s.

Boulder City i = 2m.23s.

Salt Lake City e = 4m.31s.

Berkeley iPZ = 3m.35s.

Ferndale eE = 4m.41s.

Grand Coulee i = 5m.10s.

Long waves were also recorded at Honolulu, San Juan, Riverview, Christchurch, and other American and European stations.

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Jan. 15d. 19h. Probably South Pacific and very deep. Pasadena suggests depth 600km.

Riverview iSE = 53m.35s., isSEZ = 56m.48s., iN = 56m.52s., iZ = 57m.5s., iScS?N = 58m.51s.  
 Mount Wilson iP = 55m.8s., i = 55m.11s., epP = 57m.20s.  
 Pasadena iP = 55m.8s., epP = 57m.17s.  
 La Jolla eP = 55m.9s.  
 Palomar iPEZ = 55m.10s., ipP = 57m.21s.  
 Riverside iP = 55m.11s.  
 Haiwee iP = 55m.14s.  
 Tinemaha iP = 55m.16s.  
 Boulder City iP = 55m.25s.  
 Overton iP = 55m.28s.  
 Tucson iP = 55m.30s., i = 55m.48s. and 57m.42s.  
 Grand Coulee eP = 55m.43s.  
 Warsaw iPZ = 61m.32s.a.  
 Copenhagen PKP = 62m.29s.  
 Ksara ePKP = 62m.39s., pPKP = 65m.1s.  
 Stuttgart eP?Z = 62m.42s., e = 62m.49s.k.  
 Chur eP = 62m.44s.  
 Jena eN = 62m.44s. and 62m.54s.  
 Paris iPKP = 62m.44s., i = 62m.51s. and 63m.3s.  
 Helwan iZ = 62m.50s. and 63m.0s., eZ = 65m.9s.  
 St. Louis iN = 66m.13s., eN = 68m.50s.

Jan. 15d. Readings also at 2h. (near Andijan, Frunse, and Tchimkent), 4h. (Copiapo), 5h. (near Obi-garm), 6h. (near Tchimkent), 7h. (near Tananarive), 9h. (Tchimkent, near Andijan, Obi-garm, and Stalinabad), 14h. (Brisbane), 15h. (Mount Wilson, Pasadena, Palomar, Riverside, and Tucson), 18h. (Lick), 19h. (La Paz, near Huan-cayo (2), and near Branner), 20h. (Mizusawa), 21h. (near Tucson).

Jan. 16d. 11h. 29m. 6s. Epicentre 13°·7N. 55°·4E.

A = +·5519, B = +·8000, C = +·2354;  $\delta = +1$ ;  $h = +6$ ;  
 D = +·823, E = -·568; G = +·134, H = +·194, K = -·972.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Bombay	E.	17·5	70	i 4 4	- 3	—	—	—	—
Kodaikanal	E.	21·9	95	e 4 15	-42	—	—	—	—
Hyderabad	N.	22·5	77	—	—	9 10	+ 5	—	—
New Delhi	N.	25·1	49	i 5 23	- 5	i 9 21	-30	—	i 13·5
Ksara		26·7	320	i 5 43	0	e 10 37	+20	—	—
Baku		27·0	349	e 5 46	+ 1	i 10 22	0	—	—
Helwan		27·4	309	5 48	- 1	10 24	- 4	6 33	PP
Stalinabad		27·5	22	i 5 46	- 4	i 10 25	- 5	—	—
Samarkand		27·8	18	6 4	+11	—	—	—	—
Obi-garm		27·9	23	5 56	+ 2	—	—	—	—
Leninakan		28·8	341	e 6 6	+ 4	—	—	—	—
Tashkent		30·1	20	e 6 9	- 4	e 11 5	- 7	—	—
Andijan		30·8	25	e 6 26	+ 6	—	—	—	—
Tchimkent		31·0	20	i 6 14	- 7	—	—	—	—
Calcutta	N.	32·4	69	—	—	e 12 29	+41	—	e 16·4
Almata		34·8	27	e 6 54	0	—	—	—	—
Istanbul		35·6	324	e 7 54?	+53	—	—	—	—
Sverdlovsk		43·2	4	7 59	- 5	e 14 17	-15	—	—
Rome		46·5	315	8 30 <sub>a</sub>	- 1	e 15 17	- 2	e 10 4	PP
Triest		47·4	321	e 8 34	- 4	e 15 28	- 4	—	e 20·3
Chur		50·5	320	c 9 0	- 2	—	—	—	—
Irkutsk		54·0	34	e 9 20	- 8	17 7	+ 4	—	—

Helwan also gives eZ = 6m.0s. and SSN = 11m.36s.

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Jan.16d. 15h. 22m. 19s. Epicentre 6°·2N. 82°·4W. (as on 1946, May 21d.).

A = +·1315, B = -·9855, C = +·1073;  $\delta$  = +2;  $h$  = +7;  
D = -·991, E = -·132; G = +·014, H = -·106, K = -·994.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Balboa Heights	3·9	45	e 0 59	- 3	e 1 47	- 3	—	—
Bogota	z. 8·4	100	i 2 9	+ 3	—	—	i 2 26	PPP
Huancayo	19·4	159	e 4 29	- 1	(e 8 7)	+ 3	—	e 8·1
San Juan	20·0	51	e 4 39	+ 2	e 8 35	SS	—	—
La Paz	z. 26·6	147	5 49	+ 7	—	—	—	15·1
St. Louis	33·0	349	e 6 38	- 1	e 12 1	+ 4	i 6 43	? e 16·2
Tucson	37·1	318	i 7 12	- 2	—	—	e 8 42	PP e 19·3
Palomar	41·9	316	i 7 52	- 2	—	—	—	—
Pasadena	43·2	315	e 8 3	- 1	—	—	—	—

Tucson gives also  $i = 7m.20s.$   
Long waves were also recorded at Weston.

Jan. 16d. 17h. 43m. 22s. Epicentre 33°·8N. 134°·2E.

Intensity VI at Numajima (Hyogo Pref.); V at Nada and Koriya (Hyogo Pref.); IV at Sumoto, Tokushima, Kôti, Takamatsu, and Kobe; II-III at Siomisaki, Tsu, Osaka, Owase, and Matsue.

Epicentre as adopted. Focal depth 10km. Macroscopic radius between 200 and 300km. The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year 1947, Tokyo, 1950, p. 5., macroseismic chart, p. 5.

A = -·5805, B = +·5970, C = +·5537;  $\delta$  = -3;  $h$  = +1;  
D = +·717, E = +·697; G = -·386, H = +·397, K = -·833.

	$\Delta$	Az.	P.	O-C.	S.	O-C.
	°	°	m. s.	s.	m. s.	s.
Kôti	0·6	246	0 12 <sub>k</sub>	- 3	0 20	- 6
Sumoto	0·8	46	0 5 <sub>a</sub>	-13	0 25	- 6
Kobe	1·2	43	0 23	- 1	0 39	- 2
Siomisaki	1·4	105	0 22	- 5	0 38	- 8
Owase	1·7	81	0 28	- 3	0 49	- 5
Kyoto	1·8	46	0 32	0	—	—
Toyooka	1·8	16	0 31 <sub>a</sub>	- 1	0 56	0
Hamada	2·1	302	0 40	+ 3	1 9	+ 5
Hikone	2·2	49	0 38	0	1 10	+ 4
Nagoya	2·7	59	0 44	- 1	1 20	+ 1
Izuka	2·9	267	0 48	0	—	—
Miyazaki	3·0	231	1 0	P <sub>s</sub>	1 39	S <sub>s</sub>
Kumamoto	3·1	251	0 51 <sub>a</sub>	0	1 44	S <sub>s</sub>
Hukuoka	3·2	266	1 5 <sub>a</sub>	P <sub>s</sub>	1 51	S <sub>s</sub>
Shizuoka	3·6	70	1 7	P <sub>s</sub>	1 52	S <sub>s</sub>
Kagosima	3·8	235	1 47	+46	—	—
Toyama	3·8	39	1 14	P <sub>s</sub>	2 10	S <sub>s</sub>
Hunatu	4·1	64	1 7	+ 2	2 5	S <sub>s</sub>
Misima	4·1	70	1 16	P <sub>s</sub>	2 10	S <sub>s</sub>
Nagano	4·4	48	1 25	P <sub>s</sub>	2 18	S <sub>s</sub>
Maebasi	4·8	55	1 13	- 2	—	—
Yokohama	4·8	68	1 37	P <sub>s</sub>	2 32	S <sub>s</sub>
Kumagaya	4·9	59	1 19	+ 2	—	—
Tokyo	4·9	66	1 32	P <sub>s</sub>	2 32	S <sub>s</sub>
Utuonomiya	5·4	58	1 36	P <sub>s</sub>	2 46	S <sub>s</sub>
Kakioka	5·5	62	1 25	0	—	—
Mito	5·8	61	2 0	P <sub>s</sub>	2 56	S <sub>s</sub>
Onahama	6·3	58	2 1	P <sub>s</sub>	—	—
Sendai	7·0	49	3 25	S <sub>s</sub>	—	—

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Jan. 16d. 17h. 46m. 6s. Epicentre 33°·8N. 134°·2E. (as at 17h. 43m.).

Intensity V at Tokushima; IV at Sumoto and Takamatsu; II-III at Siomisaki, Kôti, Kobe, Kashiwara, and Tottori. Epicentre 34°·0N. 134°·4E. Depth of focus 20km. Macro seismic radius between 200 and 300km.

The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year 1947, Tokyo, 1950, p. 6, macro seismic chart, p. 6.

	$\Delta$	Az.	P.	O-C.	S.	O-C.
	°	°	m. s.	s.	m. s.	s.
Kôti	0·6	246	0 15k	0	0 26	0
Sumoto	0·8	46	0 11k	- 7	0 19	-12
Siomisaki	1·4	105	0 25	- 2	0 41	- 5
Owase	1·7	81	0 30	- 1	0 48	- 6
Kyoto	1·8	46	0 21	-11	0 41	-15
Toyooka	1·8	16	0 29	- 3	0 49	- 7
Hamada	2·1	302	0 39	+ 2	1 9	$S_g$
Hikone	2·2	49	0 36	- 2	1 2	- 4
Giho	2·7	53	0 43	- 2	1 23	$S^*$
Nagoya	2·7	59	0 41	- 4	1 11	- 8
Izuka	2·9	267	0 51	+ 3	—	—
Miyazaki	3·0	231	1 6	$P_g$	1 49	$S_g$
Kumamoto	3·1	251	1 3 <sub>a</sub>	$P_g$	1 49	$S_g$
Hukuoka	3·2	266	1 6 <sub>a</sub>	$P_g$	1 48	$S_g$
Unzendake	3·5	253	1 8	$P_g$	1 58	$S_g$
Shizuoka	3·6	70	1 2	+ 4	1 50	+ 8
Toyama	3·8	39	1 13	$P_g$	1 57	$S^*$
Hunatu	4·1	64	1 2	- 3	1 59	+ 4
Misima	4·1	70	1 4	- 1	2 9	$S^*$
Wazima	4·2	31	1 10	+ 3	2 8	$S^*$
Nagano	4·4	48	1 24	$P_g$	2 19	$S^*$
Maebasi	4·8	55	1 32	$P_g$	2 31	$S^*$
Mera	4·8	75	1 22	+ 7	—	—
Yokohama	4·8	68	1 29	$P^*$	—	—
Kumagaya	4·9	59	1 17	0	2 30	$S^*$
Tokyo	4·9	66	1 34	$P_g$	2 33	$S^*$
Utunomiya	5·4	58	1 40	$P^*$	2 48	$S^*$
Kakioka	5·5	62	1 35	$P^*$	—	—
Mito	5·8	61	1 23	- 6	—	—
Mizusawa	E. 7·7	44	e 1 6	?	e 1 53	P

Jan. 16d. 22h. 31m. 37s. Epicentre 47°·5N. 8°·9E. (as on 1937, Sept. 30d.).

Intensity IV in the Swiss frontier region (Hegau).

Epicentre 47°45'N. 8°48'E. To 22h. 31m. 47°·2s. Depth of focus 20km.

Dr. W. Hiller: Die Erdbebentätigkeit in Südwestdeutschland im Jahre, 1947 (Statische Monatshefte Württemberg-Baden, Heft 6, June 1949, p. 1.).

Dr. E. Wanner: Jahresbericht des Erdbebendienstes der Schweiz im Jahre, 1947, Zürich, 1948, p. 2, map with epicentre, fig. 1.

Intensity IV in the canton of Schaffhausen. Macro seismic radius 20km.

$$A = +\cdot6699, B = +\cdot1049, C = +\cdot7350; \quad \delta = 0; \quad h = -4;$$

$$D = +\cdot115, E = -\cdot988; \quad G = +\cdot726, H = +\cdot114, K = -\cdot678.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Zürich	0·2	238	i 0 10	0	i 0 15	- 1	—	—
Ebingen	0·7	4	e 0 16	- 1	e 0 21	$S_g$	—	e 0·3
Chur	0·8	147	e 0 25	+ 7	e 0 35	+ 4	—	—
Basle	0·9	273	e 0 19	- 1	e 0 32	$S^*$	—	—
Strasbourg	1·3	325	—	—	e 0 39	$S^*$	e 0 42	$S_g$
Stuttgart	1·3	9	e 0 23	- 2	e 0 43	$S_g$	e 0 25	$P_g$
Neuchatel	1·4	249	e 0 30	$P_g$	e 0 49	$S_g$	—	—

Stuttgart also gives eS = 0m.36s., iS<sub>g</sub> = 0m.38s.

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Jan. 16d. Readings also at 2h. (Mizusawa), 3h. (Rome, Paris, Stalinbad, Andijan, and near Obi-garm), 5h. (La Paz and Santa Lucia), 7h. (Andijan, near Obi-garm, and Stalinabad), 9h. (Ksara), 10h. (Bombay, Ksara, Samarkand, and near Andijan, Frunse, Tchimkent, Tashkent, Obi-garm, Almata, and Stalinabad), 13h. (near San Juan), 14h. (La Paz), 15h. (Brisbane), 16h. (Philadelphia and near Tananarive), 21h. (near Obi-garm, Stalinabad, and Andijan).

Jan. 17d. Readings also at 0h. (Philadelphia, Weston, San Juan, and Tucson), 3h. (Lick), 7h. (Santa Lucia), 11h. (near Andijan (3), Frunse, Obi-garm (2), Stalinabad, Tashkent (2), and Tchimkent), 14h. (near Almata, Andijan, Frunse, Obi-garm, Samarkand, Stalinabad, Tashkent, and Tchimkent), 15h. (near Reykjavik).

Jan. 18d. 2h. 58m. 42s. Epicentre  $41^{\circ}9N$ .  $67^{\circ}3E$ . Depth of focus 0.025. (given by U.S.S.R.).

A = +.2881, B = +.6887, C = +.6653;  $\delta = -7$ ;  $h = -2$ ;  
D = +.923, E = -.386; G = +.257, H = +.614, K = -.747.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Tashkent	1.6	111	e 0 29?	- 5	0 56	- 5	—	—
Tchimkent	1.8	77	i 0 24	-12	i 0 52	-13	—	—
Samarkand	2.2	186	0 41	0	1 15	+ 3	—	—
Stalinabad	3.5	160	1 0	+ 4	1 44	+ 5	—	—
Obi-garm	3.7	149	1 2	+ 4	1 46	+ 2	—	—
Andijan	4.0	104	e 1 0	- 2	1 48	- 2	—	—
Frunse	5.5	77	i 1 14	- 8	2 15	-10	—	—
Almata	7.2	76	e 1 44	0	e 2 4?	-61	—	—
Sverdlovsk	15.6	346	e 3 12	-19	6 14	- 4	—	—
Moscow	23.7	315	4 49	- 6	8 59	+ 6	—	—
Calcutta	N. 26.1	129	—	—	e 9 29	- 4	e 11 9	SS
Stuttgart	Z. 40.5	299	e 7 22	0	—	—	—	e 18.6
Strasbourg	41.5	300	e 7 29	- 1	—	—	—	e 21.7
Paris	44.8	302	c 7 57?	+ 1	—	—	—	—

Additional readings:—

Stuttgart eZ = 7m.25s. and 8m.52s.

Long waves were also recorded at Copenhagen, Warsaw, Cheb, De Bilt, and Uccle.

Jan. 18d. 4h. 13m. 31s. Epicentre  $23^{\circ}2S$ .  $172^{\circ}7E$ . (as on 1944, December 21d.).

A = -.9126, B = +.1169, C = -.3917;  $\delta = -7$ ;  $h = +4$ ;  
D = +.127, E = +.992; G = +.389, H = -.050, K = -.920.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Auckland	13.7	173	—	—	4 49	-63	—	7.5
Arapuni	15.0	171	—	—	5 29?	-54	—	—
Wellington	18.1	175	4 15	+ 1	7 50	+15	8 39	P <sub>c</sub> P 9.5
Christchurch	20.3	180	4 39	- 1	8 27	+ 4	—	10.5
Riverview	21.7	235	e 4 56	+ 1	e 8 34	-17	e 8 53	P <sub>c</sub> P e 9.6
Tucson	91.5	55	e 13 3	- 7	—	—	—	—
Ksara	140.9	296	c 16 19	?	—	—	—	—
Stuttgart	Z. 151.3	337	c 19 45	[- 4]	—	—	—	—

Additional readings:—

Riverview iEN = 8m.45s.

Stuttgart eZ = 20m.5s.

Long waves were also recorded at Berkeley, Santa Lucia, and Potsdam.

Jan. 18d. Readings also at 1h. (Stuttgart, near Almata, Andijan, Frunse, Obi-garm, Samarkand, Stalinabad, Tashkent, and Tchimkent), 2h. (New Delhi and Ksara), 4h. (near Apia), 5h. (Tucson), 7h. (Stalinabad, near Obi-garm, and Tchimkent), 8h. (near Andijan, Obi-garm, Samarkand, Stalinabad, Tashkent, and Tchimkent), 9h. (Tucson), 10h. (Pasadena, Palomar, Riverside, and Tucson), 17h. (near Lick), 18h. (Frunse and near Almata), 19h. (Andijan), 20h. (near Samarkand, Stalinabad, and Tchimkent), 22h. (Stalinabad and near Obi-garm).

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Jan. 19d. 1h. North-West India.

Andijan eP = 34m.54s., eS = 37m.55s.  
 Hyderabad PN = 35m.13s., SN = 38m.42s., SSN = 39m.1s.  
 Tashkent eP = 35m.21s., eS = 38m.30s.  
 Bombay ePN = 35m.26s., eSN = 38m.11s., LN = 39m.26s.  
 Tchinkent iP = 35m.26s., iS = 38m.40s.  
 Obi-garm iP = 35m.26s.  
 Stalinabad eP = 35m.32s.?, eS = 38m.7s.?  
 Calcutta iN = 36m.13s. and 37m.23s.  
 Ksara e = 37m.4s.  
 Stuttgart eZ = 42m.3s.

Jan. 19d. Readings also at 0h. (near Ottawa), 1h. (Ksara, Almeria, Alicante, Granada, Strasbourg, Stuttgart, Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Santa Barbara, Tinemaha, Tucson, Boulder City, Overton, and Shasta Dam), 2h. (Palomar, Riverside, Tinemaha, and Tucson), 5h. (Santa Lucia, and near Obi-garm), 6h. (Tashkent, near Andijan, Frunse, Obi-garm, and Tchinkent), 8h. (Haiwee, Mount Wilson, Palomar, and Tinemaha), 11h. (near Mizusawa), 14h. (Grand Coulee), 15h. (near Balboa Heights, and near Obi-garm (2)), 16h. (near Bogota), 17h. (San Juan), 18h. (Andijan, near Obi-garm, Stalinabad, and near Almata), 21h. (Shasta Dam), 22h. (Stuttgart).

Jan. 20d. 0h. 33m. 3s. Epicentre 43°·6N. 148°·9E. (as on 9d.).

A = -·6221, B = +·3753, C = +·6872;  $\delta = +10$ ;  $h = -3$ ;  
 D = +·517, E = +·856; G = -·588, H = +·355, K = -·726.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Mizusawa	7·4	235	1 53	+ 1	3 7	-11	—	—
Grand Coulee	60·6	50	e 10 14	- 1	—	—	—	—
Shasta Dam	62·7	58	i 10 29	0	—	—	—	—
Tinemaha	67·4	59	e 11 0	+ 1	—	—	—	—
Haiwee	68·2	60	e 11 3	- 1	—	—	—	—
Mount Wilson	69·3	61	e 11 11	0	—	—	—	—
Pasadena	69·3	61	e 11 12	+ 1	—	—	—	—
Riverside	69·9	61	i 11 14	- 1	—	—	—	—
Overton	70·2	58	i 11 17	0	—	—	—	—
Boulder City	70·3	58	i 11 18	+ 1	—	—	—	—
Palomar	70·7	62	e 11 20	0	—	—	—	—
Pierce Ferry	70·7	58	i 11 21	+ 1	—	—	—	—
Copenhagen	74·4	336	11 37	- 5	—	—	—	44·0
Tucson	75·2	59	i 11 46	0	—	—	—	—
Cheb	79·3	334	—	—	e 24 57?	? e 36 57?	Q	c 42·0
Stuttgart	z. 81·4	334	i 12 16 <sub>a</sub>	- 4	—	—	—	—
Ksara	81·7	309	e 12 20	- 2	—	—	—	—
Strasbourg	82·1	335	e 12 27	+ 3	—	—	—	e 49·0
St. Louis	z. 82·2	42	i 12 34	+10	—	—	—	—
Zürich	82·9	334	e 12 24	- 4	—	—	—	—
Basle	83·0	334	e 12 25	- 3	—	—	—	—
Paris	83·4	338	i 12 28	- 2	—	—	—	e 52·0
Helwan	z. 87·2	309	12 46	- 3	—	—	—	—

Additional readings:—

Grand Coulee i = 10m.25s.  
 Tinemaha i = 11m.12s.  
 Haiwee e = 11m.15s.  
 Mount Wilson i = 11m.24s.  
 Pasadena e = 11m.23s.  
 Palomar i = 11m.32s.  
 Stuttgart eZ = 12m.32s.  
 Paris i = 12m.42s.

Long waves were also recorded at Bombay and Uccle.

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Jan. 20d. 10h. 41m. 39s. Epicentre  $28^{\circ}7'N$ ,  $114^{\circ}2'W$ .

A = -0.3601, B = -0.8013, C = +0.4777;  $\delta = -5$ ;  $h = +2$ ;  
D = -0.912, E = +0.410; G = -0.196, H = -0.436, K = -0.879.

	$\Delta$	Az.	P.	O-C.	S.	O-C.		L.
	°	°	m. s.	s.	m. s.	s.		m.
Tucson	4.6	38	i 1 3	- 9	i 1 48	-19	—	i 2.0
La Jolla	4.9	329	e 1 22	+ 5	—	—	—	—
Palomar	5.2	334	e 1 15	- 6	—	—	—	—
Riverside	5.9	334	e 1 32	+ 1	—	—	—	—
Mount Wilson	6.4	330	e 1 36	- 2	—	—	—	—
Pasadena	6.4	329	e 1 37	- 1	e 2 51	- 2	—	—
Boulder City	7.3	356	i 1 43	- 7	i 3 48	+33	—	—
Pierce Ferry	7.4	1	i 1 43	- 9	—	—	—	—
Overton	7.8	359	(i 1 50)	- 8	—	—	—	—
Haiwee	8.1	338	e 2 3	+ 1	—	—	—	—
Tinemaha	9.0	339	e 2 18	+ 5	—	—	—	—
St. Louis	22.2	57	i 5 0	0	i 9 5	+ 5	—	i 11.4
Florissant	N. 22.2	57	—	—	9 7	+ 7	—	e 11.6

Additional readings:—

Tucson I = 1m.20s. and 1m.35s.

Overton reading diminished by 3m.

St. Louis iZ = 5m.4s.

Long waves were also recorded at other American stations.

Jan. 20d. Readings also at 1h. (Andijan, Tashkent, Tchimkent, Stuttgart, Mount Wilson, Pasadena, Palomar, Riverside, Tucson, and Boulder City), 3h. (near Andijan and Tchimkent), 5h. (Andijan, Stalinabad, Obi-garm, near Tashkent, and Tchimkent), 8h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, and near Lick), 10h. (Tucson), 11h. (La Paz, Florissant, St. Louis, Boulder City (2), Overton, Pierce Ferry, and near Tucson), 12h. (Weston, Alicante, Almeria, Granada, Andijan, Tchimkent, near Obi-garm, and Stalinabad), 13h. (near Apia), 16h. (Weston, Philadelphia, Logan, Tucson, and Boulder City), 18h. (near Branner and near Malaga), 19h. (near Berkeley), 21h. (Weston, Berkeley, Logan, Boulder City, and near Tucson).

Jan. 21d. 5h. Undetermined shock.

Irkutsk P = 10m.30s., eS = 13m.51s.

Almata P = 10m.58s.

Andijan eP = 11m.31s.

Tashkent eP = 11m.46s., eS = 15m.57s.?

Obi-garm eP = 11m.51s.

Tchimkent iP = 11m.53s.

Stalinabad eP = 12m.1s., eS = 16m.4s.

Calcutta eN = 15m.8s.

Bombay eEN = 18m.8s.

Jan. 21d. 20h. 6m. 42s. Epicentre  $24^{\circ}5'S$ ,  $70^{\circ}3'W$ .

Intensity IV-V between latitudes  $25^{\circ}$  and  $26^{\circ}S$ .

Epicentres:  $24^{\circ}5'S$ ,  $70^{\circ}W$ . (Strasbourg).

$25^{\circ}S$ ,  $70^{\circ}W$ . (U.S.C.G.S.).

F. Greve: Lista de sismos sensibles al hombre obtenidos por el servicio de postales informativas, año 1947, Instituto Sismológico de la Universidad de Chile, p. 1.

A = +0.3071, B = -0.8577, C = -0.4124;  $\delta = +3$ ;  $h = +3$ ;  
D = -0.941, E = -0.337; G = -0.139, H = +0.388, K = -0.911.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Montezuma	2.3	35	i 0 40	0	e 1 7	- 2	—	i 1.4
Copiapo	2.9	181	-0 8	-56	0 26	-58	—	—
La Paz	Z. 8.2	14	i 2 5 <sub>a</sub>	+ 2	i 3 38	0	3 34	S 4.3
Huancayo	13.3	338	e 3 13	0	e 5 38	- 4	i 3 24	PP e 6.0
La Plata	E. 14.9	137	3 35	+ 1	6 42	SS	3 49	PP 7.4
	N. 14.9	137	i 3 35	+ 1	6 36	+16	3 48	PP 7.4
	Z. 14.9	137	3 38	+ 4	—	—	3 52	PP 7.6

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.	
	<sup>c</sup>	<sup>c</sup>	m. s.	s.	m. s.	s.	m. s.	m.	
Bogota	29.2	352	i 6 19?	+14	e 11 13?	+15	c 9 13?	P <sub>c</sub> P	—
Balboa Heights	34.5	344	e 6 50	- 2	—	—	—	—	—
San Juan	42.8	6	e 7 58	- 3	e 14 9	-17	c 9 39	PP	c 17.7
Bermuda	56.8	6	e 9 48	0	e 17 32	- 9	c 11 55	PP	c 23.6
St. Louis	65.5	343	i 10 46	- 1	e 19 25	- 7	i 13 0	PP	—
Florissant	65.7	343	i 10 46	- 2	i 19 25	- 9	i 20 37	S <sub>c</sub> S	—
Weston	66.5	0	i 10 53 <sub>k</sub>	- 1	—	—	—	—	—
Harvard	66.7	0	i 10 54 <sub>a</sub>	- 1	—	—	—	—	—
Tucson	68.4	324	i 11 5 <sub>a</sub>	- 1	c 20 3	- 4	c 20 33	PS	c 33.9
Ottawa	69.7	356	11 10	- 4	20 18	- 4	26 18	Q	32.3
Seven Falls	71.3	0	11 24	+ 1	20 33	- 8	—	—	32.3
La Jolla	72.5	320	i 11 30	0	—	—	—	—	—
Palomar	72.6	320	i 11 34 <sub>a</sub>	+ 3	e 20 57	+ 1	i 11 42	P <sub>c</sub> P	—
Boulder City	73.4	323	i 11 36	0	e 21 6	+ 1	—	—	—
Riverside	73.4	320	i 11 35 <sub>a</sub>	- 1	e 21 2	- 3	i 11 46	P <sub>c</sub> P	—
Overton	73.6	324	i 11 37	0	—	—	—	—	—
Mount Wilson	73.9	320	i 11 39 <sub>a</sub>	0	c 21 9	- 1	i 11 50	P <sub>c</sub> P	—
Pasadena	74.0	320	i 11 39 <sub>a</sub>	0	i 21 10	- 1	i 11 56	P <sub>c</sub> P	c 35.6
Santa Barbara	75.1	319	i 11 45	- 1	e 21 29	+ 5	—	—	—
Haiwee	75.3	322	i 11 47	0	e 21 24	- 2	—	—	—
Tinemaha	76.1	322	i 11 52	+ 1	e 21 33	- 2	i 12 9	P <sub>c</sub> P	—
Fresno	76.7	321	e 11 58	+ 3	c 21 33	- 8	—	—	—
Berkeley	78.9	320	i 12 7	0	—	—	c 19 0	?	—
Bozeman	79.1	333	e 22 25	PS	c 22 2	- 5	c 28 22	?	e 49.3
Shasta Dam	80.9	323	i 12 16	- 1	—	—	—	—	—
Grand Coulee	84.3	330	e 12 34	- 1	—	—	—	—	—
Malaga	86.9	47	i 12 49 <sub>a</sub>	+ 1	—	—	13 5	pP	—
Granada	87.7	47	i 12 51 <sub>k</sub>	- 1	c 23 37	+ 4	16 45	PP	43.0
Almeria	88.3	48	i 12 53	- 2	23 48	+ 9	16 28	PP	43.7
Paris	97.5	39	i 13 37	0	—	—	e 17 38	PP	—
Strasbourg	100.6	41	e 13 52	+ 1	—	—	—	—	e 54.3
Rome	100.9	48	e 17 57	PP	e 24 30	[- 1]	c 27 24	PS	c 45.3
Stuttgart	101.5	41	e 13 56	+ 1	—	—	c 16 48	?	—
Cheb	103.9	40	—	—	e 23 49	[- 57]	—	—	e 53.3
Helwan	111.3	66	e 19 18	PP	i 21 36	PPP	—	—	—
Ksara	116.1	63	e 19 49?	PP	29 31	PS	—	—	—
Moscow	119.9	38	e 19 53	PP	—	—	—	—	—
Sverdlovsk	132.3	33	i 19 21	[+ 5]	—	—	—	—	—
Tashkent	142.5	53	e 19 41	[+ 6]	e 22 35	PP	—	—	—
Tchinkent	142.5	51	e 19 32	[- 3]	—	—	—	—	—
Stalinabad	142.7	57	i 19 33	[- 2]	—	—	—	—	—
Obi-garm	143.4	57	e 19 36	[ 0]	—	—	—	—	—
Andijan	144.9	53	19 43	[+ 4]	—	—	—	—	—
Bombay	145.4	92	i 19 43	[+ 3]	—	—	—	—	—
Frunse	145.8	49	e 19 45	[+ 4]	—	—	—	—	—
Kodaikanal	E. 146.2	108	e 19 18	[- 23]	—	—	—	—	—
Colombo	146.5	117	19 48	[+ 6]	—	—	—	—	—
Almata	147.3	47	e 19 48	[+ 5]	—	—	—	—	—

Additional readings :—

Huancayo e = 3m.36s., iS = 5m.48s.  
 La Plata Z = 4m.6s., 4m.22s., and 4m.30s.  
 Bogota eS<sub>c</sub>P = 13m.56s.?  
 San Juan e = 10m.47s.  
 Bermuda eS<sub>c</sub>S = 19m.46s.  
 St. Louis iZ = 11m.34s., eSN = 19m.13s., iE = 20m.37s.  
 Tucson i = 11m.21s., e = 12m.1s., i = 12m.28s. and 12m.38s., ePKP, PKP = 39m.24s.  
 Palomar iN = 12m.4s., eZ = 17m.45s.  
 Pasadena iZ = 12m.13s.  
 Berkeley iZ = 13m.9s.  
 Granada P<sub>c</sub>P = 13m.42s.  
 Almeria PPP = 18m.29s., SKS = 22m.27s., sS = 24m.29s.  
 Helwan iZ = 19m.24s., eEN = 29m.12s., eN = 29m.34s.  
 Malaga P<sub>c</sub>PZ = 14m.46s., P<sub>c</sub>SZ = 18m.46s., sSZ = 20m.14s.

Long waves were also recorded at Philadelphia, Belgrade, Kew, Clermont-Ferrand, De Bilt, Copenhagen, Uccle, and Riverview.



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Jan. 21d. Readings also at 0h. (near Berkeley), 1h. (Ksara), 2h. (near Mineral), 4h. (Bucharest, and Lick), 6h. (near Fresno, Lick, Berkeley, Branner, San Francisco, and Mineral), 7h. (Boulder City and near Shasta Dam), 12h. (near Tchinkent), 14h. (Lick), 16h. (Calcutta, Bombay, Istanbul, and near Lick (2)), 17h. (near Algiers), 18h. (Balboa Heights and near Bogota), 21h. (Branner), 22h. (Fresno).

Jan. 22d. 8h. 57m. 39s. Epicentre  $27^{\circ}08'$ .  $70^{\circ}6'W$ . (as on 1946, August 15d.).

Doubtful identification.

A = +.2964, B = -.8415, C = -.4516;  $\delta = -8$ ;  $h = +3$ ;  
D = -.943, E = -.332; G = -.150, H = +.426, K = -.892.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Santa Lucia	N.	6.4	181	1 32	- 6	1 44	-69	—	2.5
La Paz	N.	10.7	13	3 31	+53	5 15	+36	—	6.0
La Plata	E.	13.4	129	3 6	- 8	5 21	-24	—	6.6
Huancayo		15.5	341	e 3 57	+15	e 7 7	+32	c 4 7 PPP	c 8.5
Tucson		70.3	326	e 11 17k	0	—	—	e 11 31 ?	—
La Jolla	Z.	74.3	321	e 11 42	+ 1	—	—	—	—
Palomar		74.4	321	i 11 44	+ 2	—	—	i 11 57 pP	—
Riverside	Z.	75.1	321	i 11 47	+ 1	—	—	i 12 1 pP	—
Boulder City		75.3	324	c 11 49	+ 2	—	—	—	—
Overton		75.5	325	i 11 50	+ 2	—	—	—	—
Mount Wilson	Z.	75.7	321	i 11 50	+ 1	—	—	—	—
Pasadena	Z.	75.7	321	i 11 50	+ 1	—	—	—	—
Santa Barbara	Z.	76.8	320	c 12 1	+ 6	—	—	—	—
Haiwee	Z.	77.1	323	e 11 58	+ 1	—	—	—	—
Tinemaha	Z.	77.9	323	i 12 4	+ 3	—	—	i 12 18 pP	—
Shasta Dam		82.8	323	i 12 27	0	—	—	—	—

Huancayo also gives  $e = 7m.29s$ .

Jan. 22d. Readings also at 0h. (near Berkeley), 2h. (Tucson, Boulder City, Calcutta, Bombay, and near Hyderabad), 6h. (near Balboa Heights and near Bogota), 7h. (Huancayo, La Paz, Montezuma, Haiwee, Mount Wilson, Pasadena, Palomar, Tinemaha, Tucson, and Shasta Dam), 9h. (near Andijan, Frunse, Tchinkent, Tashkent, Obi-garm, and Almata), 10h. (Mount Wilson, Pasadena, Riverside, Palomar, Haiwee, Tucson, Andijan, Tchinkent, and near Obi-garm), 11h. (College, Grand Coulee, Boulder City, Overton, Tucson, La Jolla, Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, and Tinemaha), 12h. (near Mizusawa), 13h. (near Tchinkent), 15h. (near Istanbul), 18h. (Shasta Dam and Stuttgart), 20h. (Branner and near Andijan, Tashkent, Tchinkent, and Obi-garm), 23h. (Shasta Dam).

Jan. 23d. 15h. 57m. 40s. Epicentre  $53^{\circ}3'N$ .  $162^{\circ}5'W$ .

A = -.5724, B = -.1805, C = +.7998;  $\delta = -10$ ;  $h = -7$ ;  
D = -.301, E = +.954; G = -.763, H = -.241, K = -.600.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
College		13.8	27	e 3 25	+ 6	e 6 0	+ 6	—	c 6.4
Shasta Dam		29.7	97	e 6 12	+ 2	—	—	—	—
Berkeley		31.6	101	i 6 23	- 3	i 11 43	+ 8	i 6 41 pP	c 13.8
Fresno	N.	33.8	100	e 5 51	-55	—	—	—	—
Tinemaha		34.5	99	i 6 55	+ 3	—	—	i 9 27 P <sub>c</sub> P	—
Haiwee		35.3	99	e 7 1	+ 2	—	—	e 9 29 P <sub>c</sub> P	—
Santa Barbara	Z.	35.5	103	i 7 2	+ 2	—	—	—	—
Salt Lake City		36.0	88	e 7 4	- 1	—	—	e 8 30 PP	c 15.3
Mount Wilson		36.6	101	i 7 11k	+ 1	—	—	i 9 32 P <sub>c</sub> P	—
Pasadena		36.6	101	i 7 11	+ 1	e 12 57	+ 4	i 9 31 P <sub>c</sub> P	c 15.5
Overton		37.1	96	i 7 17	+ 3	—	—	—	—
Riverside		37.2	101	i 7 17k	+ 2	—	—	i 9 33 P <sub>c</sub> P	—
Boulder City		37.3	96	i 7 18	+ 2	—	—	—	—
Palomar		37.9	102	i 7 13	- 7	e 13 18	+ 5	—	—
La Jolla		38.0	103	e 7 21	0	—	—	i 9 32 P <sub>c</sub> P	—

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Rapid City	39.2	77	c 7 33	+ 2	e 13 9	-23	e 9 2	PP c 18.5
Tucson	42.3	97	i 7 58k	+ 1	e 14 24	+ 5	i 9 50	PP c 19.7
Florissant	50.0	75	i 8 57	- 1	e 16 6	- 3	—	c 23.8
St. Louis	50.2	75	i 8 58	- 2	e 16 12	+ 1	i 10 16	PcP c 23.8
Irkutsk	52.4	309	9 15	- 1	e 16 33?	- 9	—	—
Scoresby Sund	53.3	15	9 26 <sup>a</sup>	+ 3	—	—	—	26.3
Ottawa	53.8	60	c 9 26	0	—	—	—	27.3
Seven Falls	55.1	55	9 36	0	17 20	+ 2	—	29.3
Philadelphia	57.8	64	c 9 53	- 2	e 18 1	+ 7	c 11 58	PP c 27.3
Fordham	57.9	62	i 9 55	- 1	e 17 58	+ 3	—	—
Harvard	57.9	59	i 9 56	0	—	—	—	c 33.6
Weston	58.1	59	i 9 56k	- 2	—	—	—	c 29.9
Sverdlovsk	64.7	335	i 10 42	0	i 19 23	+ 1	—	—
Moscow	70.1	348	11 14	- 2	e 20 26	- 1	—	—
Almata	71.1	318	11 28	+ 6	—	—	—	—
Copenhagen	71.3	3	i 11 23	0	i 20 41	0	21 20	PS 37.3
Tchimkent	74.8	323	i 11 44	0	i 21 21	+ 1	—	—
Andijan	75.1	320	11 47	+ 1	i 21 26	+ 2	—	—
Tashkent	75.7	322	c 11 46	- 3	e 21 29	- 1	—	—
Paris	77.5	10	i 12 1	+ 2	—	—	—	—
Obi-garm	77.9	321	12 1	0	21 53	- 1	—	—
Stuttgart	z. 78.1	6	c 12 2	0	—	—	—	—
Strasbourg	78.2	7	c 12 5	+ 2	—	—	—	—
Stalinabad	78.3	321	c 12 4	+ 1	—	—	—	—
San Juan	79.2	73	—	—	e 22 10	+ 2	e 22 38	ScS c 45.0
Basle	79.2	7	c 12 9k	+ 1	—	—	—	—
Zürich	79.4	7	c 12 10k	+ 1	—	—	—	—
Grozny	80.7	340	c 12 22	+ 6	—	—	—	—
Baku	82.6	336	c 12 33	+ 7	e 22 53	+10	—	—
Calcutta	n. 83.0	298	—	—	e 22 44	- 3	—	—
Leninakan	83.6	340	e 12 36	+ 5	—	—	—	—
Rome	85.1	4	c 12 36k	- 3	e 23 14	+ 6	—	—
Ksara	91.8	345	c 13 19	+ 8	—	—	—	—
Hyderabad	n. 92.3	303	—	—	24 14	- 1	—	—

Additional readings :—

College e = 3m.51s.

Berkeley iZ = 6m.28s., eN = 6m.37s., iN = 6m.54s., iSE = 11m.46s.

Fresno eSN = 5m.55s. ; readings wrongly identified.

Mount Wilson i = 7m.25s. and 7m.32s.

Palomar iN = 7m.42s.

Tucson i = 8m.13s., 8m.25s., and 8m.59s.

St. Louis iZ = 9m.4s. and 9m.19s., iE = 9m.39s., eSSE = 19m.55s.

Philadelphia eSS? = 22m.6s.

Paris i = 12m.16s.

Stuttgart eZ = 12m.9s. and 12m.18s.

Long waves were also recorded at Christchurch, Honolulu, Belgrade, Edinburgh, Cheb, and other American stations.

Jan. 23d. Readings also at 0h. (Haiwee, Mount Wilson, Pasadena, Riverside, Tucson, and Shasta Dam), 3h. (near Andijan, Obi-garm, Stalinabad, Tashkent, and Tchimkent), 5h. (Tashkent, near Andijan, Obi-garm, and Stalinabad), 6h. (near Malaga), 9h. (La Paz, Almeria, Alicante, and Malaga), 10h. (Copenhagen), 11h. (Bogota, La Paz, Tashkent, near Andijan, Obi-garm, and Stalinabad), 13h. (Mount Wilson, Tucson, Pasadena, Palomar, Tinemaha, and near Mizusawa), 14h. (La Paz, Grozny, and near Leninakan), 15h. (near Almata, Andijan, Obi-garm, Stalinabad, Tashkent, and Tchimkent), 17h. (Ferndale), 19h. (Belgrade), 20h. (Tucson, near Berkeley, Fresno, Lick, San Francisco, Mineral, Shasta Dam, near Boulder City, near Almata, Frunse, Obi-garm, Stalinabad, Tashkent, and Tchimkent), 21h. (Paris and Stuttgart).

Jan. 24d. 2h. Switzerland.

Neuchatel iP<sub>g</sub> = 30m.50s., eS<sub>g</sub> = 31m.9s.

Basle eP<sub>g</sub>? = 31m.2s., eS<sub>g</sub> = 31m.30s.

Zürich eP = 31m.7s., eS<sub>g</sub> = 31m.38s.

Chur eP = 31m.12s., eS<sub>g</sub> = 31m.46s.

Besançon e = 31m.13s.

Paris eP = 31m.32s., eP<sub>g</sub> = 31m.44s., eS<sub>g</sub> = 32m.32s., e = 32m.56s. and 33m.16s.

Stuttgart eP?Z = 31m.38s., e = 32m.22s. and 32m.29s.

Strasbourg eS<sub>g</sub> = 32m.4s.

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Jan. 24d. 16h. 47m. 50s. Epicentre 33°·0N. 135°·6E. (as on 1946, Dec. 21d.).

Intensity VI at Numayama (Hyogo Pref.); V at Shionomisaki and Tottori; IV at Osaka, Sumoto, Owase, Takamatsu, and Kobe; II-III at Tsunaga, Matsue, Hikone, Kōti, and Tsu. Epicentre 33°·2N. 135°·3E. Very shallow. Macroseismic radius greater than 300km.

The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year 1947, Tokyo, 1950, pp. 6-7, macroseismic chart, p. 6.

$$\begin{aligned} A = -\cdot6004, B = +\cdot5879, C = +\cdot5421; \quad \delta = -2; \quad h = +1; \\ D = +\cdot700, E = +\cdot714; \quad G = -\cdot387, H = +\cdot379, K = -\cdot840. \end{aligned}$$

	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L. m.
			m.	s.		m.	s.		m.	s.	
Stomisaki	0·5	17	0	16k	+ 2	0	23	0	—	—	—
Owase	1·2	25	0	28	+ 4	0	43	+ 2	—	—	—
Sumoto	1·5	336	0	27a	- 1	0	39	-10	—	—	—
Osaka	1·6	358	0	33a	+ 3	0	53	+ 2	—	—	—
Kobe	1·7	348	0	33a	+ 2	0	53	- 1	—	—	—
Kōti	1·8	288	0	30a	- 2	1	1	$S_g$	—	—	—
Kameyama	2·0	21	0	39	+ 4	0	57	- 5	—	—	—
Kyoto	2·0	3	0	40	$P_g$	1	2	0	—	—	—
Hikone	2·3	13	0	46a	$P_g$	1	15	$S_g^*$	—	—	—
Nagoya	2·4	28	0	47k	$P_g$	1	15	$S_g^*$	—	—	—
Gihu	2·6	22	0	47k	$P^*$	1	29	$S_g$	—	—	—
Toyooka	2·6	346	0	46a	+ 2	1	24	$S_g^*$	—	—	—
Omaesaki	2·7	53	1	2	$P_g$	—	—	—	—	—	—
Shizuoka	3·0	49	1	3	$P_g$	—	—	—	—	—	—
Hamada	3·5	305	1	1a	$P^*$	—	—	—	—	—	—
Misima	3·5	52	1	14	$P_g$	2	23	+43	—	—	—
Hunatu	3·6	46	1	2	$P^*$	2	11	+29	—	—	—
Miyazaki	3·7	253	0	57a	- 3	1	58	$S_g^*$	—	—	—
Toyama	3·9	20	1	8a	$P^*$	2	16	$SSS$	—	—	—
Mera	4·0	61	1	29	$P_g$	2	25	$S_g$	—	—	—
Izuka	4·1	280	1	13	$P^*$	—	—	—	—	—	—
Kumamoto	4·1	269	1	4a	- 1	2	9	$S_g^*$	—	—	—
Yokohama	4·1	54	1	8	+ 3	2	2	+ 7	—	—	—
Nagano	4·2	30	1	32	$P_g$	2	23	$S_g^*$	—	—	—
Hukuoka	4·4	279	1	5a	- 5	2	5	+ 3	—	—	—
Kumagaya	4·4	44	1	29	$P_g$	2	24	$S_g$	—	—	—
Maebasi	4·4	39	1	22	$P^*$	2	29	$S_g$	—	—	—
Tokyo	4·4	51	1	26	$P_g$	2	26	$S_g$	—	—	—
Kagosima	4·5	252	1	10	- 1	—	—	—	—	—	—
Wazima	4·5	14	1	13	+ 2	2	26	$S_g$	—	—	—
Tukubasan	4·9	48	1	39	$P_g$	2	45	$S_g$	—	—	—
Kakioka	5·0	48	1	26	$P^*$	2	46	$S_g$	—	—	—
Utunomiya	5·0	44	1	32	$P^*$	2	43	$S_g$	—	—	—
Mito	5·2	49	1	53	$P_g$	2	57	$S_g$	—	—	—
Tomie	5·8	267	3	5	$S_g$	—	—	—	—	—	—
Onahama	5·9	47	1	55a	$P_g$	—	—	—	—	—	—
Hokusima	6·2	39	1	35	0	3	6	$S_g^*$	—	—	—
Sendai	6·8	38	1	58	$P^*$	—	—	—	—	—	—
Akita	7·6	27	2	54	+59	4	37	+74	—	—	—
Mizusawa	7·6	35	2	11	$P^*$	4	9	$S_g$	c 2 14	$P^*$	—
Morioka	8·0	32	1	55	- 5	—	—	—	—	—	—
Miyako	8·4	36	2	6	0	—	—	—	—	—	—
Vladivostok	10·5	345	i 2	36	+ 1	i 4	30	- 5	—	—	—
Sapporo	11·0	23	2	49	PP	—	—	—	—	—	—
Irkutsk	29·7	319	6	8	- 2	i 11	12	+ 6	—	—	—
Calcutta	N.	42·8	e 7	45	-16	i 14	25	- 1	i 17 20	SS	—
Almata		46·4	e 8	29	- 1	—	—	—	—	—	—
New Delhi	N.	49·8	e 8	56	0	i 16	8	+ 2	e 10 48	PP	—
Andijan		50·2	e 9	4	+ 4	—	—	—	—	—	—
Tchimkent		51·9	i 9	10	- 2	i 16	30	- 5	—	—	—

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	c	c	m. s.	s.	m. s.	s.	m. s.	m.
Tashkent	52.3	299	e 9 11	- 4	c 16 40	0	—	—
Obi-garm	52.7	296	e 9 18	0	—	—	—	—
Hyderabad	N. 53.4	267	9 23	- 1	16 51	- 4	11 23	PP 25.9
Stalinabad	53.4	296	i 9 22	- 2	16 57	+ 2	—	—
Samarkand	54.5	298	9 25	- 7	c 17 5	- 5	—	—
College	55.0	30	—	—	c 17 28	+11	—	e 26.3
Sverdlovsk	55.1	219	i 9 35	- 1	i 17 15	- 3	—	—
Bombay	57.4	272	c 9 51	- 2	c 17 46	- 3	i 18 11	PPS 27.1
Colombo	E. 57.7	255	—	—	17 40	-13	—	—
Kodaikanal	E. 57.8	261	i 9 23	-32	c 17 30	-24	—	27.8
Baku	66.5	304	e 11 0	+ 6	e 19 48	+ 4	—	—
Moscow	67.6	322	10 59	- 2	19 52	- 5	—	—
Riverview	68.1	166	i 20 32	PPS	e 20 0	- 3	i 27 34	SSS c 30.4
Grozny	68.2	308	c 11 5	+ 1	c 19 59	- 5	—	—
Leninakan	70.5	306	e 11 25	+ 7	—	—	—	—
Helsinki	71.3	331	—	—	c 20 36	- 5	c 28 46	SSS c 35.2
Upsala	74.4	332	c 13 57	?	e 21 4	-12	c 22 35	PPS c 33.2
Scoresby Sund	75.5	352	12 0	P <sub>c</sub> P	21 31	+ 3	—	—
Shasta Dam	77.3	49	i 12 1	+ 3	—	—	—	—
Warsaw	77.7	324	e 11 59 <sub>a</sub>	- 1	c 21 52	0	22 23	PS c 33.7
Copenhagen	79.2	331	i 12 8	0	i 22 4	- 4	15 6	PP 40.2
Ksara	79.5	303	e 12 5	- 5	23 33	PPS	—	—
Potsdam	81.3	329	—	—	c 22 43	+13	c 42 10	Q c 44.2
Budapest	81.7	322	c 12 36	P <sub>c</sub> P	c 22 35	+ 1	e 22 38	S 44.2
Tinemaha	z. 82.0	51	e 12 28	+ 5	—	—	—	—
Kalossa	82.4	322	c 12 58	P <sub>c</sub> P	—	—	c 13 4	? c 50.2
Belgrade	82.7	319	i 12 28	+ 1	i 22 52	+ 8	c 15 50	PP c 39.5
Haiwee	z. 82.8	51	e 12 34	+ 7	—	—	—	—
Prague	82.9	326	c 12 24	- 4	e 22 28	-18	—	e 43.2
Jena	N. 83.0	327	e 12 28	0	—	—	—	—
Cheb	83.2	327	e 14 10	?	e 22 45	- 4	c 28 2	SS c 45.2
Aberdeen	83.3	339	—	—	e 22 59	+ 9	—	c 44.2
Mount Wilson	z. 83.8	53	e 12 35	+ 3	—	—	i 12 40	P <sub>c</sub> P
Pasadena	z. 83.8	53	e 12 39	+ 7	—	—	—	e 40.8
Zagreb	84.4	322	e 12 7	-29	—	—	c 12 24	pP e 53.6
De Bilt	84.8	332	e 12 34	- 3	e 23 3	- 2	—	e 41.2
Boulder City	84.9	50	e 12 42	P <sub>c</sub> P	—	—	—	—
Helwan	84.9	302	i 12 52 <sub>k</sub>	+14	i 23 0	- 6	15 55	PP
Palomar	85.1	53	e 12 45	P <sub>c</sub> P	—	—	—	—
Pierce Ferry	85.3	49	e 12 44	P <sub>c</sub> P	—	—	—	—
Stuttgart	85.6	327	e 12 42 <sub>a</sub>	+ 1	—	—	e 13 0	P <sub>c</sub> P e 48.7
Uccle	86.1	332	—	—	e 23 11	[+ 3]	—	e 44.2
Strasbourg	86.4	328	e 12 44	- 1	e 23 22	+ 1	e 16 9	PP c 47.1
Zürich	86.9	327	e 12 54	+ 6	—	—	—	—
Basle	87.2	327	e 12 49	0	e 23 28	0	—	—
Paris	88.4	331	e 13 10 <sub>l</sub>	+15	—	—	e 34 33	? c 49.2
Tucson	89.8	51	e 13 14	+12	e 22 48	[-44]	e 16 37	PP e 43.7
Clermont-Ferrand	90.6	329	e 12 56	- 9	e 23 29	[- 7]	e 29 20	SS e 52.2
St. Louis	97.0	35	e 18 23	PKP	e 24 14	[+ 2]	e 26 13	PS e 39.6
Huancayo	144.8	61	e 19 44	[+ 5]	—	—	e 45 54	SSS e 62.2
La Paz	N. 153.0	57	20 30	[+38]	—	—	—	77.2

Additional readings :—

- New Delhi S<sub>c</sub>SN = 18m.55s., SSN = 19m.56s.
- Hyderabad S<sub>c</sub>SN = 19m.10s., SSN = 20m.35s.
- Riverview eN = 20m.45s.
- Upsala eN = 14m.0s.
- Warsaw eSEZ = 21m.56s.
- Copenhagen 27m.16s. and 30m.58s.
- Belgrade ePPP? = 17m.57s., eSS? = 28m.57s., e = 29m.48s., and 31m.34s.
- Prague e = 30m.40s. and 34m.10s.
- Jena eN = 19m.32s. and 19m.42s.
- Cheb eSSS = 31m.38s., e = 39m.10s.?
- Mount Wilson iZ = 12m.49s.
- Stuttgart eZ = 13m.20s.
- Strasbourg e = 23m.32s., eSS = 29m.10s.

Long waves were also recorded at Salt Lake City, Weston, Chicago, Philadelphia, Harvard, San Juan, Durham, Bucharest, Kew, Besançon, Neuchatel, Alicante, Malaga, Tortosa, Almeria, and Rome.

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Jan. 24d. Readings also at 4h. (Boulder City), 5h. (Stuttgart and near Andijan, Frunse, Tchimkent, Tashkent, Stalinabad, Almata, and Obi-garm), 8h. (Istanbul and Huancayo), 10h. (Bucharest and Grand Coulee), 11h. (Bucharest), 12h. (Copenhagen), 13h. (Paris), 16h. (Uccle, Samarkand, near Obi-garm and Stalinabad), 17h. (near Istanbul (2)), 18h. (Tucson), 19h. (Boulder City, Shasta Dam, and near Mineral), 20h. (Brisbane), 21h. (Riverview), 22h. (near Tchimkent).

Jan. 25d. 3h. 11m. 28s. Epicentre  $13^{\circ}0'N$ .  $87^{\circ}8'W$ . (as on 1942, Sept. 26d.).

Foreshock of 3h. 52m.

A = +.0374, B = -.9740, C = +.2235;  $\delta = +3$ ;  $h = +6$ ;  
D = -.999, E = -.038; G = +.009, H = -.223, K = -.975.

	$\Delta$ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.
Balboa Heights	9.0	115	e 2 17	+ 4	—	—	—
Bogota	15.9	120	i 3 48	+ 1	e 6 2	-42	e 6.3
San Juan	21.5	74	—	—	(e 8 36)	-11	e 8.6
Columbia	21.8	15	—	—	e 9 1	+ 9	e 11.2
St. Louis	25.6	4	i 5 32	0	i 10 6	+ 7	i 16.8
Fort de France	25.9	84	e 5 30	- 5	—	—	—
Huancayo	27.8	155	e 5 53	0	e 11 5	+30	—
Tucson	28.5	317	e 5 59	0	—	—	e 14.3
Bermuda	28.6	45	—	—	e 12 10	SS	e 13.7
Pierce Ferry	32.9	318	e 6 28	-10	—	—	—
Boulder City	33.4	317	e 6 43	+ 1	—	—	—
La Paz	N. 35.2	146	9 12	P <sub>c</sub> P	—	—	19.3
Tinemaha	Z. 36.3	318	e 7 9	+ 2	—	—	—

Additional readings :—

Huancayo e = 8m.8s. and 8m.36s.

Tucson e = 8m.10s.

Long waves were also recorded at Weston, Chicago, Salt Lake City, and Berkeley.

Jan. 25d. 3h. 50m. 48s. Epicentre  $13^{\circ}0'N$ .  $87^{\circ}8'W$ . (as at 3h. 11m.).

Foreshock of 3h. 52m.

	$\Delta$ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	Supp. m. s.	L. m.
Balboa Heights	9.0	115	e 2 16	+ 3	—	—	—	—
Bogota	15.9	120	i 3 49	+ 2	—	—	—	—
St. Louis	25.6	4	i 5 29	- 3	e 10 5	+ 6	i 5 59	PP
Huancayo	27.8	155	e 5 53	0	—	—	—	—
New Kensington	28.4	13	—	—	e 11 12	+27	—	—
Tucson	28.5	317	e 5 57	- 2	e 11 22	+36	e 6 32	PP e 12.8
Pierce Ferry	32.9	318	e 6 34	- 4	—	—	—	—
Palomar	E. 33.3	312	e 6 45	+ 4	—	—	—	—
Boulder City	33.4	317	e 6 42	0	—	—	—	—
Overton	33.5	318	e 6 42	- 1	—	—	—	—
Riverside	Z. 34.0	314	e 6 48	0	—	—	—	—
Mount Wilson	Z. 34.6	314	e 6 55	+ 2	—	—	—	—
Pasadena	Z. 34.7	314	e 6 54	0	—	—	—	—
Haiwee	Z. 35.6	317	e 7 1	0	—	—	—	—
Tinemaha	Z. 36.3	318	e 7 6	- 1	—	—	—	—
Grand Coulee	43.4	330	e 8 6	0	—	—	—	—

Additional readings :—

St. Louis iPPPZ = 6m.17s., eN = 10m.43s.

Tucson iP = 6m.1s.

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Jan. 25d. 3h. 52m. 37s. Epicentre 13°·0N. 87°·8W.

(as on 1942, Sept. 26d., and see above foreshocks).

Intensity VI-VII at La Union ; V at San Salvador, felt also in Nicaragua and Honduras. See Report from the French Consul in Salvador (Records of the Observatory of San Salvador).

Area affected 20,000 sq.km. Houses and Waterways badly damaged.

A = +·0374, B = -·9740, C = +·2235 ;  $\delta$  = +3 ;  $h$  = +6 ;  
D = -·999, E = -·038 ; G = +·009, H = -·223, K = -·975.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Balboa Heights	9·0	115	e 2 16	+ 3	—	—	—	—
Bogota	15·9	120	i 3 50	+ 3	e 7 18	SSS	—	—
Mobile	17·6	359	4 20	+12	7 46	+23	—	—
San Juan	21·5	74	e 4 57	+ 5	e 8 45	- 2	e 5 39	PP
Columbia	21·8	15	e 4 54	- 2	e 8 52	0	—	c 10·6
St. Louis	25·6	4	i 5 31	- 1	e 9 57	- 2	i 5 51	PP
Florissant	z. 25·8	4	i 5 33	- 1	i 10 7	+ 5	—	—
Fort de France	25·9	84	e 5 32	- 3	e 10 10	+ 6	—	c 14·2
Georgetown	27·5	19	i 5 51	+ 1	i 10 35	+ 5	i 7 11	PPP
Huancayo	27·8	155	i 5 55	+ 2	e 10 23	-12	e 9 10	P <sub>c</sub> P
Tucson	28·5	317	i 5 59	0	e 11 10	+24	e 6 44	PP
Bermuda	28·6	45	e 6 2	+ 2	e 10 36	-12	—	e 13·4
Chicago	28·7	359	e 5 59	- 2	e 10 41	- 9	e 6 37	PP
Lincoln	28·8	345	—	—	e 10 53	+ 2	—	e 11·4
Philadelphia	29·1	21	e 6 0	- 4	e 10 50	- 6	e 6 58	PP
Fordham	30·3	22	e 6 15	0	i 11 23	+ 8	i 12 40	SS
Harvard	32·6	23	e 6 34	- 1	e 11 40	-11	e 13 54	SS
Weston	32·6	23	i 6 33 <sup>k</sup>	- 2	i 11 54	+ 3	—	c 15·8
Pierce Ferry	32·9	318	i 6 37	- 1	—	—	—	e 13·6
Boulder City	33·4	317	e 6 42	0	—	—	—	—
Overton	33·5	318	e 6 43	0	—	—	—	c 18·6
Rapid City	33·7	340	i 6 46	+ 1	e 12 10	+ 2	—	—
Ottawa	33·9	15	6 42	- 5	12 10	- 1	14 23?	SSS
Riverside	z. 34·0	314	e 6 47	- 1	—	—	—	c 14·9
Mount Wilson	z. 34·6	314	e 6 52	- 1	—	—	e 8 16	PP
Pasadena	34·7	314	e 6 52	- 2	—	—	e 8 17	PP
Salt Lake City	34·8	328	e 6 55	+ 1	e 12 24	- 1	e 8 11	PP
La Paz	35·2	146	i 6 59	+ 1	12 47	+16	8 23	PP
Logan	35·5	332	i 7 0	0	i 12 38	+ 2	i 8 21	PP
Haiwee	z. 35·6	317	e 7 2	+ 1	—	—	—	c 15·6
Shawinigan Falls	35·8	18	7 0	- 3	12 42	+ 1	—	—
Tinemaha	z. 36·3	318	e 7 5	- 2	—	—	—	18·4
Seven Falls	36·9	19	7 8	- 4	13 2	+ 4	—	—
Fresno	N. 37·1	316	e 7 53	+39	—	—	e 8 49	PP
Halifax	37·7	29	—	—	e 12 47	-23	—	c 21·0
Bozeman	38·1	335	—	—	e 13 15	- 1	—	15·4
Lick	38·7	316	e 7 31	+ 4	—	—	—	e 20·5
Santa Clara	38·9	316	e 7 33	+ 4	—	—	—	e 18·9
Butte	39·0	334	e 9 2	PP	e 13 36	+ 7	—	e 19·8
Berkeley	39·4	316	—	—	e 13 38	+ 3	—	e 18·2
Shasta Dam	41·0	319	e 7 42	- 4	—	—	—	i 19·8
Grand Coulee	43·4	330	e 8 5	- 1	—	—	e 9 48	PP
La Plata	55·4	150	—	—	17 5	-17	27 53	Q
Ivigutut	56·0	22	—	—	23 11	SSS	—	32·3
Scoresby Sund	E. 69·8	19	—	—	20 17	- 6	24 59	SS
Aberdeen	76·9	34	—	—	e 24 15	?	e 32 22	Q
Paris	80·5	42	e 12 13	- 2	—	—	—	c 37·4
Clermont-Ferrand	81·4	46	—	—	—	—	—	e 36·4
Strasbourg	84·0	41	e 12 37	+ 4	—	—	e 28 16	SS
Stuttgart	z. 84·9	41	e 12 34	- 4	—	—	e 28 37	SS

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Copenhagen	85.1	34	—	—	i 23 5	- 3	28 45	SS 35.4
Cheb	86.6	39	e 14 23?	?	—	—	—	e 37.4
Helsinki	89.7	28	—	—	e 23 44	- 8	—	e 39.4
Warsaw	91.0	37	—	—	e 25 14	PS	—	e 41.9
Helwan	z. 107.6	53	e 18 47	PP	—	—	—	—
Ksara	109.0	48	e 14 43	P	28 26	PS	18 58	PP —
Riverview	122.8	238	—	—	e 27 13	{-20}	e 30 38	PS e 56.4
Calcutta	N. 144.5	6	—	—	e 29 10	{-37}	—	—

Additional readings:—

San Juan iS = 8m.57s.  
 Bermuda iS = 10m.58s.  
 Weston eS<sub>c</sub>S = 17m.16s., iS<sub>c</sub>S = 17m.34s.  
 La Paz P<sub>c</sub>P = 9m.19s., iE = 16m.17s., iS<sub>c</sub>S = 17m.23s.  
 Logan i = 7m.21s., iPPP = 8m.41s., i = 13m.26s.  
 Shasta Dam e = 7m.49s.  
 La Plata N = 17m.47s.  
 Strasbourg e = 28m.55s.  
 Copenhagen 31m.59s.  
 Warsaw eN = 25m.17s.  
 Helwan eZ = 18m.59s.

Long waves were also recorded at Port au Prince, Christchurch, Arapuni, Wellington, Auckland, Bombay, Kodaikanal, New Delhi, and other American and European stations.

Jan. 25d. 4h. 46m. 57s. Epicentre 13°·0N. 87°·8W. (as at 3h.).

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Balboa Heights	9.0	115	e 2 17	+ 4	—	—	—	—
Columbia	21.8	15	—	—	e 9 3	+11	—	e 11.4
St. Louis	25.6	4	i 5 30	- 2	e 10 4	+ 5	—	—
Huancayo	27.8	155	e 5 55	+ 2	—	—	—	e 11.0
Tucson	28.5	317	i 6 0	+ 1	—	—	—	e 14.6
Pierce Ferry	32.9	318	e 6 33	- 5	—	—	—	—
Boulder City	33.4	317	e 6 42	0	—	—	—	—
Overton	33.5	318	e 6 45	+ 2	—	—	—	—
Rapid City	33.7	340	e 6 44	- 1	e 12 11	+ 3	e 8 29	PP e 17.7
Ottawa	33.9	15	e 6 44	- 3	—	—	—	13.0
Riverside	z. 34.0	314	e 6 48	0	—	—	—	—
Mount Wilson	z. 34.6	314	e 6 53	0	—	—	—	—
Pasadena	z. 34.7	314	e 6 53	- 1	—	—	e 8 16	PP e 18.8
Haiwee	z. 35.6	317	e 7 2	+ 1	—	—	—	—
Tinemaha	z. 36.3	318	e 7 9	+ 2	—	—	e 8 32	PP —

Long waves were also recorded at San Juan, Bermuda, Chicago, Salt Lake City, and Scoresby Sund.

Jan. 25d. Readings also at 4h. (near La Paz), 6h. (near Balboa Heights), 11h. (near Berkeley, Branner, Lick, Fresno, San Francisco, and Mineral), 13h. (Pierce Ferry, and Tucson), 17h. (Pierce Ferry, Boulder City, and near Tucson), 19h. (Zürich), 20h., (Stuttgart, Santa Lucia, and Mizusawa), 22h. (Branner), 23h. (Branner and Fresno).

Jan. 26d. 10h. 6m. 48s. Epicentre 12°·1N. 86°·2W. Depth of focus 0.015.

A = +.0648, B = -.9759, C = +.2083;  $\delta$  = -3;  $h$  = +6;  
 D = -.998, E = -.066; G = +.014, H = -.208, K = -.978.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Balboa Heights	7.2	115	i 1 48	+ 4	i 3 20	+15	—	—
Bogota	14.1	120	e 3 17	+ 2	i 6 7	+18	i 3 23	PP —
Port au Prince	14.9	63	i 3 30	+ 5	i 6 15	+ 8	3 37	PP —
Mobile	18.6	353	i 4 11	+ 1	i 7 42	+13	—	—
San Juan	20.4	68	i 4 31	+ 2	—	—	—	—

Continued on next page.

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	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.	
	<sup>c</sup>	<sup>e</sup>	m. s.	s.	m. s.	s.	m. s.	m.	
Columbia	22.3	10	i 4 50	+ 3	i 8 41	+ 2	e 5 28	PP	e 11.6
Fort de France	24.5	81	e 5 7	- 2	—	—	—	—	—
Huancayo	26.3	155	e 5 24	- 1	e 9 48	+ 1	—	—	e 11.0
St. Louis	26.7	352	i 5 23	- 6	i 9 40	-13	i 5 35	pP	—
Florissant	26.9	352	i 5 27	- 4	i 9 53	- 3	i 6 7	PP	—
Georgetown	27.9	16	e 5 38	- 2	i 10 14	+ 2	e 6 31	PP	—
Bermuda	28.2	40	i 5 47	+ 4	i 10 23	+ 6	i 6 33	PP	i 11.9
New Kensington	28.9	9	i 5 54	+ 5	e 10 32	+ 4	e 6 38	PP	—
Philadelphia	29.4	17	e 5 51	- 2	i 10 36	0	i 6 41	PP	i 11.6
Pennsylvania	29.5	11	i 5 56	+ 2	i 10 37	- 1	i 6 50	PP	—
Chicago	29.6	356	i 5 55	0	i 10 34	- 5	i 8 39	PcP	e 11.4
Lincoln	30.1	343	i 6 0	0	i 10 46	- 1	e 7 0	PP	i 12.7
Tucson	30.2	315	i 5 57	- 3	i 10 20	-29	i 6 47	PP	e 11.6
Fordham	30.6	18	e 6 1	- 3	i 10 59	+ 4	i 6 59	PP	—
Denver	32.2	331	i 6 22	+ 4	i 11 22	+ 2	i 7 41	PP	—
Weston	32.8	20	i 6 22	- 1	i 11 29	- 1	i 7 40	PP	i 14.1
La Paz	33.6	146	i 6 32 <sub>a</sub>	+ 2	i 11 44	+ 2	7 8	pP	16.1
Ottawa	34.4	12	6 33	- 4	11 54	0	8 0	PP	16.2
Pierce Ferry	34.6	318	i 6 36	- 2	e 11 51	- 6	—	—	—
La Jolla	35.1	310	e 6 43	0	i 12 4	- 1	i 9 10	PcP	—
Palomar	35.1	311	i 6 40	- 3	i 12 5	0	i 16 48	ScS	—
Boulder City	35.1	317	i 6 41	- 2	e 12 4	- 1	i 7 2	pP	e 16.8
Rapid City	35.1	337	i 6 44	+ 1	i 12 4	- 1	e 8 2	PP	e 13.2
Overton	35.2	318	i 6 41	- 3	i 12 9	+ 2	—	—	—
Riverside	35.8	312	i 6 46	- 3	e 12 47	+31	i 9 15	PcP	—
Shawinigan Falls	36.2	15	6 50	- 2	12 24	+ 2	8 25	PP	15.2
Mount Wilson	36.4	312	e 6 51	- 3	i 12 26	+ 1	i 9 16	PcP	—
Pasadena	36.4	312	e 6 51	- 3	i 12 25	0	i 7 9	pP	15.3
Salt Lake City	36.4	326	i 6 55	+ 1	i 12 24	- 1	i 8 31	PP	e 13.3
Logan	37.0	327	i 7 0	+ 1	i 12 26	- 8	i 8 18	PP	i 15.2
Seven Falls	37.2	17	6 58	- 2	12 37	0	8 34	PP	17.2
Haiwee	37.3	315	e 6 59	- 2	e 12 40	+ 1	e 17 0	ScS	—
Santa Barbara	37.7	311	e 7 2	- 3	e 12 42	- 3	i 9 20	PcP	—
Halifax	37.8	26	i 6 40	-25	i 12 20	-26	8 14	PP	17.2
Tinemaha	38.0	315	e 7 5	- 2	i 12 50	0	i 9 22	PcP	—
Fresno	N. 38.9	314	i 7 16	+ 1	i 13 2	- 1	i 17 9	ScS	—
Bozeman	39.6	332	i 7 22	+ 2	i 13 11	- 2	e 9 5	PP	i 16.2
Butte	40.5	331	i 7 28	0	i 13 20	- 7	i 9 10	PP	e 16.4
Santa Clara	40.7	314	e 7 32	+ 3	e 13 24	- 6	—	—	—
Branner	40.9	314	i 7 33	+ 2	i 13 33	0	i 17 22	SSS	—
Berkeley	41.1	314	i 7 31	- 2	i 13 34	- 2	i 7 36	pP	e 22.6
San Francisco	41.2	314	i 7 37	+ 4	i 13 40	+ 3	—	—	e 21.6
Shasta Dam	42.7	318	e 7 40	- 6	i 13 44	-15	—	—	—
Saskatoon	43.2	341	i 7 32	-18	i 13 43	-23	9 17	PP	19.2
Ferndale	E. 43.8	317	e 7 59	+ 4	i 13 15	-60	—	—	—
Grand Coulee	45.0	328	e 8 2	- 2	i 14 36	+ 4	—	—	i 19.7
Santa Lucia	E. 47.6	161	8 27	+ 2	15 8	- 1	18 2	SS	—
Victoria	47.7	326	8 21	- 4	14 57	-13	10 2	PP	22.2
La Plata	E. 53.9	150	i 9 10	- 2	i 16 32	- 4	13 12	PPP	22.0
	N. 53.9	150	i 9 8	- 4	16 26	-10	11 16	PP	23.5
Ivigtut	56.3	20	i 9 26 <sub>a</sub>	- 4	i 17 3	- 5	11 28	PP	26.2
Sitka	58.6	331	e 9 52	+ 6	i 17 36	- 2	i 21 24	SS	e 23.4
College	67.2	335	e 10 51	+ 9	i 19 29	+ 4	e 13 24	PP	e 27.4
Honolulu	68.7	288	i 11 2	+10	i 19 51	+ 8	—	—	e 28.2
Scoresby Sund	70.2	18	i 10 59	- 2	i 19 56	- 4	13 35	PP	—
Lisbon	72.5	53	i 11 14 <sub>k</sub>	0	i 20 25	- 2	i 11 54	pP	33.3
Edinburgh	76.2	35	11 31	- 5	21 5	- 3	11 44	PcP	—
Malaga	Z. 76.3	54	i 11 37 <sub>a</sub>	+ 1	i 21 13	+ 4	i 14 33	PP	32.0
Aberdeen	76.7	33	i 11 40	+ 1	i 21 5	- 8	i 14 33	PP	e 33.9
Granada	76.9	54	i 11 37	- 3	i 21 13	- 2	e 14 40	PP	39.4
Durham	E. 77.1	36	i 11 39	- 2	i 21 13	- 5	i 12 25	pP	—
Jersey	77.1	42	i 11 37	- 4	i 21 12	- 6	—	—	—
Almeria	77.9	54	11 30	-15	21 21	- 5	22 34	PPS	—
Kew	78.1	39	i 11 43 <sub>a</sub>	- 3	i 21 19	- 9	i 12 25	pP	e 37.2
Alicante	79.3	52	11 0	?	20 10	?	13 30	PP	e 32.4

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	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.	
			m.	s.		m.	s.		m.	s.		
Paris	80.2	42	i 11	56	- 2	i 21	41	- 9	i 12	37?	pP	e 33.2
Bergen	80.3	29	i 11	54	- 4	i 21	46	- 6	e 12	37	pP	e 32.2
Clermont-Ferrand	81.0	45	i 12	1 <sub>a</sub>	- 1	i 21	56	- 3	i 12	43	pP	—
Uccle	81.1	39	i 12	0 <sub>a</sub>	- 2	e 21	46	-14	i 12	42	pP	e 35.2
De Bilt	81.4	38	i 12	3 <sub>a</sub>	- 1	i 21	57	- 6	i 15	16	PP	e 36.2
Algiers	82.3	54	12	24	+15	22	12	0	e 12	57	pP	—
Besançon	82.7	44	e 12	9	- 2	e 22	0	-16	—	—	—	34.2
Neuchatel	83.4	43	i 12	9	- 5	e 22	9	-14	—	—	—	—
Strasbourg	83.6	41	i 12	14 <sub>a</sub>	- 1	i 22	16	- 9	i 12	56	pP	i 33.8
Basle	83.7	43	e 12	15	- 1	e 23	19	- 7	e 12	56	pP	—
Zürich	84.4	43	i 12	18 <sub>a</sub>	- 1	e 22	24	[- 4]	e 13	0	pP	—
Stuttgart	84.5	41	i 12	20 <sub>a</sub>	0	e 22	22	[- 6]	i 13	1	pP	e 35.2
Copenhagen	84.9	34	i 12	20	- 2	i 22	27	[- 3]	e 13	0	pP	36.2
Chur	85.2	43	e 12	23	0	e 22	40	- 1	e 13	3	pP	—
Jena	85.6	39	e 12	24	- 1	e 22	34	[- 1]	e 13	4	pP	e 39.8
Potsdam	86.1	37	e 12	31	+ 3	i 22	49	0	i 13	17	pP	e 38.2
Cheb	86.3	39	i 12	29	0	e 23	46	PS	e 14	58	PP	e 43.2
Upsala	86.5	29	i 12	29 <sub>a</sub>	- 1	i 22	46	- 7	15	51	PP	e 33.2
Prague	87.5	39	i 12	30 <sub>a</sub>	- 4	22	43	[- 5]	e 15	56	PP	e 35.2
Triest	88.3	43	i 12	37 <sub>a</sub>	- 1	i 23	7	- 3	i 13	20	pP	—
Rome	88.4	47	e 14	7	?	—	—	—	—	—	—	—
Zagreb	89.7	43	i 12	45 <sub>a</sub>	0	i 23	22	- 1	i 13	25	pP	—
Helsinki	89.8	27	e 12	45 <sub>a</sub>	0	e 22	56	[- 6]	e 13	24	pP	—
Warsaw	90.8	36	i 12	49 <sub>a</sub>	- 1	i 23	21	-12	16	28	PP	e 34.2
Budapest	E. 91.2	41	12	51	- 1	(23 12?)	[+ 2]	—	i 16	48	PP	23.2
Kalossa	91.5	42	e 13	38	+45	—	—	—	e 17	12?	PP	e 31.2
Belgrade	93.0	44	e 13	2	+ 2	i 24	13	+21	13	12	P <sub>c</sub> P	39.4
Bucharest	E. 96.9	42	e 17	2	PP	i 23	38	[- 3]	—	—	—	—
Moscow	97.8	28	13	20	- 2	24	30	- 3	14	1	pP	—
Istanbul	100.3	44	13	29	- 4	—	—	—	17	23	PP	—
Simferopol	101.8	39	e 16	57	PP	—	—	—	—	—	—	—
Yalta	102.0	39	—	—	—	24	0	[- 7]	27	6	PS	—
Tuai	102.6	232	—	—	—	24	12	[+ 2]	—	—	—	—
Arapuni	103.7	234	—	—	—	24	36	[+21]	33	12	SS	50.1
Auckland	104.3	235	—	—	—	24	12	[- 5]	24	58	SKKS	42.7
Wellington	z. 104.6	231	13	52	0	24	22	[+ 3]	14	29	pP	48.7
Sverdlovsk	106.0	18	i 13	59	+ 1	i 24	22	[- 3]	i 18	18	PP	—
Christchurch	106.3	228	14	7	P	24	27	[+ 1]	14	41	pP	49.9
Helwan	106.8	54	i 14	3 <sub>k</sub>	P	24	27	[- 1]	e 14	44	pP	—
Ksara	108.5	49	e 14	12	P	28	8	PS	18	38	PP	—
Grozny	109.6	35	e 18	4	[- 11]	—	—	—	e 18	34	PP	—
Leninakan	110.0	39	—	—	—	28	28	PS	—	—	—	—
Erevan	110.8	39	—	—	—	28	37	PS	—	—	—	—
Baku	113.8	36	e 19	8	PP	—	—	—	—	—	—	—
Vladivostok	114.9	330	19	21	PP	e 25	1	[ 0]	—	—	—	—
Irkutsk	115.2	354	19	22	PP	e 28	46	PS	e 21	46	PPP	—
Tchimkent	121.5	22	18	28	[- 10]	—	—	—	—	—	—	—
Tashkent	122.2	23	e 18	38	[- 2]	i 28	30	PS	—	—	—	—
Almata	122.8	15	20	21	PP	—	—	—	—	—	—	—
Riverview	123.7	238	i 18	45 <sub>a</sub>	[+ 2]	i 25	35	[+ 4]	20	25	PP	e 56.8
Stalinabad	124.4	24	i 18	47	[+ 3]	25	22	[- 12]	38	12	sSS	—
Obi-garm	124.7	23	i 18	48	[+ 3]	—	—	—	i 20	24	PP	—
Tananarive	135.0	105	e 22	23	?	31	38	PS	22	42	PS	e 41.1
New Delhi	N. 136.5	22	e 21	14	?	i 34	9	PPS	i 21	53	PP	—
Bombay	E. 142.9	35	e 19	15	[- 4]	i 22	36	PKS	58	12?	Q	65.2
Calcutta	N. 145.2	10	i 20	32	pPKP	26	37	[+20]	i 30	52	SKKS	—
Hyderabad	147.0	28	19	27	[+ 1]	29	14	SKKS	22	53	PP	68.9
Kodaikanal	E. 152.5	37	i 19	12	[- 22]	29	57	SKKS	22	32	PP	—
Colombo	E. 156.6	38	19	41	[+ 2]	49	45	SSS	23	44	PP	—

Additional readings:—

Bogota iPPP = 3m.31s., iSS = 6m.27s., eP<sub>c</sub>P = 8m.32s., eS<sub>c</sub>S = 11m.40s.

Port au Prince PPP = 3m.44s., SS = 6m.38s.

Columbia i = 5m.44s., and 9m.37s.

Fort de France e = 5m.25s., 5m.56s., 6m.32s., and 6m.37s.

Continued on next page.

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Huancayo iP = 5m.29s., i = 9m.55s.  
 St. Louis iPZ = 5m.27s., iPPZ = 6m.6s., ipPPZ = 6m.12s., iPcPZ = 8m.11s., iSS?N = 10m.55s.  
 Florissant iZ = 6m.49s.  
 Georgetown eP = 5m.44s., e = 6m.42s., 7m.38s., and 9m.46s., SS = 11m.20s.  
 Bermuda iPcP? = 9m.12s.  
 New Kensington i = 9m.29s.  
 Philadelphia iP = 5m.54s., i = 6m.25s. and 6m.55s.  
 Pennsylvania iE = 7m.8s., e = 11m.49s.  
 Chicago e = 6m.15s., i = 6m.31s.  
 Lincoln e = 9m.28s.  
 Tucson i = 6m.1s., 6m.31s., 7m.44s., and 10m.47s.  
 Fordham i = 6m.6s., 7m.24s., and 12m.9s.  
 Weston i = 6m.26s., iSS = 13m.24s.  
 La Paz PPN = 8m.2s., PcP = 9m.2s., SSN = 13m.28s.  
 Ottawa i = 6m.38s., and 12m.48s., SSE = 13m.48s.  
 Pierce Ferry i = 6m.41s.  
 La Jolla iScS = 16m.48s.  
 Palomar i = 6m.45s., iPKKKP = 49m.3s.  
 Boulder City i = 6m.45s.  
 Rapid City iPPP? = 8m.16s.  
 Overton i = 6m.45s.  
 Riverside iScSEN = 16m.51s., ePKKKP = 49m.1s.  
 Shawinigan Falls i = 6m.55s.  
 Mount Wilson iP = 6m.55s., iScSEN = 15m.52s., ePKKKP = 49m.8s.  
 Pasadena, iP = 6m.56s., i = 7m.45s., iPP = 8m.21s., iPcP = 9m.16s., i = 9m.46s., iScP = 12m.49s., eEZ = 13m.22s., iScSEN = 15m.54s., ePKKKP = 49m.9s.  
 Salt Lake City e = 7m.25s., i = 9m.1s.  
 Logan iPPP = 8m.32s., iPcP = 9m.12s., i = 11m.10s.  
 Seven Falls e = 9m.28s. and 13m.39s., SS = 15m.15s.  
 Haiwee iScP = 12m.52s.  
 Santa Barbara iScS = 17m.2s.  
 Halifax e = 13m.20s., SSS = 15m.28s.  
 Tinemaha iPEZ = 7m.9s., iScSE = 17m.5s.  
 Bozeman i = 7m.58s.  
 Berkeley i = 7m.36s., ePPZ = 8m.30s., iZ = 13m.8s., iSE = 13m.37s., iSSN = 17m.24s., iSSE = 17m.27s.  
 Shasta Dam i = 7m.45s., 13m.29s., e = 13m.53s.  
 Saskatoon SSS = 17m.6s.  
 Grand Coulee i = 11m.36s.  
 Victoria SS = 17m.58s., e = 20m.48s.  
 La Plata Z = 10m.5s., PcSN = 14m.6s., N = 17m.24s., PSE = 17m.36s., ScSE = 18m.42s., SS? = 19m.48s.  
 Ivigtut 12m.57s., SSS = 23m.18s.  
 Sitka i = 19m.15s.  
 College ePPP? = 15m.10s., iScS = 20m.32s., eSS? = 23m.36s.  
 Scoresby Sund 11m.24s. and 13m.22s., iPPP = 15m.25s., e = 17m.52s., ScS = 21m.10s.  
 Lisbon QN = 30m.26s.  
 Edinburgh PP = 14m.12s., SKS = 21m.32s.  
 Malaga iZ = 11m.41s. and 12m.25s., PPPZ = 16m.45s., iSZ = 21m.51s.  
 Aberdeen iE = 16m.52s., iSSN = 25m.44s., iSSSN = 29m.5s.  
 Granada eSSS = 27m.55s.  
 Durham iPPE = 14m.34s.  
 Almeria SS = 26m.14s.  
 Kew iPcPE = 11m.54s., iPP = 14m.43s., iSPEZ = 22m.13s., eSSEN = 27m.12s.?, eSSS = 30m.43s.?, eQ = 33.2m.  
 Alicante PcP = 11m.14s., PPP = 15m.50s., ScS = 19m.58s., SS = 23m.38s., Q = 28m.18s.  
 Paris iPP = 14m.59s., iPPP = 16m.42s., eS = 21m.56s., iPS = 22m.32s., i = 23m.16s., iSS = 27m.20s.  
 Bergen eZ = 14m.2s., PP = 15m.6s., PSE = 22m.34s., SSEN = 27m.14s.  
 Clermont-Ferrand iP = 14m.4s., iPP = 15m.3s., iPS = 22m.47s.  
 Uccle ePPZ = 15m.6s., ePPPZ = 16m.59s., ePSÉN = 22m.46s., eSSEN = 27m.15s.  
 De Bilt iPS = 22m.51s.  
 Algiers iPP = 15m.26s.  
 Strasbourg iP = 13m.14s., iPP = 15m.34s., i = 15m.41s., ipPP = 16m.0s., i = 16m.34s., ePPP = 17m.23s., iS = 22m.20s., iS = 23m.16s. and 23m.19s., i = 24m.4s., 26m.57s., and 27m.0s., eSS = 27m.21s.  
 Basle ePP = 15m.32s.a.  
 Zürich ePP = 15m.34s.  
 Stuttgart iPcP?Z = 12m.29s., ipP?Z = 13m.8s., iPP = 15m.37s., ePPP? = 17m.57s., ePS = 23m.26s., ePPS? = 24m.12s., eSS = 28m.12s., e = 29m.42s.  
 Copenhagen i = 15m.37s., PS = 23m.27s. and 29m.6s.  
 Chur ePP = 15m.42s.  
 Jena eN = 13m.9s. and 13m.46s., ePPEZ = 15m.50s., ePPN = 15m.54s., ePPPE = 17m.40s., eSN = 22m.37s., eSSN = 28m.28s., eSSE = 28m.38s.  
 Potsdam iPN = 12m.34s., iPPEN = 16m.0s., iPPPN = 17m.56s., iPSN = 24m.14s., ePSE = 24m.18s.  
 Cheb e = 12m.57s., ePPP = 17m.48s., e = 19m.30s. and 20m.51s.

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Upsala PPN = 15m.54s., iSKS = 22m.33s., PS = 24m.1s., SS = 28m.30s.  
 Prague ePPP = 17m.49s., ePS = 23m.56s., ePPS = 24m.42s., eSS = 27m.36s.  
 Trieste iP = 13m.50s., iPP = 16m.5s., iSKS = 22m.49s., iPS = 24m.10s.  
 Zagreb iPP = 16m.26s., iNE = 22m.18s., iSNW = 22m.56s., esS = 24m.32s., e = 30m.6s. and 36m.0s.  
 Helsinki ePP = 16m.16s., e = 23m.17s., esS = 24m.7s., eSS = 29m.20s., esSS = 30m.26s.  
 Warsaw ePN = 12m.52s., PPE = 16m.31s., iE = 17m.29s., PPPN = 18m.19s., PPPE = 18m.24s., SKS = 23m.3s., SN = 23m.25s., PSN = 24m.38s., PPSN = 25m.4s., iN = 28m.35s., SSE = 29m.1s., SSN = 29m.23s., SSSN = 33m.6s., iN = 33m.39s.  
 Budapest iN = 18m.33s.  
 Kalossa eN = 13m.54s., eE = 16m.42s.  
 Belgrade ePP = 16m.52s., e = 19m.14s., i = 28m.30s.  
 Bucharest eP?N = 17m.16s.  
 Moscow PP = 17m.5s., SKS = 23m.40s.  
 Arapuni e = 27m.24s. and 29m.6s.  
 Auckland S? = 25m.36s., e = 34m.7s.  
 Wellington PKP = 18m.1s., PP = 18m.16s., sPKPZ = 18m.50s., iZ = 23m.38s. and 24m.28s., S? = 25m.52s., iZ = 27m.0s., SPPZ = 27m.16s., PSZ = 27m.50s., PPS?Z = 29m.7s., SSZ = 33m.10s., SSSZ = 37m.23s., Q = 43m.42s.  
 Sverdlovsk pS = 26m.31s., iPPS = 28m.42s., sSS = 34m.7s.  
 Christchurch PP = 18m.14s., PPPEN = 21m.22s., PPPPEN = 22m.47s., SKKS = 25m.20s., PS?EN = 27m.18s., PS = 27m.33s., PPSEZ = 28m.51s., SS = 33m.27s., SSS = 37m.32s., SSSS = 40m.52s., Q = 44m.2s.  
 Helwan PP = 18m.32s., PPPZ = 21m.3s., eN = 25m.38s., sSN = 26m.36s., PSEN = 27m.45s., iEN = 28m.18s., PPSEN = 28m.45s.  
 Vladivostok SKS = 26m.9s., i = 27m.1s., 28m.13s., and 33m.2s.  
 Irkutsk PPP = 25m.2s., e = 33m.18s., SS = 39m.12s.  
 Tashkent sS = 28m.49s., PS = 30m.10s.  
 Riverview eZ = 15m.57s., ePPZ = 20m.33s., epPPE = 20m.55s., eZ = 21m.1s., iZ = 21m.39s., iSKKSE = 27m.17s., iE = 27m.34s., iSKSPEZ = 30m.20s., eSSE = 37m.19s., eE = 38m.0s., iPKP<sub>2</sub>, PKP<sub>2</sub>E = 40m.22s., eQE = 52m.0s.  
 Tananarive e = 33m.46s.  
 New Delhi iN = 22m.34s. and 24m.49s., PPSN = 35m.21s., PPPSN = 36m.7s., SSN = 41m.1s., SSSN = 45m.54s.  
 Calcutta iPKSN = 24m.10s., iSSN = 43m.32s., iSSSN = 49m.17s.  
 Hyderabad SKSP = 33m.1s., SSE = 41m.15s.  
 Kodaikanal SSSE = 48m.27s.  
 Long waves were also recorded at Montezuma and Seattle.

Jan. 26d. Readings also at 1h. (Andijan, near Samarkand, and Tchimkent), 3h. (near Mizusawa and near Erevan), 4h. (Copenhagen, Calcutta, near Obi-garm, Samarkand, Stalinabad, near Berkeley and Branner), 5h. (Copenhagen, Stuttgart, Bucharest, and Ksara), 10h. (Stuttgart), 12h. (Palomar, Tinemaha, Tucson, Overton, Pierce Ferry, and near Apia), 14h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, Pierce Ferry, Shasta Dam, Grand Coulee, St. Louis, Stuttgart, Strasbourg, and Ksara), 17h. (Tucson), 19h. (Mount Wilson, Pasadena, Riverside, Tinemaha, Tucson, and Shasta Dam), 20h. (San Juan).

Jan. 27d. Readings also at 0h. (Samarkand, near Obi-garm and Stalinabad), 1h. (Bogota, St. Louis, Florissant, Philadelphia, Weston, Tucson, San Juan, and Huancayo), 2h. (near Andijan, Tchimkent, Tashkent, Obi-garm, Stalinabad, and Almata), 3h. (Ksara, Helwan, Chev, Strasbourg, Copenhagen, and near Istanbul), 6h. (Stuttgart, Santa Lucia, La Plata, Tucson (2), and Shasta Dam), 12h. (near Andijan, Tchimkent, Tashkent, Obi-garm, and Almata), 13h. (Tucson and Boulder City), 20h. (near Mizusawa), 22h. (near Andijan).

Jan. 28d. 10h. 22m. 0s. Epicentre 18° 5S. 66° 5E.

A = +.3784, B = +.8703, C = -.3154;  $\delta$  = +9;  $h$  = +5;  
 D = +.917, E = -.399; G = -.126, H = -.289, K = -.949.

		$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Tananarive		18.0	266	i 4 15	+ 2	e 7 45	+13	i 4 34	PP 8.9
Colombo	E.	28.5	28	6 1	+ 2	11 29	SS	—	—
Kodaikanal	E.	30.5	21	(e 6 35)	+18	e 11 25	+ 7	(7 33)	PP (15.0)
Hyderabad	N.	37.6	19	7 17	- 1	12 51	-17	—	16.6
Bombay		37.7	9	i 7 19	0	13 4	- 6	i 8 37	PP 16.4
Calcutta	N.	46.0	29	e 8 0	-27	e 15 0	-12	—	—
New Delhi	N.	47.9	13	—	—	i 15 33	- 6	—	e 24.9
Helwan		58.8	324	e 10 0	- 2	18 4	- 3	—	—
Tashkent		59.6	3	e 10 4	- 4	e 18 9	- 8	—	—
Tchimkent		60.6	3	c 10 27	+12	—	—	—	—

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	$\Delta$ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	Supp. m. s.	L. m.
Leninakan	62.6	341	e 10 52	P <sub>c</sub> P	—	—	—	—
Sverdlovsk	75.2	357	11 48	+ 2	21 22	- 3	—	—
Riverview	E. 75.6	122	e 21 52	PS	e 26 23	SS	—	e 34.9
Warsaw	80.8	334	—	—	e 22 13	-12	e 26 58	SS e 41.0
Prague	82.3	329	—	—	e 22 30	-10	e 25 12	?
Stuttgart	Z. 84.7	326	e 12 40	+ 3	—	—	—	—
Strasbourg	84.8	326	e 12 45	+ 8	—	—	e 13 10	P <sub>c</sub> P 38.0
Copenhagen	86.8	333	—	—	23 26	+ 1	25 37	PPS 36.0
Grand Coulee	150.3	8	e 20 0	[+12]	—	—	—	—
St. Louis	151.5	320	i 20 4	[+14]	—	—	—	e 81.2
Shasta Dam	156.6	342	e 20 35	[+38]	—	—	—	—
Tucson	166.1	350	e 20 23	[+16]	—	—	e 21 12	? e 84.9

Additional readings:—

Tananarive iEN = 4m.19s., SS = 8m.14s., P<sub>c</sub>P = 8m.30s., S<sub>c</sub>S = 15m.41s.

Kodaikanal readings increased by 1m.

Calcutta eS?N = 14m.30s.

Strasbourg e = 14m.12s.

Long waves were also recorded at Huancayo, Philadelphia, and Florissant.

Jan. 28d. Readings also at 2h. (near Mizusawa), 3h. (Shasta Dam), 4h. (Riverview), 5h. (Lick, Fresno, and near Branner), 10h. (Christchurch), 13h. (Stuttgart, Strasbourg, and near Zürich), 17h. (Kodaikanal), 18h. (La Paz), 19h. (St. Louis), 21h. (Stuttgart), 22h. (La Paz).

Jan. 29d. 8h. 17m. 49s. Epicentre 26°·3S. 63°·2W. Depth of focus 0·080.  
(as on 1946, Aug. 28d.).

A = +·4047, B = -·8012, C = -·4407;  $\delta$  = -8; h = +3;  
D = -·893, E = -·452; G = -·199, H = +·393, K = -·898.

	$\Delta$ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	Supp. m. s.	L. m.
Montezuma	6.3	304	e 1 43	+ 1	13 2	0	—	e 3.5
Coplapo	E. 6.5	259	1 42	- 2	3 8	+ 2	—	—
La Plata	E. 9.7	153	i 2 16	0	i 4 3	- 1	13 46	S <sub>c</sub> S
	N. 9.7	153	i 2 16	0	i 4 6	+ 2	13 45	S <sub>c</sub> S
	Z. 9.7	153	i 2 18	+ 2	4 0	- 4	—	—
Santa Lucia	E. 9.7	221	2 9	- 7	—	—	2 31	PP
La Paz	10.8	334	i 2 31k	+ 4	i 4 29	+ 5	—	5.4
Huancayo	18.2	319	e 3 44	+ 4	e 6 33	- 5	e 4 20	PP
Bogota	32.5	340	i 5 50	+ 3	i 10 21	- 5	i 6 30	pP
Balboa Heights	38.5	335	e 6 37	0	e 15 42	S <sub>c</sub> S	e 8 26	pP
Fort de France	40.8	4	i 6 55	- 1	i 12 23	- 6	i 8 39	pP
San Juan	44.5	357	i 7 23	- 2	i 13 13	- 8	e 16 21	S <sub>c</sub> S
Bermuda	58.4	359	i 9 7	+ 1	i 16 26	- 1	i 9 53	P <sub>c</sub> P
Columbia	62.3	344	i 9 31	0	i 17 12	- 3	e 20 26	sS
Philadelphia	66.9	351	i 10 1	+ 1	i 18 12	+ 2	e 12 4	pP e 24.7 e 27.2
Fordham	67.5	352	i 10 6	+ 2	i 18 20	+ 2	i 19 11	SP
Pennsylvania	E. 68.1	348	i 10 0	- 7	i 18 16	- 8	—	—
New Kensington	68.3	347	i 10 11	+ 2	i 18 27	0	—	—
Weston	68.8	354	i 10 11k	- 1	i 18 31	- 1	i 10 35	P <sub>c</sub> P
St. Louis	69.4	338	i 10 11	- 4	i 18 31	- 8	i 12 29	pP
Florissant	69.6	338	i 10 15	- 1	i 18 37	- 5	i 12 13	pP
Chicago	71.4	341	i 10 26	- 1	i 18 56	- 6	i 19 36	S <sub>c</sub> S
Ottawa	72.3	351	i 10 32	0	i 19 11	- 1	13 19	PP
Shawinigan Falls	73.0	354	10 36	0	19 20	0	—	—
Seven Falls	73.4	355	10 40	+ 2	19 24	0	24 17	SS 31.2
Lincoln	73.7	334	e 10 39	- 1	i 19 22	- 5	e 22 43	SS
Tucson	73.8	320	i 10 41k	0	e 19 27	- 1	i 12 39	pP
Denver	76.4	328	e 11 57	+ 62	e 20 59	+ 63	—	—
La Jolla	78.1	316	i 11 5	+ 1	e 20 16	+ 2	—	—
Palomar	78.2	317	i 11 6k	+ 1	i 20 17	+ 2	i 13 10	pP

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	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.
	$^{\circ}$	$^{\circ}$	m.	s.	s.	m.	s.	s.	m.	s.	m.
Pierce Ferry	78.4	321	i 11	6	0	i 20	18	+ 1	—	—	—
Overton	79.0	321	i 11	6	- 3	i 20	21	- 2	i 11	28	P <sub>c</sub> P
Rapid City	79.0	332	i 11	10	+ 1	i 20	23	0	e 23	52	sS
Riverside	79.0	317	i 11	10k	+ 1	e 20	25	+ 2	i 13	13	pP
Mount Wilson	79.5	317	i 11	12k	0	e 20	29	0	i 13	13	pP
Pasadena	79.6	317	i 11	13k	+ 1	i 20	29	- 1	i 13	16	pP
Salt Lake City	80.6	325	e 11	19	+ 2	i 20	38	- 2	e 13	22	pP
Santa Barbara	80.7	316	i 11	19	+ 1	i 20	43	+ 2	—	—	—
Haiwee	80.8	318	i 11	19k	+ 1	e 20	44	+ 2	i 13	24	pP
Logan	81.3	326	i 11	21	0	i 20	46	- 1	i 13	41	pP
Tinemaha	81.6	319	i 11	23k	+ 1	e 20	51	+ 1	i 13	28	pP
Lisbon	82.1	41	i 11	26	+ 1	20	53	- 2	11	35	P <sub>c</sub> P
Fresno	82.3	318	i 11	26	0	e 20	54	- 3	—	—	—
Malaga	83.6	44	i 11	34k	+ 2	i 14	54	PP	i 13	36	pP
Bozeman	83.8	329	e 11	35	+ 2	i 21	11	0	e 24	47	sS
Lick	83.8	317	e 11	11?	- 22	—	—	—	—	—	—
Branner	84.2	317	e 11	36	+ 1	i 21	15	0	i 20	57	SKS
Granada	84.4	44	i 11	40k	+ 4	22	15	+ 58	11	48	P <sub>c</sub> P
Berkeley	84.5	317	i 11	37	0	i 21	18	0	i 11	41	P <sub>c</sub> P
San Francisco	84.5	317	e 11	37	0	21	18	0	—	—	—
Butte	84.8	319	i 11	41	+ 3	i 21	19	- 2	e 14	22	pP
Almeria	84.9	46	i 11	38	- 1	i 22	16	+ 54	12	10	pP
Mineral	85.7	319	e 11	43	0	i 21	28	- 1	—	—	—
Shasta Dam	86.4	319	i 11	44	- 2	e 21	31	- 5	e 21	14	SKS
Saskatoon	86.9	335	11	40	- 8	21	18	[- 5]	—	—	—
Ivigtut	88.0	8	i 11	53k	0	21	51	+ 1	21	27	SKS
Algiers	88.4	47	i 11	58	+ 3	21	32	[- 0]	i 14	5	pP
Grand Coulee	89.2	327	i 11	58	- 1	i 21	57	- 4	e 21	33	SKS
Clermont-Ferrand	93.6	40	i 12	19k	0	i 22	1	[- 1]	i 14	25	pP
Christchurch	93.7	217	14	23	pP <sub>c</sub> P	21	58	[- 4]	16	16	PP
Wellington	94.0	220	12	19	- 2	22	2	[- 2]	14	22	pP
Kew	95.0	34	i 10	25?k	?	i 22	6	[- 3]	i 14	23	pP
Paris	95.0	37	i 12	26?	0	—	—	—	i 14	33	pP
Arapuni	95.5	223	28	11?	?	—	—	—	—	—	—
New Plymouth	95.8	222	—	—	—	22	4	[- 9]	—	—	—
Durham	96.4	31	i 12	33	+ 1	i 22	17	[+ 1]	i 16	32	PP
Neuchatel	96.5	41	e 12	33	+ 1	—	—	—	e 16	33	PP
Auckland	96.8	224	—	—	—	21	55	[- 23]	e 25	35	PS
Basle	97.1	40	e 12	36	+ 1	e 22	19	[- 1]	e 16	38	PP
Uccle	97.1	36	i 12	35k	0	i 22	19	[- 1]	i 16	39	PP
Rome	97.3	46	i 12	35k	- 1	i 22	18	[- 3]	14	42	pP
Zürich	97.6	41	i 12	38k	+ 1	e 22	21	[- 2]	e 14	44	pP
Strasbourg	97.8	40	i 12	38k	0	e 22	21	[- 3]	e 14	45	pP
De Bilt	98.2	35	i 12	41k	+ 1	i 22	26	[ 0]	i 16	47	PP
Stuttgart	98.7	40	i 12	42k	0	e 22	26	[- 2]	—	—	—
Triest	99.9	44	i 12	45	- 3	i 22	32	[- 2]	i 15	39	sP
Scoresby Sund	100.9	13	12	52k	0	22	39	[ 0]	i 17	7	PP
Cheb	101.1	39	i 17	9	PP	i 22	40	[ 0]	—	—	37.2
Jena	101.1	39	e 12	54	+ 1	—	—	—	e 17	8	PP
Zagreb	101.4	45	e 12	54	0	i 22	39	[- 2]	i 17	9	PP
Prague	102.3	40	e 13	1	+ 3	e 22	46	[+ 1]	e 17	14	PP
Potsdam	102.6	37	i 17	21	PP	i 22	48	[+ 1]	i 17	30	?
Bergen	102.7	28	—	—	—	e 22	46	[- 1]	—	—	—
Copenhagen	103.7	34	i 13	5	P	i 22	51	[- 1]	17	26	PP
Belgrade	103.8	47	e 16	12	?	e 23	45	[+ 53]	—	—	—
Budapest	104.0	44	e 16	23	?	i 22	50	[- 3]	i 17	29	PP
Helwan	106.3	65	13	17	P	23	2	[- 1]	16	21	sP
Warsaw	107.0	40	e 13	19k	P	i 23	5	[- 1]	e 17	55	PP
Upsala	108.0	31	i 17	56	PP	i 23	9	[- 1]	—	—	—
Ksara	111.1	62	i 18	23	PP	28	13	PS	20	15	pPP

Continued on next page.

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	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Helsinki	111.5	32	—	—	i 23 22	[- 3]	—	—
Riverview	111.9	210	—	—	i 23 24	[- 2]	—	—
Brisbane	N. 116.2	217	e 33 47	SS	—	—	—	—
Leninakan	119.1	56	e 19 18	PP	—	—	—	—
Baku	123.6	57	e 19 41	PP	—	—	—	—
Sverdlovsk	130.0	36	e 17 49	[-19]	e 24 24	[- 1]	e 20 1	PP
Samarkand	136.7	59	e 18 27	[+ 6]	—	—	—	—
Stalinabad	138.1	60	i 18 16	[- 7]	—	—	21 8	PP
Tashkent	138.3	56	18 15	[- 9]	e 25 6	[+25]	20 37	pPKP
Bombay	138.9	92	i 18 26	[+ 1]	—	—	e 21 12	PP
Kodaikanal	E. 139.6	105	(e 18 20)	[- 6]	—	—	—	—
Andijan	140.7	57	18 24	[- 4]	—	—	—	—
Frunse	142.0	54	e 18 29	[- 3]	—	—	e 20 56	pPKP
Hyderabad	143.4	97	i 18 33	[- 1]	—	—	i 22 14	PP
Almata	143.5	51	i 18 33	[- 1]	—	—	—	—
Irkutsk	152.4	17	i 18 48	[+ 1]	—	—	e 21 3	pPKP
Calcutta	N. 153.8	92	(i 19 26)	[+37]	(i 33 16)	PS	—	—
Vladivostok	159.2	327	18 45	[-11]	e 25 11	[+ 2]	e 24 16	PP

Additional readings and note :—

Santa Lucia 3m.13s.  
 Huancayo iS = 6m.44s.  
 Bogota i = 5m.58s., 10m.27s., and 11m.7s.  
 Balboa Heights eS<sub>c</sub>P = 11m.30s.  
 San Juan iP<sub>c</sub>P = 9m.4s.  
 Bermuda i = 9m.31s., ePP? = 11m.49s., iS<sub>c</sub>S = 17m.55s., isS = 19m.41s., eSS? = 21m.37s.  
 Columbia epP? = 11m.56s., iS<sub>c</sub>S = 18m.23s., e = 21m.27s.  
 Philadelphia i = 10m.14s., iP<sub>c</sub>P = 10m.26s., e = 11m.50s., iPP? = 12m.39s., iS<sub>c</sub>S? = 19m.3s., e = 20m.28s., esS = 21m.34s., e = 22m.11s. and 24m.6s.  
 Weston iPP = 12m.51s., i = 19m.15s., e = 21m.55s.  
 St. Louis iZ = 10m.22s., iP<sub>c</sub>PZ = 10m.30s., iSPZ = 13m.25s., ipPPZ = 14m.46s., iS<sub>c</sub>SEN = 19m.18s., isSN = 22m.1s., isPS?N = 22m.35s., isSP?Z = 22m.45s., eSSN = 23m.50s., isSS?N = 26m.44s.  
 Florissant eP<sub>c</sub>PZ = 10m.35s., esPZ = 12m.35s., ipPPE = 13m.59s., iS<sub>c</sub>SEN = 19m.22s., esSE = 21m.7s., esPSE = 22m.0s., eSSN = 22m.59s., esSSE = 25m.49s., eSSSE = 26m.14s.  
 Ottawa SS = 22m.41s.  
 Lincoln iS<sub>c</sub>S = 19m.52s.  
 Tucson i = 11m.14s. and 11m.30s., iPP = 13m.44s., eS = 19m.16s., iS<sub>c</sub>S = 19m.59s., esS? = 23m.29s., esSS? = 27m.33s.  
 Palomar iZ = 12m.46s.  
 Overton iPKKP = 29m.38s., iPKP,PKP = 37m.36s.  
 Rapid City ePP? = 14m.11s., eSSS? = 31m.11s.  
 Pasadena isPZ = 14m.12s., eN = 24m.5s., iPKP,PKP = 37m.56s., eZ = 38m.21s.  
 Salt Lake City epPP = 16m.22s.  
 Haiwee eZ = 37m.46s.  
 Logan i = 11m.36s. and 12m.7s., esP = 14m.43s., iS<sub>c</sub>S = 20m.55s.  
 Tinemaha iZ = 12m.56s., eZ = 37m.53s.  
 Lisbon Z = 11m.50s.?, 12m.8s., and 14m.15s., EN = 24m.34s.  
 Malaga iZ = 12m.36s., SSZ = 15m.14s., SSSZ = 15m.34s.  
 Bozeman esP = 14m.56s., eSP = 22m.9s., eSS = 26m.59s., eSSS = 30m.53s.  
 Granada PP = 15m.19s.  
 Berkeley iPPZ = 14m.25s.  
 Butte esPS? = 26m.26s.  
 Almeria iPP = 15m.9s., PPP = 17m.6s., PS = 23m.38s.?, SSS = 31m.11s., Q = 34m.41s.  
 Ivigtut 25m.35s.  
 Algiers i = 12m.8s., 12m.30s., and 13m.20s., S = 21m.58s.  
 Clermont-Ferrand isP = 15m.22s., iPP = 16m.13s., ipPP = 17m.57s.  
 Christchurch SPEZ = 23m.59s., sSPEN = 27m.11s., sSS = 32m.1s.  
 Wellington sP?Z = 15m.13s., PPZ = 16m.13s., PPP?Z = 18m.11s., iZ = 18m.37s., Z = 19m.21s., pPPP?Z = 20m.0s., SZ = 22m.32s., SPZ = 23m.48s., sS? = 26m.20s., iSSPZ = 27m.7s., SS = 29m.25s.  
 Kew iZ = 16m.9s., iEZ = 16m.29s., eE = 19m.13s., iZ = 23m.41s., eEN = 26m.1s., eE = 29m.41s.?, eEN = 33m.36s.?  
 Paris i = 13m.20s. and 13m.40s., e = 14m.39s.  
 Durham eE = 15m.46s. and 15m.56s., iN = 22m.14s., iEN = 26m.13s.  
 Uccle ePP = 16m.36s., ePS?N = 26m.29s., eSSEN = 28m.17s.  
 Rome PP = 16m.36s., iPPP = 18m.28s., SP? = 23m.16s., sS? = 25m.51s., SS = 28m.16s., SSS? = 33m.26s., e = 37m.42s.  
 Zürich ePKP = 16m.37s.  
 Strasbourg esP = 15m.39s., iPP = 16m.43s., epPP = 18m.32s., esPP = 19m.36s., e = 19m.53s., 21m.45s., and 22m.16s., eSP? = 25m.25s., e = 26m.0s. and 28m.18s., eSS = 29m.37s., esSS = 33m.27s., e = 33m.30s.

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De Bilt eZ = 19m.41s., e = 26m.21s.  
 Stuttgart eZ = 12m.55s., i = 16m.50s.  
 Trieste iPP = 16m.59s., ipPP = 18m.45s., isPP = 19m.51s., isS = 26m.30s.  
 Scoresby Sund PS = 26m.40s.  
 Cheb i = 22m.40s. and 26m.42s., eSS? = 29m.3s.  
 Jena eN = 16m.4s.  
 Zagreb eNE = 19m.1s.  
 Prague e = 26m.40s., eSS? = 29m.11s.  
 Copenhagen i = 19m.38s., 23m.35s., and 26m.39s., i = 26m.49s., 27m.46s., 29m.23s., 33m.11s., and 35m.53s.  
 Belgrade e = 20m.27s. and 22m.18s.  
 Budapest eN = 17m.11s.  
 Helwan iPPZ = 17m.47s., pPPZ = 19m.35s., sPPZ = 20m.49s., SPP = 26m.59s., iN = 38m.45s.  
 Warsaw eZ = 16m.25s., iZ = 17m.49s., eZ = 19m.54s. and 20m.49s., iZ = 22m.57s., eZ = 26m.58s., iE = 27m.1s., eZ = 28m.59s., eN = 29m.40s., eE = 29m.59s., 31m.7s., and 32m.25s.  
 Upsala iE = 18m.55s., eE = 19m.46s., iE = 23m.6s., eE = 24m.2s. and 27m.6s., e = 27m.36s.  
 Ksara sPP = 21m.17s.  
 Helsinki e = 24m.26s. and 27m.22s.  
 Riverview eN = 24m.33s. and 27m.4s.  
 Sverdlovsk i = 18m.6s., 20m.27s., 21m.33s., and 22m.21s., i = 23m.24s. and 24m.40s., e = 26m.26s., i = 28m.28s. and 30m.46s.  
 Tashkent i = 18m.27s., iPP = 21m.6s., e = 21m.59s., 23m.17s., 24m.14s., and 29m.47s.  
 Kodaikanal reading increased by 10m.  
 Hyderabad eN = 29m.2s., eE = 33m.56s. and 48m.56s., eN = 49m.0s.  
 Irkutsk i = 19m.9s., e = 19m.28s. and 21m.16s., ePP = 22m.36s., e = 23m.16s., i = 28m.38s., e = 35m.11s. and 35m.47s.  
 Calcutta readings increased by 10m.  
 Vladivostok i = 21m.12s., e = 23m.11s., 26m.19s., 27m.3s., and 27m.21s.  
 Long waves were also recorded at Alicante.

Jan. 29d. 18h. 1m. 35s. Epicentre 18°·5S. 66°·5E. (as on 28d.).

A = +·3784, B = +·8703, C = -·3154;  $\delta = +9$ ;  $h = +5$ .

	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Tananarive	18·0	266	e 4 15	+ 2	c 7 48	+16	—	8·9
Colombo	E. 28·5	28	(e 6 7)	+ 8	(e 10 31)	-16	—	—
Kodaikanal	E. 30·5	21	e 6 16	- 1	—	—	—	—
Hyderabad	37·6	19	7 16	- 2	12 59	- 9	8 38	PP 18·0
Bombay	37·7	9	e 7 18	- 1	e 13 2	- 8	—	—
Calcutta	N. 46·0	29	e 13 34	?	—	—	—	—
New Delhi	N. 47·9	13	—	—	i 15 27	-12	—	e 24·0
Helwan	58·8	324	e 10 31	+29	e 18 1	- 6	—	—
Tashkent	59·6	3	e 10 6	- 2	e 18 9	- 8	—	—
Ksara	59·7	330	10 15	+ 6	—	—	—	—
Sverdlovsk	75·2	357	e 11 41	- 5	—	—	—	—
Moscow	77·9	345	12 7	+ 6	—	—	—	—

Additional readings and note :—

Colombo readings reduced by 3m.  
 Hyderabad SN = 12m.56s., SSE = 15m.3s.  
 Long waves were also recorded at Riverview.

Jan. 29d. 18h. Off Portugal.

Lisbon P = 47m.46s., P<sub>g</sub>Z = 48m.53s., S = 48m.16s., S\*NZ = 48m.19s.  
 Malaga Z iP = 48m.15s. and 48m.25s., iP<sub>g</sub> = 48m.29s., PS = 48m.37s., S = 48m.56s. and 49m.0s., iS = 49m.7s., S<sub>g</sub> = 49m.23s.  
 Granada iP = 48m.27s., P<sub>g</sub> = 48m.10s., 48m.46s. and 48m.54s., iS<sub>g</sub> = 49m.31s., S<sub>g</sub> = 49m.46s. and 49m.55s.  
 Almeria eP = 48m.37s., P<sub>g</sub> = 48m.55s. and 49m.10s., iS<sub>g</sub> = 49m.55s., S<sub>g</sub> = 49m.58s., 50m.5s. and 50m.11s.  
 Grand Coulee eP? = 58m.23s.  
 Long waves were also recorded at Stuttgart and Uccle.

Jan. 29d. Readings also at 0h. (Stuttgart and San Juan), 1h. (Philadelphia, Bogota, Huancayo, and La Paz), 3h. (near Leninakan), 6h. (Copenhagen), 8h. (near Istanbul), 10h. (Copiapo), 16h. (Stuttgart), 19h. (Grand Coulee and near Andijan, Frunse, Tchinkent, and Tashkent), 23h. (near Mineral (2)).

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Jan. 30d. 1h. 2m. 16s. Epicentre 12°·4N. 92°·5E. (as on 1946, December 5d.).

A = -·0426, B = +·9761, C = +·2134;  $\delta = +13$ ;  $h = +6$ ;  
D = +·999, E = +·044; G = -·009, H = +·213, K = -·977.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Calcutta	N.	10·8	339	c 0 49	?	i 3 25	?	—	—
Colombo	E.	13·6	248	3 12	- 5	5 45	- 5	—	—
Hyderabad	E.	14·4	292	3 28	+ 1	c 6 17	+ 8	—	7·7
Kodaikanal	E.	14·9	264	e 5 35	?	—	—	—	—
Bombay		20·0	292	e 4 46	+ 9	c 8 25	+ 8	—	10·2
New Delhi	N.	21·5	322	e 4 53	+ 1	i 8 50	+ 3	—	—
Andijan		33·3	332	e 6 39	- 2	—	—	—	—
Stalinabad		33·5	325	e 6 42	- 1	c 12 0	- 5	—	—
Tashkent		35·2	329	e 6 56	- 2	e 12 26	- 5	—	—
Sverdlovsk		50·6	338	8 59	- 3	e 16 13	- 4	—	—
Ksara		55·5	302	e 9 43	+ 4	—	—	12 2	PP
Moscow		60·5	328	e 10 14	0	—	—	—	—
Copenhagen		74·2	325	11 35	- 5	i 21 8	- 6	—	—
Stuttgart	z.	76·4	318	e 11 49	- 4	—	—	—	40·7

Long waves were also recorded at De Bilt, Uccle, and Cheb.

Jan. 30d. 12h. 32m. 40s. Epicentre 36°·3N. 71°·0E. Depth of focus 0·025.  
(as on 1946, June 26d.).

Intensity VI at Sunaga and II at Drosh.  
Epicentre 37°·0'N. 71°·30'E. (U.S.S.R.). Focal depth 220km.  
36°·5N. 70°·5E. (Strasbourg).

Seismological Bulletin, January-March, 1947, Government of India Meteorological Department, p. 26.

A = +·2630, B = +·7638, C = +·5894;  $\delta = -5$ ;  $h = 0$ ;  
D = +·946, E = -·326; G = +·192, H = +·557, K = -·808.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Stalinabad		2·9	322	i 0 47	- 2	i 1 24	- 2	—	—
Andijan		4·6	14	1 8	- 2	1 54	-10	—	—
Tashkent		5·2	347	—	—	c 2 36	SS	—	—
Tchimbkent		6·1	351	i 1 26	- 3	i 2 28	-11	—	—
Frunse		7·1	22	i 1 41	- 1	i 2 51	-11	—	—
Almata		8·3	32	i 1 58	0	3 20	-10	—	—
New Delhi		9·3	144	i 2 13	+ 2	i 3 56	+ 2	14 0	SS
Bombay		17·4	174	i 3 57	+ 5	i 7 20	SS	—	8·6
Hyderabad	N.	19·9	159	e 4 22	+ 4	e 7 54	+ 7	i 5 22	?
Calcutta	N.	20·4	127	(e 4 29)	+ 6	(i 8 7)	+11	(i 4 39)	PP
Grozny		20·6	299	e 4 27	+ 2	i 8 5	+ 6	—	—
Leninakan		21·6	292	e 4 39	+ 4	—	—	—	—
Sverdlovsk		21·7	345	i 4 35	- 1	e 8 21	+ 2	i 5 8	PP
Irkutsk		28·4	44	e 5 39	0	10 12	+ 2	e 6 20	PP
Ksara		28·8	275	e 5 41	- 1	10 28	+12	6 29	PP
Helwan		33·7	270	6 23	- 2	—	—	—	c 16·3
Warsaw		38·3	311	e 7 1a	- 2	c 15 15	SS	c 8 36	PP
Upsala		41·2	322	—	—	c 14 20?	+54	—	c 18·3
Prague	E.	42·5	308	e 9 51	P <sub>c</sub> P	—	—	c 10 23	?
Copenhagen		43·6	315	i 7 46	- 1	14 5	+ 4	i 17 30	SS
Cheb		43·8	308	—	—	e 17 30	SS	—	c 19·4
Jena	N.	44·2	308	e 7 52	0	—	—	—	—
Stuttgart		46·0	306	e 8 5a	- 1	—	—	c 9 57	P <sub>c</sub> P
Strasbourg		47·0	306	e 8 11	- 3	c 18 32	SS	c 9 13	pP
De Bilt		48·1	312	i 8 21a	- 1	—	—	c 11 17	PPP
Clermont-Ferrand		50·7	303	e 8 40	- 2	—	—	—	—

Additional readings and note:—

New Delhi eE = 3m.50s.

Calcutta iSSN = (8m.29s.); readings increased by 1 minute.

Sverdlovsk iSP = 5m.35s.

Irkutsk sS = 11m.27s.

Warsaw eE = 7m.4s., eZ = 8m.8s. and 8m.33s., eE = 9m.5s., eEZ = 9m.31s., eE = 15m.8s., eN = 15m.12s.

Copenhagen 8m.52s., 10m.14s., 10m.32s., and 15m.25s.

Stuttgart eZ = 13m.10s.

Strasbourg ePP = 10m.6s., e = 11m.12s.

De Bilt eZ = 9m.26s.

Long waves were also recorded at Uccle and Bergen.



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Jan. 30d. 14h. Undetermined shock.

Riverview iPNZ = 42m.16s.<sub>a</sub>, iPPPNZ = 42m.51s., iSE = 46m.2s., iSN = 46m.8s., iP<sub>c</sub>PZ = 46m.23s., eL = 47.1m.

Christchurch PZ = 42m.54s., eZ = 44m.16s., S = 47m.14s., EN = 48m.8s., eZ = 48m.40s.

Brisbane iPN = 43m.19s., eS?N = 48m.0s.

Wellington P? = 44m.0s., i = 45m.34s., SZ = 47m.50s., Q = 49m.10s., RZ = 51m.

Auckland P = 45m.15s., PP = 46m.14s., S = 49m.52s., Q? = 50m.55s.

Ksara ePP? = 55m.20s., e = 64m.49s.

Stuttgart eZ = 57m.30s.?

Helwan PZ = 57m.39s.

Long waves were also recorded at Arapuni and Uccle.

Jan. 30d. Readings also at 0h. (Port au Prince), 1h. (near Branner), 5h. (near Mineral), 7h. (near Andijan, Stalinabad, Tashkent, Frunse, and Tchimkent), 11h. (near Overton, Pierce Ferry, and Boulder City), 14h. (Granada, near Andijan, Tchimkent (2), Frunse, and Stalinabad), 18h. (near Ottawa), 19h. (near Malaga), 20h. (near Andijan, Tchimkent, Frunse, and Tashkent), 21h. (Mizusawa).

Jan. 31d. Readings at 4h. (Andijan, near Tchimkent, Lick, near Berkeley and Fresno), 7h. (Ksara), 11h. (Malaga, Tucson, Pierce Ferry, and Boulder City), 12h. (Colombo), 14h. (Alicante, Almeria, near Tashkent, and near Mineral), 17h. (Copiapo, La Plata, Tucson, Riverside, Mount Wilson, and Tinemaha), 20h. (Mizusawa).

Feb. 1d. 13h. 28m. 56s. Epicentre 29° 0S. 162° 0W.

Only a few New Zealand and Californian P readings are available. The determination is in consequence very doubtful and, in any case, is only intended as approximately accounting for the observations.

A = - .8331, B = - .2707, C = - .4823;  $\delta = -5$ ;  $h = +2$ ;  
D = - .309, E = + .951; G = + .459, H = + .149, K = - .876.

	$\Delta$	Az.	P.	O-C.	S.	O-C.
	°	°	m. s.	s.	m. s.	s.
Tuai	19.9	234	4 37	+ 1	8 9	- 6
New Plymouth	22.2	236	4 51	- 9	—	—
Wellington	22.5	231	5 1	- 1	9 13	+ 8
Pasadena z.	75.2	37	i 11 46	0	—	—
Palomar z.	75.3	38	i 11 47 <sub>a</sub>	0	—	—
Mount Wilson z.	75.4	37	i 11 47 <sub>a</sub>	0	—	—
Riverside z.	75.5	37	i 11 48	0	—	—
Haiwee z.	76.9	36	c 11 55	- 1	—	—
Tinemaha z.	77.5	35	i 11 56	- 3	—	—
Tucson	77.9	43	i 12 10	+ 9	—	—
Boulder City	78.4	37	i 12 4	0	—	—
Shasta Dam	78.5	30	i 11 53	- 11	—	—
Overton	79.0	37	i 12 7	0	—	—
Pierce Ferry	79.0	38	i 12 8	+ 1	—	—
Strasbourg	158.9	18	c 19 46	[-14]	—	—
Stuttgart z.	159.1	16	c 19 49	[-11]	—	—

Additional readings:—

Wellington i = 5m.9s., e = 9m.5s.

Palomar iZ = 12m.25s.

Riverside eZ = 12m.23s.

Tucson i = 12m.31s.

Feb. 1d. 15h. 49m. 51s. Epicentre 50° 8N. 11° 6E.

W. Sponheuer and F. Gerecke.

Die Sprengung in Grossentersdorf bei Kahla (Thüringen) am 1 Feb., 1947.

Veröffentlichungen für Erdbebenforschung in Jena, Heft. 51, Berlin, 1949, pp. 48-56, 2 fig. and isoseismal chart, p. 51.

A = + .6216, B = + .1276, C = + .7728;  $\delta = -11$ ;  $h = -6$ ;  
D = + .201, E = - .980; G = + .757, H = + .155, K = - .635.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.
	°	°	m. s.	s.	m. s.	s.	m. s.
Jena	0.1	—	i 0 1	P <sub>g</sub>	—	—	—
Stuttgart	2.6	217	e 0 45 <sub>a</sub>	+ 1	e 1 19	+ 2	i 0 49 P <sub>g</sub>
Strasbourg	3.3	228	e 0 57	+ 4	e 1 45	+ 10	e 1 49 S <sub>g</sub>
Zürich	4.0	211	e 1 10	P*	e 2 3	S*	e 1 13 P <sub>g</sub>

Additional readings:—

Stuttgart iS<sub>g</sub>Z = 1m.25s., iZ = 1m.30s., e = 1m.35s.

Strasbourg e = 2m.29s.

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Feb. 1d. Readings also at 1h. (La Paz, Montezuma, Tucson (2), Haiwee, Mount Wilson, Riverside, Tinemaha, and near Florence), 8h. (Calcutta and near Mizusawa), 9h. (Copiapo), 10h. (Brisbane, Mount Wilson, Palomar, Riverside, Tinemaha, and Tucson), 12h. (near Apia), 13h. (Boulder City, Overton, and Pierce Ferry), 16h. and 17h. (Paris), 23h. (Riverside, Tinemaha, and Tucson).

Feb. 2d. 1h. 36m. 9s. Epicentre  $27^{\circ}58'$ ,  $70^{\circ}5'W$ . Depth of focus 0.010.  
(as on 1940, February 12d.).

A = +.2965, B = -.8373, C = -.4593;  $\delta = -6$ ;  $h = +3$ ;  
D = -.943, E = -.334; G = -.153, H = +.433, K = -.888.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Copiapo	E.	0.2	—	0 7	- 7	0 25	0	—	—
Santa Lucia		5.9	182	1 26	0	2 32	- 1	—	—
La Paz		11.2	12	3 3	+25	i 4 51	+ 9	—	5.6
La Plata		13.0	128	2 56	- 6	5 21	- 4	—	6.3
Huancayo		16.1	342	e 3 47	+ 5	c 6 45	+ 8	c 4 33	PP e 8.4
St. Louis	Z.	68.3	344	e 11 6	+13	—	—	i 11 27	pP —
Tucson		70.7	325	e 11 7	0	—	—	e 11 26	pP —
Palomar	Z.	74.8	322	i 11 31	0	—	—	c 11 46	pP —
Pierce Ferry		75.4	325	i 11 35	0	—	—	—	—
Riverside	Z.	75.6	322	i 11 36	0	—	—	e 11 55	pP —
Mount Wilson	Z.	76.1	322	e 11 40	+ 1	—	—	e 11 59	pP —
Pasadena	Z.	76.1	322	e 11 39	0	—	—	e 11 55	pP —
Haiwee	Z.	77.5	323	e 11 47	0	—	—	—	—
Tinemaha	Z.	78.4	323	i 11 53	+ 1	—	—	e 12 7	pP —

Additional readings and notes:—

Santa Lucia 2m.14s.  
La Paz readings are given as at 2h.  
La Plata SN = 5m.9s., N = 5m.51s.

Feb. 2d. 4h. 4m. 42s. Epicentre  $57^{\circ}2'N$ ,  $153^{\circ}7'W$ . (as on 1946, December 18d.).

A = -.4880, B = -.2412, C = +.8389;  $\delta = +7$ ;  $h = +8$ ;  
D = -.443, E = +.896; G = -.752, H = -.372, K = -.544.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Grand Coulee		22.8	98	e 5 6	+ 1	—	—	—	—
Shasta Dam		26.0	115	i 5 35	- 1	—	—	—	—
Berkeley		28.3	119	i 5 55	- 2	i 10 37	- 6	—	c 13.8
Tinemaha	Z.	30.9	115	e 6 20	0	—	—	i 12 58	ScP —
Haiwee	Z.	31.8	116	e 6 27	- 1	—	—	—	—
Overton		33.2	111	i 6 45	+ 5	—	—	—	—
Mount Wilson	Z.	33.3	118	e 6 41	0	—	—	i 13 5	ScP —
Pasadena	Z.	33.3	118	e 6 39	- 2	—	—	e 13 4	ScP c 15.9
Boulder City		33.5	112	i 6 42	- 1	—	—	—	—
Pierce Ferry		33.7	111	i 6 44	- 1	—	—	—	—
Rapid City		33.8	90	e 6 57	+11	e 12 14	+ 4	e 8 19	PP c 18.9
Riverside	Z.	33.8	118	e 6 44	- 2	—	—	e 13 7	ScP —
Palomar		34.5	117	i 6 49	- 3	—	—	i 13 9	ScP —
Tucson		38.4	111	e 7 25	0	e 13 25	ScP	e 9 46	PP —
St. Louis		44.6	86	e 8 42	+26	—	—	—	c 22.8
Ottawa		47.5	69	e 8 50	+12	—	—	—	25.3
Philadelphia		51.7	74	—	—	e 16 36	+ 4	e 21 8	SSS c 26.8
Weston		51.9	69	i 9 16	+ 4	—	—	—	c 28.3
Stuttgart	Z.	73.4	11	e 11 43	+ 7	—	—	—	—

Additional readings:—

Berkeley eN = 10m.58s.  
Tinemaha iZ = 6m.27s.  
Riverside iZ = 6m.51s.  
Palomar i = 6m.58s.  
Tucson i = 7m.45s.  
Weston i = 9m.23s.

Long waves were also recorded at Honolulu, Bermuda, and other American stations.

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Feb. 2d. 18h. 50m. 30s. Epicentre  $16^{\circ}18'$ .  $168^{\circ}3'E$ . Depth of focus 0.015.  
(as on 1943, October 11d.).

A = -0.9413, B = +0.1949, C = -0.2756;  $\delta = -1$ ;  $h = +6$ ;  
D = +0.203, E = +0.979; G = +0.270, H = -0.056, K = -0.961.

		$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.	
		$^{\circ}$	$^{\circ}$	m.	s.	s.	m.	s.	s.	m.	s.	m.	
Brisbane	N.	18.1	229	i 4	2	- 2	i 7	20	+ 1	i 7	35	sS	—
Auckland		21.5	166	5	40	+60	9	45	+80	—	—	—	—
Riverview		23.5	217	i 5	0 <sub>a</sub>	+ 1	i 9	4	+ 4	i 5	25	pP	—
Tuai		23.9	163	5	7	+ 4	9	17	+10	—	—	—	—
Wellington		25.7	170	5	20	0	9	44	+ 7	i 5	55	pP	10.5
Christchurch		27.6	173	5	39	+ 2	10	11	+ 3	7	5	PP	11.1
Santa Barbara	Z.	84.8	53	e 12	19	- 2	—	—	—	—	—	—	—
Shasta Dam		85.5	46	e 12	22	- 3	—	—	—	—	—	—	—
Pasadena	Z.	85.9	53	i 12	24	- 3	i 15	45	PP	i 12	57	pP	—
Mount Wilson	Z.	86.0	53	i 12	26	- 1	—	—	—	i 12	59	pP	—
Riverside	Z.	86.4	53	i 12	27	- 2	i 15	51	PP	i 12	59	pP	—
Palomar	Z.	86.6	55	e 12	29	- 1	i 15	51	PP	i 13	1	pP	—
Haiwee	Z.	86.8	51	e 12	28	- 3	—	—	—	e 13	3	pP	—
Boulder City		89.1	52	i 12	40	- 2	e 16	25	PP	i 13	14	pP	—
Overton		89.6	52	e 12	42	- 2	—	—	—	i 13	16	pP	—
Pierce Ferry		89.8	52	e 12	43	- 2	—	—	—	i 13	15	pP	—
Tucson		91.0	57	e 12	49	- 2	e 16	26	PP	e 13	21	pP	—
La Paz	E.	115.6	118	e 15	5	P	i 30	6	PPS	—	—	—	—
Ksara		133.8	301	e 19	1	[- 1]	32	48	PSKS	e 22	18	PKS	—
Helwan	Z.	138.3	297	19	8	[- 2]	—	—	—	22	35	PKS	—
Stuttgart	Z.	143.2	337	i 19	16 <sub>k</sub>	[- 3]	—	—	—	—	—	—	—
Rome	Z.	146.9	325	i 19	23 <sub>a</sub>	[- 2]	—	—	—	—	—	—	—

Additional readings:—

Riverview iPPE = 5m.40s., iPPPN = 5m.52s., iN = 9m.11s., isSEN = 9m.43s., iN = 10n.21s. and 10m.33s.

Stuttgart eZ = 19m.13s.?

Long waves were also recorded at Arapuni.

Feb. 2d. 21h. 11m. 42s. Epicentre  $32^{\circ}9'N$ .  $133^{\circ}9'E$ . Depth of focus 0.005.

Intensity V at Koti; II-III at Tokusima and Hirosima.

Seismo. Bull. Cent. Met. Obs., Japan, 1947, Tokyo, 1950, p.8, with macroseismic chart.  
Depth of focus 60km., macroseismic area 200-300km.

A = -0.5833, B = +0.6062, C = +0.5406;  $\delta = -3$ ;  $h = +1$ ;  
D = +0.721, E = +0.693; G = -0.375, H = +0.390, K = -0.841.

		$\Delta$	Az.	P.		O-C.	S.		O-C.
		$^{\circ}$	$^{\circ}$	m.	s.	s.	m.	s.	s.
Koti		0.7	335	0	7 <sub>k</sub>	- 8	0	9	-18
Siomisaki		1.7	71	0	33	+ 5	0	52	+ 2
Sumoto		1.7	29	0	23 <sub>a</sub>	- 5	0	41	- 9
Hirosima		1.9	320	0	26	- 5	0	44	-10
Kobe		2.1	31	0	31	- 3	0	54	- 5
Owase		2.2	59	0	39	+ 4	—	—	—
Hamada		2.5	323	0	28	-11	0	54	-15
Kyoto		2.6	36	0	38	- 3	1	9	- 3
Kumamoto		2.7	268	0	48	+ 6	—	—	—
Toyooka		2.7	16	0	42	0	1	8	- 6
Izuka		2.8	286	0	43	- 1	—	—	—
Hukuoka		3.0	283	0	46	- 1	1	21	- 1
Hikone		3.1	39	0	56	+ 8	1	12	-12
Nagoya		3.4	48	0	59	+ 7	1	37	+ 5
Gihu		3.4	44	0	52	0	1	38	+ 6
Mera		5.3	67	0	48	-31	—	—	—

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Feb. 2d. Readings also at 0h. (near Tchimkent), 1h. (Paris and Tchimkent), 4h. (near Tchimkent), 7h. (Pierce Ferry), 9h. (near Bogota (2)), 13h. (near Apia and near Tchimkent), 16h. (Balboa Heights, Harvard, near Ottawa, Shawinigan Falls, and Seven Falls), 20h. (Palomar and Tucson), 21h. (Stalinabad, near Almata, Andijan, and Frunse), 22h. (Santa Lucia, Tashkent, Samarkand, near Almata, Andijan, Frunse, and Stalinabad), 23h. (Tucson, Bermuda, and San Juan).

Feb. 3d. 9h. S.W. Pacific.

Brisbane iPN = 57m.51s., iPPN = 58m.12s., iSE = 61m.45s., iSSN = 62m.12s.  
 Riverview ePN = 58m.57s., eE = 59m.46s., ePPN = 60m.5s., eSE = 63m.47s., eSSE = 65m.23s., eR = 67.7m.  
 Christchurch PZ = 60m.44s., PPEZ = 62m.39s., SEN = 66m.45s., QEN = 69m.40s., RZ = 72m.15s.  
 Mount Wilson ePZ = 66m.17s., iZ = 66m.35s.  
 Pasadena ePZ = 66m.17s.  
 Palomar ePZ = 66m.21s.  
 Riverside ePZ = 66m.21s., eZ = 66m.43s.  
 Tucson eP? = 70m.53s., eL = 98m.10s.  
 Long waves were also recorded at Wellington and Auckland.

Feb. 3d. 16h. Undetermined shock. Peru. Apparently with deep focus.

Huancayo iP = 43m.8s., i = 43m.26s., iS = 43m.33s., iL = 44m.21s.  
 La Paz PE = 45m.8s., iE = 45m.54s., iSE = 46m.47s., LE = 47m.46s.  
 Bogota iPZ = 45m.51s., iZ = 46m.5s. and 46m.23s., iSZ = 48m.32s., i = 49m.49s.  
 San Juan eP = 48m.57s., eS = 53m.3s., eL = 53m.21s.  
 St. Louis iPZ = 51m.8s., ipPZ = 51m.53s.  
 Florissant iPZ = 51m.9s.  
 Weston iP = 51m.26s., ipP = 52m.10s.  
 Tucson iP = 51m.34s.k, ipP = 52m.20s., eP<sub>c</sub>P = 52m.50s., ePP = 53m.39s., ePPP = 54m.33s., eL = 71m.15s.  
 Palomar iP = 52m.6s.k, iZ = 52m.39s. and 52m.53s.  
 Pierce Ferry iP = 52m.7s., ipP = 52m.53s.  
 Boulder City iP = 52m.10s., epP = 52m.47s.  
 Overton iP = 52m.11s.  
 Riverside iPZ = 52m.11s.k, eZ = 52m.43s., iZ = 52m.58s., eZ = 53m.14s.  
 Mount Wilson iPZ = 52m.16s.k, i = 52m.48s. and 53m.3s.  
 Pasadena iPNZ = 52m.16s.k, iNZ = 52m.47s. and 53m.1s.  
 Rapid City eP = 52m.16s., epP = 52m.42s., eP<sub>c</sub>P = 53m.2s., ePP = 54m.50s.  
 Santa Barbara iPZ = 52m.22s.  
 Haiwee ePZ = 52m.24s.  
 Shasta Dam iP = 52m.58s.  
 Grand Coulee iP = 53m.18s.

Feb. 3d. Readings also at 0h. (Ksara, Helwan, Tashkent, Almata, Stalinabad, near Tchimkent, Andijan, and Frunse), 5h. (Grozny and near Tchimkent), 12h. (Paris), 13h. (Rome and Paris), 15h. (Strasbourg and Stuttgart), 16h. (Stuttgart), 20h. (near Branner (2)), 21h. (near Malaga), 22h. (near Pierce Ferry and Boulder City).

Feb. 4d. 5h. 27m. 46s. Epicentre 36°·7N. 70°·5E. Depth of focus 0·020.

Epicentre given by U.S.S.R. Suggested depth 200km.

A = +·2683, B = +·7576, C = +·5951;  $\delta$  = +9;  $h$  = 0;  
 D = +·943, E = -·334; G = +·199, H = +·561, K = -·804.

	$\Delta$	Az.	P.	O - C.	S.	O - C.
	°	°	m. s.	s.	m. s.	s.
Obi-garm	2·1	342	i 0 37	+ 1	1 9	+ 3
Stalinabad	2·3	323	i 0 40	0	i 1 12	+ 2
Samarkand	4·1	319	e 1 4	+ 1	i 1 52	+ 1
Andijan	4·3	20	1 4?	- 1	1 54?	- 1
Tashkent	4·7	349	e 1 10	0	e 1 58	- 7
Frunse	6·9	26	e 1 37	- 3	i 2 51	- 6
Almata	8·2	35	1 53	- 4	3 23	- 5
Sverdlovsk	21·2	345	4 37	+ 3	e 8 11	- 4

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Feb. 4d. 23h. 38m. 32s. Epicentre 42°·3N. 143°·0E. Depth of focus 0·005.

Intensity V at Mori and Hatinohé ; IV at Kusiro, Sapporo, Hakodate, Muroran, Miyako, and Nemuro ; II-III at Asahigawa, Abashiri, and Morioka.  
 Macroseismic radius greater than 300km., epicentre as adopted. Focal depth 60km.  
 Seismo. Bull. Cent. Met. Obs., Japan, 1947, Tokyo, 1950, p.p. 8-9. Macroseismic chart p. 8.

A = -·5925, B = +·4465, C = +·6706 ;  $\delta = +12$  ;  $h = -3$  ;  
 D = +·602, E = +·799 ; G = -·536, H = +·404, K = -·742.

	$\Delta$ °	Az. °	P.		O - C.	S.		O - C.	Supp.		L.
			m.	s.	s.	m.	s.	m.	s.	m.	
Sapporo	1·4	302	0	21 <sub>a</sub>	- 3	0	37	- 6	—	—	—
Mori	1·8	264	0	28 <sub>k</sub>	- 2	0	48	- 4	—	—	—
Hatinohé	2·1	212	0	25 <sub>k</sub>	- 9	0	50	- 9	—	—	—
Miyako	2·8	196	0	45	+ 1	1	17	0	—	—	—
Morioka	3·0	208	0	46 <sub>k</sub>	- 1	1	21	- 1	—	—	—
Akita	3·4	221	0	53 <sub>k</sub>	+ 1	1	34	+ 2	—	—	—
Mizusawa	3·5	205	0	55	+ 1	1	36	+ 2	—	—	—
Sendai	4·3	202	1	5 <sub>k</sub>	0	—	—	—	—	—	—
Hokusima	4·9	204	1	24 <sub>k</sub>	+11	2	30	+21	—	—	—
Onahama	5·6	197	1	23	0	2	30	+ 3	—	—	—
Mito	6·2	199	1	32	+ 1	2	39	- 2	—	—	—
Utunomiya	6·2	204	1	30 <sub>k</sub>	- 1	2	42	+ 1	—	—	—
Kakioka	6·4	200	1	32 <sub>k</sub>	- 2	2	49	+ 3	—	—	—
Tukubasan	6·5	201	1	9	-26	2	20	-29	—	—	—
Nagano	6·7	215	1	43	+ 5	3	19	+25	—	—	—
Kumagaya	6·8	206	1	40	+ 1	2	55	- 1	—	—	—
Wazima	6·8	226	1	38	- 1	—	—	—	—	—	—
Tokyo	7·1	202	1	33	-11	3	1	- 3	—	—	—
Toyama	7·2	220	1	44	- 1	4	6	+60	—	—	—
Yokohama	7·3	202	1	45	- 1	3	8	- 1	—	—	—
Hunatu	7·6	207	1	48	- 2	3	13	- 3	—	—	—
Mera	7·8	200	1	52	- 1	3	12	- 9	—	—	—
Misima	7·8	205	1	54	+ 1	3	24	+ 3	—	—	—
Shizuoka	8·2	208	1	57	- 2	3	27	- 4	—	—	—
Vladivostok	8·2	280	i 1	58	- 1	i 3	32	+ 1	—	—	—
Nagaoya	8·5	215	2	3	0	4	4	+26	—	—	—
Omaesaki	8·5	208	2	4	+ 1	4	2	+24	—	—	—
Hikone	8·8	219	2	8	+ 1	—	—	—	—	—	—
Toyooka	9·3	226	2	14 <sub>k</sub>	0	3	43	-15	—	—	—
Osaka	9·6	220	2	32	+14	3	58	- 7	—	—	—
Kobe	9·7	221	2	20 <sub>k</sub>	+ 1	4	57	+49	—	—	—
Owase	9·8	215	2	24	+ 3	4	30	+20	—	—	—
Sumoto	10·2	221	2	24	- 2	—	—	—	—	—	—
Koti	11·5	224	2	42	- 2	—	—	—	—	—	—
Miyazaki	13·9	225	3	19	+ 4	—	—	—	—	—	—
Kagosima	14·6	227	3	16	- 8	—	—	—	—	—	—
Irkutsk	27·8	304	5	42	- 3	i 11	20	SS	—	—	—
Almata	47·3	295	e 8	32	+ 3	—	—	—	—	—	—
Andijan	51·5	293	e 9	1	0	16	14	- 1	—	—	—
Sverdlovsk	52·1	316	i 9	4	- 2	i 16	20	- 3	—	—	—
Tchimkent	52·6	297	i 9	7	- 2	—	—	—	—	—	—
Tashkent	53·3	295	e 9	11	- 4	e 16	33	- 7	—	—	—
New Delhi	54·1	278	—	—	—	i 16	43	- 7	i 17 15	pS	e 27·9
Stalinabad	54·9	293	e 9	48	+22	i 17	22	+21	—	—	—
Samarkand	55·6	295	e 9	28	- 3	—	—	—	—	—	—
Moscow	63·8	323	10	25	- 3	e 18	53	- 3	—	—	—
Grand Coulee	64·7	48	e 10	30	- 3	—	—	—	—	—	—
Baku	66·3	304	—	—	—	e 19	32	+ 5	—	—	—
Grozny	67·0	308	10	51	+ 3	19	37	+ 2	—	—	—
Shasta Dam	67·0	56	e 10	48	0	—	—	—	—	—	—
Berkeley	68·8	58	i 11	1	+ 2	—	—	—	—	—	—
Tinemaha	71·8	57	i 11	19	+ 1	—	—	—	—	—	—
Haiwee	72·6	57	i 11	24	+ 2	—	—	—	i 12 6	pP	—
Santa Barbara	72·6	59	i 11	23	+ 1	—	—	—	—	—	—
Mount Wilson	73·7	59	i 11	31	+ 2	—	—	—	i 12 12	pP	—

Continued on next page.

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	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	$\circ$	$\circ$	m. s.	s.	m. s.	s.	m. s.	m.
Pasadena	73.7	59	i 11 30	+ 1	—	—	—	—
Copenhagen	73.8	334	i 11 29	0	i 20 56	+ 2	—	33.5
Riverside	z. 74.3	59	i 11 33	+ 1	—	—	—	—
Boulder City	74.6	55	i 11 35	+ 1	—	—	—	—
Pierce Ferry	75.0	55	i 11 38	+ 2	—	—	—	—
La Jolla	75.1	59	e 11 40	+ 3	—	—	—	—
Palomar	75.1	58	i 11 29	- 8	—	—	—	—
Rapid City	75.6	43	e 11 42	+ 2	—	—	—	—
Jena	N. 78.0	330	e 11 51	- 2	—	—	—	—
Cheb	78.4	330	—	—	e 21 28?	- 16	—	e 39.5
Ksara	79.1	306	e 12 1	+ 2	23 17?	PS	—	—
Tucson	79.6	56	i 12 3	+ 1	—	—	e 14 41	PP
Stuttgart	z. 80.6	331	e 12 6	- 1	—	—	—	—
Strasbourg	81.3	332	e 12 10	- 1	—	—	—	e 39.5
Paris	82.8	335	i 12 25	+ 7	—	—	—	e 48.5
Helwan	84.6	306	e 12 28	0	22 46	- 2	15 40	PP
St. Louis	z. 86.0	39	i 12 36	+ 1	—	—	e 15 53	PP
Weston	90.2	25	i 12 56	+ 1	—	—	—	—
La Paz	143.0	55	19 36	[+ 9]	—	—	22 56	PP

Additional readings:—

Grand Coulee iP = 10m.33s.

Tinemaha iZ = 11m.37s.

Pasadena iZ = 11m.40s.

Copenhagen 11m.34s., i = 21m.21s.

Riverside iZ = 11m.48s. and 11m.58s.

Palomar iNZ = 11m.53s.

Tucson i = 12m.23s., e = 12m.45s., i = 13m.1s.

Long waves were also recorded at De Bilt, Uccle, Prague, and Warsaw.

Feb. 4d. Readings also at 0h. (near Stalinabad), 1h. (Paris and Shasta Dam), 5h. (Paris and Santa Lucia), 6h. (Mount Wilson, Pasadena, Palomar, Tinemaha, Boulder City, Pierce Ferry, Tucson, Philadelphia, Weston, Bermuda, San Juan, Cheb, and Prague), 7h. (Harvard, Berkeley, and near Alicante), 9h. (near Andijan), 12h. (Copiapo), 13h. (Strasbourg), 17h. and 19h. (near Mizusawa), 20h. (Tucson), 21h. (Grand Coulee), 22h. (Branner, near Obi-garm, Samarkand, and Stalinabad).

Feb. 5d. 6h. 14m. 20s. Epicentre 36°·2N. 120°·6W.

Intensity VI at Lonoak (Priest Valley); V at Idria, less strongly at Big Sur, Coalinga, Huron, and Parkfield.

L. M. Murphy.

United States Earthquakes, 1947, Serial No. 730, Washington, 1950, p. 15. Epicentre as adopted.

$$A = -.4117, B = -.6962, C = +.5880; \quad \delta = -6; \quad h = 0;$$

$$D = -.861, E = +.509; \quad G = -.299, \Lambda = -.506, K = -.809.$$

	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	$\circ$	$\circ$	m. s.	s.	m. s.	s.	m. s.	m.
Fresno	N. 0.8	51	i 0 18	0	i 0 31	0	—	—
Lick	1.4	323	i 0 26	- 1	i 0 43	- 3	—	—
Santa Clara	1.6	317	i 0 28	- 2	i 0 51	0	—	—
Branner	1.8	314	e 0 32	0	i 1 0	+ 4	—	—
Santa Barbara	1.9	158	i 0 35	+ 1	i 1 6	S <sub>r</sub>	—	—
Berkeley	2.1	321	i 0 36	- 1	i 1 3	- 1	i 0 42	P <sub>r</sub>
Haiwee	2.1	92	e 0 39	+ 2	i 1 9	S <sub>r</sub>	—	—
Tinemaha	2.1	64	i 0 38 <sub>a</sub>	+ 1	i 1 7	+ 3	—	—
Mount Wilson	z. 2.9	134	e 0 48	0	—	—	—	—
Pasadena	2.9	136	e 0 48	0	i 1 25	+ 1	—	—
Riverside	z. 3.4	128	e 0 55	0	—	—	—	—
Mineral	E. 4.2	350	i 1 1	- 6	i 2 2	+ 5	i 1 18	P*
Palomar	z. 4.2	132	i 1 6	- 1	—	—	—	—
Boulder City	4.7	91	e 1 16	+ 2	—	—	i 1 29	P <sub>r</sub>
Shasta Dam	4.7	342	e 1 12	- 2	—	—	—	1 2.6

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Pierce Ferry	5.3	89	e 1 23	+ 1	(e 2 45)	S*	i 1 32	e 2.8
Salt Lake City	8.2	54	e 3 53	S	(e 3 53)	+15	—	e 5.8
Logan	8.8	48	e 2 16	+ 5	—	—	—	i 4.6
Tucson	9.0	113	e 2 14	+ 1	e 4 17	+19	—	i 4.6
Grand Coulee	11.8	5	e 2 56	+ 3	—	—	—	—
St. Louis	z. 24.2	75	e 3 14	?	—	—	—	—

Additional readings :—

Lick iE = 29s., iEN = 51s.

Branner iN = 1m.9s.

Berkeley iE = 1m.18s.

Mineral iE = 1m.10s.

Salt Lake City eS = 5m.17s.

Tucson iP = 2m.20s.

Long waves were also recorded at Bozeman and Butte.

Feb. 5d. 15h. 33m. 25s. Epicentre 42° 6N. 20° 7E.

Intensity VIII at Cobic (42° 36' N. 20° 45' E.) and Zabrde; VII at Srbica; and less strongly in many other districts.

B. J. Metovic.

Annuaire microseismique et macroseismic de l'Institut Seismologique de Beograd, 1949, Nouvelle Série No. 7, Belgrade, 1950, p.42. Epicentre as adopted.

A = +.6907, B = +.2612, C = +.6744;  $\delta$  = +11;  $h$  = -3;  
D = +.353, E = -.935; G = +.631, H = +.239, K = -.738.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Belgrade	2.2	355	i 0 39	+ 1	i 1 19	S <sub>r</sub>	i 0 45	—
Kalossa	4.1	343	e 1 16	P*	i 2 12	S <sub>r</sub>	—	—
Bucharest	4.3	64	e 1 32	P <sub>r</sub>	e 1 56	- 4	i 2 15	S*
Zagreb	4.7	314	e 1 18	+ 4	e 2 23	S*	—	—
Budapest	5.0	347	1 36	P <sub>r</sub>	—	—	—	2.9
Istanbul	6.4	101	—	—	e 3 6	S*	3 34	S <sub>r</sub>
Chur	9.0	302	i 2 10	- 3	—	—	—	—
Zürich	9.8	303	e 2 24	0	—	—	—	—
Stuttgart	10.1	311	e 2 24	- 4	e 4 31	+ 6	—	—
Ksara	14.8	121	e 4 21	+49	—	—	—	e 7.6

Additional readings :—

Belgrade i = 54s., 59s., and 1m.47s.

Kalossa iN = 2m.16s.

Bucharest iN = 2m.18s.

Zagreb e = 1m.48s., eNE = 2m.46s., e = 3m.6s.

Budapest ePE = 1m.44s.

Long waves also recorded at Warsaw, Prague, Strasbourg, and Copenhagen.

Feb. 5d. Readings also at 0h. (Calcutta and Tucson), 1h. (near Tchinkent), 3h. (near La Paz), 5h. (Santa Lucia, Branner, Fresno, Lick, Mount Wilson, Palomar, Tinemaha, Tucson, Shasta Dam, and near Belgrade), 13h. (near Andijan, Obi-garm, and Stalinabad), 17h. (Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Santa Barbara, Tinemaha, Tucson, Boulder City, Pierce Ferry, Shasta Dam, College, St. Louis, and near Mizusawa), 18h. (Ksara), 19h. (near Ottawa, near Andijan, Stalinabad, Tchinkent, and near Malaga), 21h. (Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, and Pierce Ferry).

Feb. 6d. 8h. Undetermined shock. Suggested deep focus.

Grand Coulee eP = 2m.48s.

Shasta Dam eP = 3m.5s.

Tinemaha iPZ = 3m.44s., iZ = 4m.16s. and 5m.15s.

Haiwee ePZ = 3m.50s., epPZ = 4m.22s.

Pasadena ePZ = 3m.58s., epPZ = 4m.31s.

Mount Wilson iPZ = 3m.59s., iZ = 4m.30s., eZ = 4m.53s.

Riverside ePZ = 4m.2s., epPZ = 4m.34s.

Overton iP = 4m.3s.

Boulder City iP = 4m.5s.

Palomar iP = 4m.8s., ipP = 4m.39s., iZ = 5m.2s.

Tucson iP = 4m.42s., epP = 5m.11s., ePP = 6m.50s.

St. Louis eP?Z = 6m.2s., iP?Z = 6m.8s.

Copenhagen P = 6m.31s., eS = 16m.30s.

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Feb. 6d. 14h. Undetermined shock. Suggested deep focus.

Auckland e = 56m.45s., i = 58m.41s. and 59m.4s.  
 Tuai e = 56m.58s., S = 58m.27s., L = 59m.27s.  
 Arapuni SKS? = 59m.12s.  
 Wellington e = 59m.33s., PPP = 59m.40s., i = 60m.38s., SKS = 61m.57s., S = 64m.30s.,  
 SS = 73m.5s., SSS = 78m.4s.  
 Riverview eP?Z = 59m.39s., eE = 60m.31s., eS?E = 64m.32s., eN = 65m.11s., eLEZ =  
 66m.18s.  
 Brisbane eEN = 64m.20s.  
 Pasadena iP = 66m.20s., ipPZ = 66m.36s., iPPZ = 69m.49s., eLZ = 90.7m.  
 Mount Wilson iPZ = 66m.21s. a, ipPZ = 66m.38s., eZ = 66m.52s., iPPZ = 69m.50s.  
 Palomar iP = 66m.21s. a, ipPZ = 66m.40s.  
 Riverside iPZ = 66m.22s., ipPZ = 66m.39s.  
 Haiwee iPEZ = 66m.27s., ipPZ = 66m.44s.  
 Shasta Dam iP = 66m.28s.  
 Tinemaha iP = 66m.29s. a, epPZ = 66m.44s.  
 La Jolla ePZ = 66m.33s.  
 Santa Barbara ePZ = 66m.34s.  
 Boulder City iP = 66m.37s., ePP = 70m.12s.  
 Tucson iP = 66m.39s., ipP = 66m.56s., e = 67m.21s  
 Overton iP = 66m.40s., ipP = 66m.58s.  
 Pierce Ferry iP = 66m.40s.  
 Grand Coulee eP = 67m.0s., ipP = 67m.19s.  
 Copenhagen eP = 73m.44s., L = 126m.0s.  
 Stuttgart eZ = 73m.46s. and 74m.25s.  
 Granada iPKP = 73m.57s., iPKP<sub>2</sub> = 75m.28s., iPP = 79m.2s., pPP = 79m.49s., SKKS =  
 86m.43s., SS = 100m.25s., SSS = 106m.22s., L = 138m.36s.  
 Malaga iPKPZ = 73m.58s., PKP<sub>2</sub>Z = 75m.13s., PPZ = 79m.2s., pPPZ = 79m.53s., SKS =  
 81m.2s.  
 Almeria PKP = 73m.59s., PKP<sub>2</sub> = 75m.1s., PKS = 77m.28s., PP = 78m.45s., PPP =  
 82m.31s., SKKS = 85m.26s., SS = 99m.5s., SSS = 105m.32s., L = 137m.0s.  
 Helwan iZ = 74m.6s. and 74m.32s.  
 Alicante PKP = 74m.18s., PP = 79m.0s., SS = 100m.16s., SSS = 105m.38s., eL = 133m.10s.  
 Basle e = 74m.30s.  
 Zürich e = 74m.30s.  
 Strasbourg e = 74m.36s.  
 Long waves were recorded also at Christchurch and Berkeley.

Feb. 6d. 17h. 20m. 39s. Epicentre 35°·7N. 118°·0W. (as on 1946, July 23d.).

Intensity VI at the station at Jawbone Aqueduct ; and V at Kernville, Miramonte, Lone Pine, etc. Epicentre 35°40'N. 118°04'W.

L. M. Murphy. United States Earthquakes, 1947, serial No. 730, Washington 1950, p. 15.

A = -·3821, B = -·7187, C = +·5810 ; δ = +9 ; h = 0 ;  
 D = -·883, E = +·469 ; G = -·273, H = -·513, K = -·814.

	△	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Haiwee	0·4	4	i 0 11k	- 2	i 0 18	- 3	—	—
Tinemaha	1·4	352	i 0 27	0	i 0 46	0	—	—
Mount Wilson	1·5	182	i 0 28k	0	i 0 47	- 2	—	—
Pasadena	1·6	185	i 0 29	- 1	i 0 52	+ 1	—	—
Fresno	N. 1·8	306	i 0 33	+ 1	i 0 57	+ 1	—	—
Riverside	1·8	163	i 0 32k	0	i 0 54	- 2	—	—
Palomar	2·5	158	i 0 43k	0	—	—	—	—
Boulder City	2·6	84	i 0 44	0	i 1 26	S <sub>g</sub>	i 0 50	P <sub>g</sub>
La Jolla	2·9	168	e 0 50	+ 2	—	—	—	—
Overton	3·0	74	i 0 51	+ 1	—	—	i 0 59	P <sub>g</sub>
Pierce Ferry	3·3	83	i 0 54	+ 1	i 1 43	S*	i 1 4	P <sub>g</sub>
Lick	3·4	300	e 0 55	0	i 1 36	- 1	i 1 2	P*
Santa Clara	3·6	298	e 1 6	P <sub>g</sub>	i 2 1	S <sub>g</sub>	—	—
Branner	3·8	298	i 1 1	0	i 1 57	S*	i 1 13	P <sub>g</sub>
Berkeley	4·1	303	e 1 4	- 1	i 1 56	+ 1	i 2 5	S*
Mineral	E. 5·4	330	i 1 33	P*	i 2 48	S*	i 1 53	P <sub>g</sub>
Shasta Dam	6·1	326	e 1 38	+ 4	—	—	—	13·1
Tucson	6·9	118	i 1 43	- 2	i 3 19	S*	i 2 19	P <sub>g</sub>
Salt Lake City	7·0	42	e 2 20	P <sub>g</sub>	e 4 9	?	—	e 4·7

Additional readings :—

Lick iN = 1m.47s., iE = 1m.50s.

Berkeley iN = 1m.52s., iEN = 2m.9s.

Long waves were also recorded at Logan.



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Feb. 6d. 18h. 14m. 58s. Epicentre 38°·3N. 140°·5E. Depth of focus 0·005.  
(as on 1944, December 6d.).

Intensity V at Onahama; IV at Hukushima and Mito; II-III at Sendai, Tukubasan, Kakioka, and Miyako. Macroseismic radius between 200 and 300km.  
Epicentre 38°·0N. 141°·0E. Depth of focus 40km.

The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year 1947, Tokyo, 1947, pp. 9-10, macroseismic chart p. 9.

A = -·6071, B = +·5004, C = +·6172;  $\delta = -9$ ;  $h = -1$ ;  
D = +·636, E = +·772; G = -·476, H = +·393, K = -·787.

	$\Delta$ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.
Sendai	0·3	96	0 20	+ 8	0 32	+12
Hukushima	0·6	183	0 32 <sub>a</sub>	+18	0 44	+19
Mizusawa	1·0	31	0 28	+ 9	0 45	+12
Akita	1·4	348	0 35	+11	0 59	+16
Onahama	1·4	167	0 24	0	0 42	- 1
Morioka	1·5	20	0 33 <sub>k</sub>	+ 7	0 56	+11
Utunomiya	1·8	196	0 28 <sub>k</sub>	- 2	0 49	- 3
Mito	1·9	181	0 33	+ 2	0 53	- 1
Kakioka	2·1	187	0 35	+ 1	0 58	- 1
Tukubasan	2·1	189	0 35	+ 1	0 57	- 2
Maebasi	2·2	211	0 38	+ 3	1 5	+ 3
Nagano	2·4	228	0 40 <sub>k</sub>	+ 2	1 12	+ 5
Tokyo	2·7	193	0 44	+ 2	1 13	- 1
Yokohama	2·9	193	0 47	+ 2	1 18	- 1
Wazima	3·0	252	0 49	+ 2	1 24	+ 2
Hunatu	3·1	206	0 50	+ 2	1 23	- 1
Toyama	3·1	238	1 4	+16	—	—
Mera	3·4	189	0 44	- 8	1 28	- 4
Misima	3·4	202	0 53	+ 1	1 32	0
Osima	3·6	195	0 30	-25	1 7	-30
Shizuoka	3·8	208	0 58	0	1 38	- 4
Omaesaki	4·1	206	1 1	- 1	2 4	+15
Gihu	4·2	227	1 5	+ 2	—	—
Hikone	4·6	230	1 12	+ 3	—	—
Sapporo	4·8	8	0 43	-29	—	—
Nemuro	6·3	36	0 39	-53	—	—
Grand Coulee	68·9	45	i 10 59	- 1	—	—
Shasta Dam	70·9	53	i 11 11	- 1	—	—
Tinemaha	z. 75·6	55	i 11 39	- 1	—	—
Mount Wilson	z. 77·5	56	i 11 50	0	—	—
Pasadena	z. 77·5	56	e 11 50	0	—	—
Riverside	z. 78·1	56	e 11 52	- 2	—	—
Palomar	z. 78·8	56	i 11 57	0	—	—
Tucson	83·4	54	i 12 22	0	—	—

Feb. 6d. Readings also at 2h. (Ksara), 5h. (La Plata), 8h. (Shasta Dam and Chur), 9h. (Zürich), 10h. (Mizusawa), 12h. (Almata, Samarkand, Andijan (2), Tchinkent (2), near Obi-garm, Frunse, and Stalinabad), 20h. (Pasadena, Mount Wilson, Palomar, Tinemaha, and Tucson), 21h. (Boulder City and near Pierce Ferry).

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Feb. 7d. 2h. 9m. 27s. Epicentre 12°·2N. 59°·8W. Depth of focus 0·020.  
(as on 1946, July 31d.).

A = +·4918, B = -·8450, C = +·2100;  $\delta = -1$ ;  $h = +6$ ;  
D = -·864, E = -·503; G = +·106, H = -·181, K = -·978.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Fort de France	2·9	33	i 0 45	- 2	i 1 20	- 3	1 8 sP	—
San Juan	8·7	316	e 1 55	- 9	—	—	—	e 3·3
Bogota	16·0	243	i 3 24	-13	i 7 30	SSS	i 8 2 P <sub>c</sub> P	—
Balboa Heights	19·7	263	e 4 8	-11	—	—	—	—
Huancayo	28·6	213	i 5 42	- 1	e 10 37	+19	i 6 8 pP	e 13·0
La Paz	N. 29·7	196	5 53	0	10 33	- 3	—	14·1
Tucson	50·8	302	e 8 45	- 1	—	—	i 9 14 pP	—
Boulder City	54·7	306	e 9 15	0	—	—	—	—
Palomar	Z. 56·0	302	e 9 23	- 1	—	—	e 9 52 pP	—
Mount Wilson	Z. 57·1	303	e 9 38	+ 6	—	—	—	—
Tinemaha	Z. 57·7	306	e 9 37	+ 1	—	—	—	—
Strasbourg	66·1	42	e 11 5	pP	—	—	—	—
Stuttgart	Z. 67·1	42	e 10 55	+17	—	—	—	—

Additional readings:—

Fort de France P<sub>g</sub> = 0m.48s., iP<sub>g</sub> = 0m.51s., iP<sub>g</sub>S = 1m.11s., iS<sub>g</sub> = 1m.24s., S<sub>g</sub> = 1m.31s.

Bogota ePPNZ = 3m.37s., eNZ = 5m.31s.

Huancayo ePP = 6m.54s., eP<sub>c</sub>P = 7m.46s.

Feb. 7d. 8h. 40m. 31s. Epicentre 10°·0S., 161°·1E. (as on 1946, Aug. 6d.).

A = -·9319, B = +·3191, C = -·1725;  $\delta = + 2$ ;  $h = +7$ ;  
D = +·324, E = +·946; G = +163, H = -·056, K = -·985.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Brisbane	N. 19·0	202	i 4 28	+ 2	i 8 6	+11	i 4 51 PP	i 9·9
Riverview	25·4	199	i 5 35k	+ 4	i 9 59	+ 3	i 10 13 sS	e 12·1
Apia	26·8	99	e 5 39	- 5	—	—	e 9 12 P <sub>c</sub> P	—
Auckland	29·5	159	5 55?	-13	11 38	+36	6 43 PP	13·6
Arapuni	30·9	157	—	—	11 59	+35	13 41 Q	15·5
Tuai	32·1	156	6 29	- 2	11 36	- 7	—	—
Wellington	33·4	162	6 43	+ 1	11 43	-20	7 59 PP	14·2
Christchurch	34·9	165	6 57	+ 2	12 18	- 9	7 52 PP	16·5
Omaesaki	49·4	335	8 57	+ 4	—	—	—	—
Misima	49·5	337	e 9 1	+ 7	—	—	—	—
Yokohama	49·5	338	8 58	+ 4	e 16 12	+10	—	—
Tokyo	49·7	338	e 8 56	0	—	—	—	—
Kumagaya	50·2	337	18 6	-54	—	—	—	—
Miyazaki	50·4	327	e 9 10	+ 9	—	—	—	—
Nagoya	50·4	335	e 8 56	- 5	—	—	—	—
Utunomiya	50·4	338	e 9 4	+ 3	—	—	—	—
Kagosima	50·6	325	e 9 8	+ 6	—	—	—	—
Koti	50·6	330	e 9 3	+ 1	16 17	0	—	—
Osaka	50·6	332	9 13	+11	16 52	PPS	—	—
Sumoto	50·6	332	i 9 7	+ 5	—	—	—	—
Gihu	50·7	335	i 9 6	+ 3	—	—	—	—
Hikone	50·8	334	9 8	+ 4	—	—	—	—
Kobe	50·8	333	e 9 5	+ 1	—	—	—	—
Honolulu	50·9	51	—	—	e 16 1	-20	—	—
Kumamoto	51·5	326	e 9 14	+ 5	—	—	—	—
Sendai	51·6	341	9 13	+ 3	16 33	+ 2	—	—
Toyama	51·6	336	9 15	+ 5	—	—	—	—
Unzendake	51·7	326	7 30	?	—	—	—	—
Hukuoka	52·3	327	9 17	+ 2	—	—	—	—
Mizusawa	52·3	341	9 21	+ 6	e 16 46	+ 6	e 16 50 PS	e 23·8
Wazima	52·3	336	e 8 25	-50	—	—	—	—
Miyako	52·3	342	9 17	0	16 45	+ 2	—	—
Morioka	52·8	340	e 9 22	+ 3	16 25	-22	—	—
Mori	55·2	342	e 9 14	-23	i 18 26	+66	—	—
Sapporo	55·8	343	e 9 51	+10	—	—	—	—

Continued on next page.

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	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Vladivostok	59.2	336	i 10 5	0	i 18 17	+ 5	—	—
Calcutta	78.2	296	e 12 11	+ 8	e 22 1	+ 4	e 14 37	PP
Irkutsk	78.7	329	i 12 7	+ 1	22 6	+ 3	—	—
Colombo	82.6	279	12 30	+ 4	28 8	SS	—	—
College	83.8	19	—	—	e 22 53	- 2	e 28 16	SS
Sitka	84.5	29	e 12 11	-25	i 23 3	+ 1	i 23 56	PS
Berkeley	85.7	50	e 12 41	- 1	i 23 18	+ 4	i 12 48	pP
Branner	85.7	50	i 12 44	+ 2	e 23 14	0	—	—
Santa Clara	85.8	50	e 12 40	- 2	e 23 17	+ 2	—	—
Hyderabad	86.0	287	i 12 42	- 1	23 13	- 4	23 43	PS
Lick	86.1	50	e 12 44	0	e 23 9	[+ 1]	—	—
Shasta Dam	86.4	47	e 12 44	- 1	—	—	i 12 51	P <sub>c</sub> P
Santa Barbara	86.8	54	e 12 47	0	—	—	—	—
Mineral	86.9	48	e 12 25	-23	—	—	—	—
Fresno	87.3	52	e 12 51	+ 1	e 23 30	+ 1	—	—
Mount Wilson	88.0	54	i 12 53 <sub>a</sub>	0	e 23 22	[+ 1]	i 13 9	P <sub>c</sub> P
Pasadena	88.0	54	i 12 52 <sub>a</sub>	- 1	e 23 37	+ 1	e 23 18	SKS
La Jolla	88.4	56	e 12 53	- 2	e 23 36	- 4	—	—
Haiwee	88.6	52	i 12 55	- 1	e 23 40	- 2	i 13 0	P <sub>c</sub> P
Riverside	88.6	54	i 12 55 <sub>a</sub>	- 1	e 23 27	[+ 3]	i 13 9	P <sub>c</sub> P
Tinemaha	88.6	51	i 12 56	0	e 23 46	+ 4	i 13 1	PS
Palomar	88.9	56	i 12 56 <sub>a</sub>	- 2	e 23 32	[+ 6]	e 23 19	SKS
New Delhi	89.4	299	—	—	e 23 32	[+ 3]	—	e 52.0
Grand Coulee	90.7	40	e 13 4	- 2	—	—	—	—
Boulder City	91.1	53	i 13 7	- 1	e 23 40	[+ 1]	—	—
Overton	91.5	53	i 13 9	- 1	—	—	—	—
Bombay	91.6	289	e 17 1	PP	—	—	—	—
Pierce Ferry	91.7	53	i 13 9	- 1	e 23 42	[- 1]	—	—
Almata	92.6	313	13 19	+ 4	—	—	—	—
Tucson	93.6	57	i 13 19	0	e 24 33	+ 7	e 17 1	PP
Salt Lake City	94.2	50	e 14 23	+61	e 25 0	[+63]	e 30 52	SS
Logan	94.4	48	i 13 24	+ 1	e 24 4	[+ 6]	e 26 6	PS
Andijan	95.5	309	e 13 44	+16	—	—	—	—
Bozeman	95.6	45	e 26 17	PS	e 24 8	[+ 4]	e 31 20	SS
Tashkent	97.9	311	e 13 38	- 1	24 12	[- 4]	17 42	PP
Stalinabad	98.0	308	i 13 42?	+ 3	—	—	17 52	PP
Samarkand	99.5	308	17 39	PP	—	—	—	—
Rapid City	101.0	46	i 13 56	+ 3	e 24 36	[+ 4]	—	e 47.1
Sverdlovsk	104.0	327	18 39	PP	25 5	[+19]	28 25	PPS
Florissant	110.6	52	—	—	e 28 47	PS	—	e 51.5
St. Louis	110.7	52	e 18 30	[- 5]	i 26 55	S	i 27 18	sS
Santa Lucia	114.5	134	30 28	PPS	—	—	—	—
Grozny	115.2	313	20 11	PP	—	—	—	—
Erevan	116.3	310	e 20 2	PP	—	—	—	—
Leninakan	117.0	311	e 20 6?	PP	—	—	—	—
Sotchi	119.4	314	e 20 14	PP	—	—	—	—
Scoresby Sund	119.5	2	20 35	PP	37 3	SSP	30 9	PS
Huancayo	119.8	110	e 18 54	[+ 2]	e 26 1	[+12]	e 20 13	PP
Ottawa	120.5	42	e 18 51	[- 3]	—	—	—	53.5
Fordham	122.8	47	e 18 59	[+ 1]	—	—	—	e 55.5
Philadelphia	122.9	49	e 18 14	[-44]	—	—	—	e 52.8
Upsala	123.3	339	e 34 14	S <sub>c</sub> SPKP	e 41 29	SSS	—	e 55.5
Weston	124.1	45	i 19 2	[+ 1]	—	—	—	e 63.7
Ksara	124.6	304	e 19 49	[+47]	—	—	—	—
La Paz	124.6	118	e 19 4	[+ 2]	26 4	[ 0]	27 53	SKKS
Warsaw	126.9	330	e 19 8 <sub>a</sub>	[+ 2]	31 8	PS	i 21 8	PP
Istanbul	127.7	315	e 21 11	PP	e 34 51	?	—	—
Copenhagen	128.2	338	19 11	[+ 2]	28 14	{+ 6}	21 14	PP
Bucharest	128.3	320	19 29?	[+20]	27 29?	[+74]	—	—
Helwan	129.3	301	19 14	[+ 3]	22 35	SKP	21 26	PP
Potsdam	130.4	335	i 22 41?	SKP	—	—	—	e 69.5
Budapest	130.8	326	19 19	[+ 5]	i 22 42	SKP	—	e 66.5
Aberdeen	131.2	348	i 22 40	SKP	—	—	e 58 29	Q
Prague	131.5	332	e 21 5	?	e 26 29	[+ 5]	e 21 53	PP
Belgrade	131.5	323	e 19 5	[-10]	e 26 25	[+ 1]	e 21 39	PP

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Bermuda	132.3	55	e 23 2	PKS	e 32 54	PPS	e 39 15	SSP e 62.2
Cheb	132.4	333	e 21 29?	PP	e 31 29?	PS	—	e 54.5
Zagreb	132.5	326	e 19 18	[+ 1]	e 22 52	PKS	—	—
Edinburgh	132.6	348	—	—	e 31 29	PS	—	—
San Juan	133.6	73	e 19 25	[+ 6]	e 39 31	SS	e 22 49	PKS e 55.1
De Bilt	133.7	340	i 21 52	PP	i 22 55	PKS	i 24 45	PPP e 58.5
Stuttgart	z. 134.8	334	e 19 14	[- 7]	—	—	e 21 57	PP —
Triest	134.8	328	e 19 32	[+ 11]	i 22 53	SKP	e 21 56	PP —
Uccle	135.0	340	e 19 44	[+ 23]	e 23 16	SKP	e 22 14	PP e 59.5
Strasbourg	135.5	335	e 19 25	[+ 3]	e 22 56	SKP	e 21 58	PP e 63.5
Paris	137.4	339	i 19 27	[+ 1]	i 22 49	PKS	e 22 3	PP e 64.5
Rome	137.9	326	e 19 25	[- 2]	e 26 8	[- 28]	e 22 14	PP —
Clermont-Ferrand	139.7	336	e 19 31	[+ 1]	—	—	e 22 28	PP 64.5
Tortosa	N. 144.8	333	i 19 40	[+ 1]	—	—	23 18	PP 72.5
Alicante	147.3	333	i 19 49	[+ 6]	26 54	[+ 4]	56 52	Q 62.7
Almeria	149.4	334	i 19 48	[+ 2]	30 6	[- 9]	23 24	PP 74.5
Granada	149.6	340	i 19 53k	[+ 7]	—	—	23 30	PP 74.0
Lisbon	150.1	345	20 5	[+ 17]	—	—	—	75.4
Malaga	Z. 150.3	335	i 19 48	[ 0]	—	—	i 23 28	PP i 72.2

Additional readings and note :—

Riverview iEN = 5m.52s., iN = 6m.22s., iE = 6m.32s., iN = 10m.23s., iE = 10m.26s., iZ = 10m.37s., iE = 10m.51s., iN = 10m.54s., iZ = 11m.28s.

Wellington P<sub>c</sub>P = 9m.25s., i = 9m.49s.

Christchurch QEN = 14m.19s., SSZ = 14m.39s.

College eSSS = 31m.37s.

Sitka eSS = 27m.58s.

Berkeley iPPE = 16m.23s., iSKSE = 23m.11s., iE = 28m.58s., iN = 29m.8s., iQN = 35m.23s.

Hyderabad ePN = 13m.57s.

Mount Wilson iZ = 13m.20s.

Pasadena iZ = 13m.19s.

Haiwee iZ = 13m.11s.

Riverside iZ = 13m.17s.

Tinemaha iZ = 13m.11s., eSE = 23m.18s.

Palomar ePKP, PKPZ = 43m.36s.

Tucson eSS = 30m.38s., eSS = 34m.21s.

Salt Lake City ePPS = 26m.58s.

Logan i = 13m.40s., iS = 24m.42s.

Bozeman eSSS = 34m.46s.

Tashkent S<sub>c</sub>S = 25m.7s.

Sverdlovsk SS = 33m.41s., SSS = 38m.41s.

St. Louis eZ = 17m.33s., ePPZ = 19m.6s., ipPP?Z = 19m.20s., iE = 28m.57s., eSSN = 34m.35s., iSSS?N = 38m.54s.

Scoresby Sund 27m.43s.

Huancayo ePS = 30m.6s., eSS = 37m.0s.

Weston e = 51m.29s., 59m.9s., and 61m.39s.

La Paz PPN = 21m.5s., SKPN = 22m.17s., PS = 30m.57s., PPSN = 32m.1s.

Warsaw ePPE = 21m.12s., eZ = 22m.8s., eN = 22m.15s., ePPPZ = 23m.54s., eN = 23m.57s., PSE = 31m.12s., PPSZ = 33m.21s., eZ = 37m.11s., eE = 38m.20s., eN = 41m.25s.

Copenhagen 22m.39s. and 31m.41s., SS = 38m.35s.

Budapest ePN = 19m.29s.

Aberdeen eE = 32m.32s., eN = 32m.42s.

Prague ePP = 24m.59s., eSS = 39m.29s.

Belgrade ePKS = 24m.3s., e = 27m.41s., and 35m.43s.

Cheb e = 38m.29s.? and 48m. 29s.?

De Bilt eSS = 39m.29s.?

Stuttgart iZ = 19m.26s. a

Triest eSSS = 44m.52s.

Uccle ePSEN = 32m.41s., eSSE = 40m.23s., eSSSE = 45m.6s., eN = 46m.14s.

Strasbourg ePKP = 19m.29s., e = 20m.12s. and 22m.59s., ePPP = 24m.36s., e = 29m.49s., 29m.57s., and 32m.32s., ePS = 32m.39s., ePPS = 33m.53s., eSS = 40m.29s., e = 46m.51s.

Paris i = 19m.52s. and 22m.13s., ePPP = 25m.19s., ePPS? = 34m.13s., e = 43m.17s.

Rome ePP?Z = 20m.48s., eSKPZ = 21m.19s., eSS? = 35m.14s., eSSS? = 40m.22s.

Clermont-Ferrand e = 21m.45s.

Tortosa PKP, N = 19m.49s., SKP?N = 23m.42s., PPPN = 25m.45s., eSS?N = 42m.41s.

Alicante i = 20m.8s., PP = 22m.19s., SKP = 23m.10s., SKKS = 29m.6s., PPS = 34m.34s., SS = 40m.2s.

Almeria SS = 42m.24s.

Long waves were also recorded at Tananarive, Chicago, Columbia, Harvard, Helsinki, Bergen, Kew, Besançon, and Barcelona.

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Feb. 7d. Readings also at 5h. (near Fresno (2) ), 10h. (Weston and Harvard), 11h. (near Almata), 12h. (Jena, near Stuttgart, Boulder City, Pierce Ferry, and near Fresno and Lick), 13h. (Tashkent, Almata, near Tchimkent, Samarkand, Obi-garm, Stalinabad, and Andijan), 14h. (Riverview and near Mineral), 16h. (Samarkand, near Andijan, Stalinabad, and Tchimkent), 19h. (near Mineral), 20h. (near Ottawa), 21h. (Almeria, Malaga, Alicante, and Granada), 23h. (near Lick).

Feb. 8d. 10h. 38m. 8s. (I) }  
 10h. 54m. 48s. (II) } Epicentre 44°·0N. 130°·8W. (as on 1940, Nov. 17d.).  
 11h. 35m. 25s. (III) }  
 11h. 50m. 55s. (IV) }  
 18h. 6m. 16s. (V) }

A = -·4716, B = -·5463, C = +·6922;  $\delta = -1$ ;  $h = -3$ ;  
 D = -·757, E = +·653; G = -·452, H = -·524, K = -·722.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
II	Seattle	6·9	55	—	—	e 4 7	?	—	e 5·3
I	Shasta Dam	7·0	115	c 1 48	+ 2	—	—	—	—
II		7·0	115	c 1 46	0	—	—	—	—
I	Berkeley	8·9	131	i 2 2	-10	i 4 10	+15	c 2 23	P* i 4·6
II		8·9	131	i 2 17	+ 5	—	—	—	—
III		8·9	131	—	—	i 4 11	+16	i 4 24	S* —
I	Grand Coulee	9·1	60	i 2 7	- 7	—	—	—	—
II		9·1	60	c 2 5	- 9	c 3 58	- 2	—	—
III		9·1	60	c 2 5	- 9	—	—	—	—
IV		9·1	60	e 2 6	- 8	—	—	—	—
V		9·1	60	e 2 11	- 3	—	—	—	—
V	Fresno	11·1	127	e 1 47	-56	—	—	—	e 7·1
I	Tinemaha	11·8	122	i 2 57	+ 4	—	—	—	—
II		11·8	122	i 2 53	0	—	—	—	—
III		11·8	122	e 2 53	0	—	—	—	—
IV		11·8	122	e 2 54	+ 1	—	—	—	—
V		11·8	122	i 2 55	+ 2	—	—	—	—
I	Haiwee	12·6	124	e 3 7	+ 4	—	—	—	—
II		12·6	124	c 3 6	+ 3	—	—	—	—
III		12·6	124	e 3 7	+ 4	—	—	—	—
IV		12·6	124	e 3 22	+19	—	—	—	—
V		12·6	124	e 3 6	+ 3	—	—	—	—
I	Mount Wilson	13·9	131	c 3 25	+ 4	—	—	—	—
II		13·9	131	c 3 26	+ 5	—	—	—	—
III		13·9	131	c 3 21	0	—	—	i 3 31	PP —
IV		13·9	131	c 3 23	+ 2	—	—	i 3 31	PP —
V		13·9	131	c 3 21	0	—	—	i 3 31	PP —
I	Pasadena	13·9	131	e 3 23	+ 2	—	—	—	e 7·0
II		13·9	131	c 3 24	+ 3	—	—	e 3 29	PP e 6·6
III		13·9	131	c 3 28	+ 7	—	—	—	—
IV		13·9	131	c 3 29	+ 8	—	—	—	c 6·7
V		13·9	131	i 3 31	+10	—	—	i 3 36	PPP —
I	Sitka	13·9	350	e 3 17	- 4	e 6 14	+17	—	e 6·5
II		13·9	350	i 3 16	- 5	e 6 22	+25	—	e 6·6
V		13·9	350	(e 3 24)	+ 3	e 3 24	P	—	e 6·4
I	Logan	14·1	93	e 3 20	- 3	e 6 4	+ 2	—	i 8·0
II		14·1	93	i 3 17	- 6	—	—	—	e 7·4
V		14·1	93	c 3 21	- 2	e 7 53	L	—	e 8·8
I	Riverside	14·4	129	e 3 30	+ 3	—	—	—	—
II		14·4	129	e 3 27	0	—	—	—	—
III		14·4	129	e 3 27	0	—	—	—	—
IV		14·4	129	e 3 30	+ 3	—	—	—	—
V		14·4	129	e 3 29	+ 2	—	—	i 3 38	PP —
I	Salt Lake City	14·4	99	c 4 25	+58	e 7 31	+82	—	e 8·2
II		14·4	99	e 4 24	+57	e 7 59	?	—	—
III		14·4	99	e 4 33	+66	e 8 17	+68	—	e 9·0
IV		14·4	99	e 4 24	+57	e 7 24	+75	—	e 8·7
V		14·4	99	—	—	e 7 15	+66	—	e 8·2

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
I Overton	14.5	115	i 3 30	+ 2	—	—	—	—
II	14.5	115	i 3 28	0	—	—	—	—
III	14.5	115	i 3 27	- 1	—	—	—	—
IV	14.5	115	i 3 28	0	—	—	—	—
V	14.5	115	i 3 30	+ 2	—	—	—	—
I Boulder City	14.6	118	e 3 33	+ 3	c 9 17	L	—	(c 9.3)
II	14.6	118	e 3 31	+ 1	—	—	—	c 9.3
III	14.6	118	e 3 29	- 1	—	—	—	—
IV	14.6	118	e 3 31	+ 1	—	—	—	—
V	14.6	118	e 3 32	+ 2	—	—	—	—
I Pierce Ferry	15.1	116	i 3 38	+ 2	—	—	—	—
II	15.1	116	i 3 36	0	—	—	—	c 8.8
III	15.1	116	i 3 34	- 2	—	—	—	—
IV	15.1	116	e 3 36	0	—	—	—	—
V	15.1	116	i 3 37	+ 1	—	—	—	—
I Palomar	15.2	130	i 3 40	+ 2	—	—	—	—
II	15.2	130	i 3 37	- 1	—	—	—	—
III	15.2	130	i 3 36	- 2	—	—	—	—
IV	15.2	130	i 3 37	- 1	—	—	—	—
V	15.2	130	i 3 38	0	—	—	—	—
II La Jolla	z.	15.3	e 3 50	+11	—	—	—	—
I Tucson	19.5	120	e 4 35	+ 4	c 8 20	+14	i 5 15	PP c 9.8
II	19.5	120	i 4 32	+ 1	e 8 7	+ 1	i 5 20	PP e 9.8
III	19.5	120	i 4 31	0	c 8 16	+10	—	e 10.2
IV	19.5	120	e 4 31	0	e 8 10	+ 4	—	e 10.6
V	19.5	120	i 4 32	+ 1	e 8 23	+17	—	e 10.4
I Rapid City	19.8	79	i 4 34	- 1	e 8 14	+ 1	—	e 11.5
II	19.8	79	i 4 31	- 4	e 8 37	+24	—	c 10.9
III	19.8	79	i 4 33	- 2	e 8 14	+ 1	—	e 11.6
IV	19.8	79	i 4 32	- 3	—	—	—	e 11.7
V	19.8	79	i 4 33	- 2	—	—	—	e 11.5
II St. Louis	30.7	86	e 6 14	- 5	—	—	—	e 13.2
II Weston	42.6	70	e 8 14	+15	—	—	—	—
III	42.6	70	e 11 54	?	e 14 23	0	—	—
IV	42.6	70	e 9 9	PP	—	—	—	c 24.8

Additional readings :—

Grand Coulee III iP = 2m.8s. ; IV iP = 2m.9s.

Mount Wilson V iZ = 3m.36s.

Pasadena II eZ = 5m.22s.

Boulder City I i = 3m.42s. ; II i = 3m.38s. ; III i = 3m.37s. ; IV e = 3m.37s.

Tucson I iP = 4m.41s. ; III i = 4m.51s. ; V i = 4m.48s.

St. Louis II iZ = 7m.21s.

Weston III e = 13m.8s. and 15m.37s.

Long waves for the above shocks were also recorded at American stations, Honolulu, and Scoresby Sund.

Feb. 8d. Readings also at 2h. (Tucson), 6h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, near Mineral, San Juan, Bogota, La Plata, La Paz, and near Huancayo), 7h. (Tucson), 10h. (Stuttgart, near Besançon, Basle, Neuchatel, and Zürich), 11h. (Boulder City, Overton, and Tucson), 19h. (near Mizusawa), 20h. (Christchurch, Wellington, Auckland, Arapuni, and Riverview), 21h. (near Andijan).

Feb. 9d. 4h. 29m. 58s. Epicentre 15° 2S. 74° 9W.

A = +.2515, B = -.9321, C = -.2606 ;  $\delta$  = -2 ; h = +6 ;  
D = -.965, E = -.261 ; G = -.069, H = +.256, K = -.965.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Huancayo	3.2	352	i 1 0	P*	i 1 29	- 3	—	i 4.3
La Paz	E. 6.6	99	i 1 40 <sub>a</sub>	- 1	i 3 18	S*	—	4.1
Santa Lucia	E. 18.5	169	6 37	?	7 22	-22	—	—
Bogota	19.7	2	e 4 45	+11	e 8 44	SS	4 52	PP e 11.4
La Plata	24.8	145	5 26	+ 1	9 50	+ 4	6 8	PP 12.4

Continued on next page.

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	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
San Juan	34.5	15	e 6 9	-43	e 12 10	-10	e 8 17	PP e 14.9
Bermuda	48.3	12	—	—	e 15 54	+ 9	e 18 52	PP e 19.8
St. Louis	55.5	345	e 9 39	0	i 17 23	- 1	—	—
Florissant	N. 55.6	345	—	—	i 17 28	+ 3	—	—
Tucson	58.4	324	e 10 0	0	e 18 8	+ 6	e 11 21	PcP e 24.6
Ottawa	60.3	359	e 10 14	+ 1	e 18 38	+12	—	— 33.0
Seven Falls	62.1	4	—	—	e 18 56	+ 7	—	— 28.0
Palomar	z. 62.7	321	e 10 29	0	—	—	—	—
Boulder City	63.4	324	i 10 34	0	—	—	—	—
Riverside	z. 63.5	321	e 10 34	0	—	—	—	—
Overton	63.6	325	i 10 35	0	—	—	—	—
Mount Wilson	z. 64.0	321	e 10 37	- 1	—	—	—	—
Pasadena	z. 64.1	321	e 10 39	+ 1	—	—	—	e 34.4
Haiwee	z. 65.3	323	e 10 51	+ 5	—	—	—	—
Salt Lake City	65.4	330	—	—	e 20 31	PPS	—	e 31.3
Tinemaha	z. 66.1	323	e 10 51	0	—	—	—	—
Scoresby Sund	92.9	15	—	—	24 32	+12	—	— 48.0
Uccle	95.0	39	—	—	e 26 6	PS	—	e 47.0
Florence	97.6	47	—	—	i 26 54	PPS	—	—
Rome	E. 98.1	49	—	—	e 24 21	[+ 3]	e 26 45	PS —
Cheb	99.8	40	e 14 45	+58	e 24 36	[+10]	—	— e 54.0
Triest	99.8	46	—	—	e 26 59	PS	—	—
Helwan	E. 111.3	64	—	—	e 30 11	PPS	—	—

Additional readings:—

Huancayo iP = 1m.3s.

La Paz iPZ = 1m.47s.

Santa Lucia E = 8m.23s.

La Plata SE = 9m.40s.

St. Louis iZ = 9m.45s., iE = 19m.26s., E = 22m.32s.

Florissant eE = 9m.26s.

Tucson iP = 10m.8s.

Pasadena eZ = 10m.52s.

Long waves were also recorded at Montezuma, Fort de France, Chicago, Weston, Berkeley, Riverview, and other European stations.

Feb. 9d. 18h. 51m. 12s. Epicentre 28°·5N. 129°·0E. (as on 1938, Aug. 18d.).

$A = -0.5539$ ,  $B = +0.6840$ ,  $C = +0.4747$ ;  $\delta = 0$ ;  $h = +2$ ;  
 $D = +0.777$ ,  $E = +0.629$ ;  $G = -0.299$ ,  $H = +0.369$ ,  $K = -0.880$ .

	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Mizusawa	E. 14.6	40	3 44	+14	8 22	L	—	(8.4)
Vladivostok	14.8	7	i 3 35	+ 3	i 6 32	+14	—	—
Irkutsk	30.0	330	e 6 13	+ 1	11 9	- 1	—	—
Calcutta	N. 37.0	271	—	—	e 13 22	+23	—	e 22.2
New Delhi	N. 45.2	283	e 10 47	PP	e 14 52	- 9	—	—
Tchimkent	49.4	302	i 8 53	0	i 15 58	- 2	—	—
Obi-garm	49.7	298	8 55	- 1	16 4	0	—	—
Tashkent	49.7	302	8 52?	- 4	e 16 5	+ 1	—	—
Stalinabad	50.4	298	9 2	+ 1	16 11	- 3	—	—
Bombay	51.9	274	—	—	e 16 48	+13	—	e 29.2
Sverdlovsk	54.9	322	i 9 35	0	17 14	- 2	—	—
Baku	64.3	305	e 19 23	S	(e 19 23)	+ 6	—	—
Riverview	65.4	159	i 10 54 <sub>a</sub>	+ 7	—	—	—	e 32.0
Leninakan	68.6	305	e 11 26	PcP	—	—	—	—
Upsala	N. 75.6	331	—	—	e 22 25	+56	e 29 13	SSS e 39.8
Grand Coulee	82.6	38	e 12 29	+ 3	—	—	—	—
Cheb	83.7	325	—	—	e 28 48?	SS	—	e 43.8
Shasta Dam	84.6	46	e 12 40	+ 4	—	—	—	—
Rome	88.7	318	e 10 23	?	—	—	—	e 40.8
Riverside	z. 91.7	50	e 13 14	+ 4	—	—	—	—
Boulder City	92.1	47	i 13 18	+ 6	—	—	—	—
Pierce Ferry	92.6	46	e 13 25	+10	—	—	—	—
Tucson	97.0	47	e 13 39	+ 4	—	—	e 17 34	PP —

For Notes see next page.

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NOTES TO FEBRUARY 9d. 18h. 51m. 12s.

Additional readings:—

Mizusawa S?N = 8m.27s.

Riverview eN = 27m.32s., eE = 27m.51s.

Upsala eN = 33m.48s.

Tucson e = 14m.8s.

Long waves were also recorded at other European stations.

Feb. 9d. Readings also at 1h. (Mount Wilson, Palomar, Riverside, Tinemaha, and Tucson), 4h. (near Grozny), 5h. (Mount Wilson, Palomar, Riverside, Tinemaha, Tucson, Boulder City, and Pierce Ferry), 7h. (La Paz and near Tananarive), 9h. (Huancayo, Fort de France, Mount Wilson, Palomar, Riverside, Tinemaha, Tucson, Overton, and Pierce Ferry), 11h. (Haiwee, Pasadena, Palomar, Tinemaha, Tucson, Overton, and Pierce Ferry), 12h. (Helwan, Bucharest, Rome, Stuttgart, Paris, Copenhagen, La Paz (2), Montezuma, Mount Wilson, Pasadena, Palomar, Riverside (2), Tinemaha (2), Tucson (2), Overton, Pierce Ferry, and near Huancayo (2). Readings from three shocks.), 13h. (Overton and Pierce Ferry), 14h. (Santa Lucia), 15h. (La Paz (2), Riverside, Tinemaha, and Tucson), 16h. (near Branner and Lick), 19h. (Alicante, Almeria, and Malaga).

Feb. 10d. 4h. 2m. 0s. Epicentre 31°·5N. 85°·0E.

A = +·0745, B = +·8509, C = +·5199;  $\delta = -12$ ;  $h = +2$ ;

D = +·996, E = -·087; G = +·045, H = +·518, K = -·854.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Dehra Dun	N.	6·1	260	e 2 31	+57	i 3 32	S <sub>r</sub>	i 4 18	—
New Delhi	N.	7·4	249	i 1 58	+ 6	i 3 21	+ 3	3 47	S*
Calcutta	N.	9·4	161	i 1 34 <sub>k</sub>	-44	i 4 10	+ 3	—	—
Almata		13·4	334	3 13	- 1	6 0	+15	—	—
Andijan		13·8	315	3 16	- 3	5 54	0	—	—
Frunse		14·1	327	(i 3 23)	0	(e 7 35)	L	—	— (e 7·6)
Obi-garm		14·4	304	3 26	- 1	6 2	- 7	—	—
Stalinabad		15·1	302	i 3 34	- 2	i 6 16	- 9	—	—
Hyderabad		15·2	205	3 38	0	6 23	- 5	6 32	SS
Tashkent		16·0	312	i 3 40	- 8	e 6 41	- 5	—	—
Bombay	N.	16·7	224	e 4 1	+ 4	i 7 0	- 3	—	— 8·2
Samarkand		16·7	304	i 3 54	- 3	i 6 56	- 7	—	—
Kodaikanal	E.	22·3	200	i 5 7	+ 6	i 9 19	+17	—	— 11·6
Colombo	E.	24·9	192	5 42	PP	10 6	+19	—	— 13·9
Baku		29·6	297	i 6 12	+ 3	e 11 0	- 4	—	—
Erevan		33·7	296	e 6 50	+ 5	—	—	—	—
Leninakan		34·2	297	i 6 51	+ 2	—	—	—	—
Sotchi		37·5	302	e 7 20	+ 3	e 13 10	+ 3	—	—
Moscow		40·9	320	e 7 44	- 2	13 56	- 2	—	—
Ksara		41·1	286	e 7 53	+ 6	e 14 12	+11	—	—
Simferopol		41·5	304	e 7 49	- 1	e 14 6	- 1	—	—
Istanbul		45·4	298	e 8 37	+15	e 14 50	-14	—	—
Helwan		45·8	282	i 8 26 <sub>k</sub>	+ 1	15 10	+ 1	10 16	PP
Helsinki		48·4	325	e 9 11 <sub>?</sub>	+25	e 15 43	- 3	e 19 23	SS
Warsaw		50·2	313	e 8 59 <sub>k</sub>	- 1	16 11	0	11 2	PP
Belgrade		51·2	304	e 9 9	+ 2	e 26 22	L	e 11 29	PP (e 26·4)
Budapest		51·8	308	9 17	+ 5	e 16 30	- 3	e 21 0 <sub>?</sub>	Q 24·0
Upsala		52·1	324	i 9 13	- 1	16 33	- 5	i 10 38	P <sub>c</sub> P e 24·5
Zagreb		54·2	306	e 9 16	-13	e 17 26	PPS	e 11 33	PP i 28·1
Prague		54·5	312	e 9 25	- 7	e 17 0	-10	e 21 0	SS c 25·0
Copenhagen		55·0	319	e 9 34	- 1	i 17 15	- 2	11 53	PP 26·0
Cheb		55·8	312	e 9 42	+ 1	e 17 30	+ 2	e 25 2	SSS e 30·0
Triest		55·9	306	e 9 38	- 4	i 17 27	- 2	e 11 44	PP
Jena		56·2	312	e 9 40	- 4	i 17 28	- 5	e 9 44	P e 29·4
Rome		57·5	302	e 9 53	0	e 17 46	- 4	e 11 53	PP 27·9

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Florence	57.9	304	e 9 39	-17	e 17 30	-25	—	—
Stuttgart	58.1	311	e 9 56	-2	—	—	c 10 27	P <sub>c</sub> P c 29.0
Bergen	N. 58.2	325	—	—	c 22 0?	SS	—	—
Chur	58.3	308	e 9 53	-6	—	—	—	e 29.0
Zürich	58.8	310	e 10 16	+14	—	—	—	e 30.8
Strasbourg	59.1	311	e 10 3	-1	e 18 11	0	c 12 18	PP e 27.9
Basle	59.4	310	e 10 8	+2	e 22 10	SS	—	—
De Bilt	59.8	315	—	—	e 18 21	+1	—	e 28.0
Neuchatel	60.0	310	e 10 8	-3	—	—	—	—
Uccle	60.7	314	e 10 18	+3	e 18 30	-2	c 24 33?	SSS e 29.0
Paris	62.4	312	i 10 25	-2	e 25 46	SSS	c 22 40	SS e 33.0
Aberdeen	62.6	323	—	—	i 18 45	-11	c 25 52	SSS 29.7
Clermont-Ferrand	62.9	308	e 10 35	+5	e 18 20	-40	c 12 51	PP 30.0
Kew	63.3	315	i 19 6	S	(i 19 6)	+2	e 26 1	SSS e 33.0
Barcelona	65.0	304	—	—	e 19 9	-17	—	e 35.0
Jersey	65.1	315	e 22 40	?	—	—	—	26.0
Scoresby Sund	66.0	339	13 12	PP	19 40	+2	26 36	SSS
Algiers	66.0	299	e 11 0	+10	—	—	—	35.0
Tortosa	N. 66.4	304	i 11 11	P <sub>c</sub> P	19 39	-4	12 30	? c 34.0
Alicante	68.0	302	20 2	S	(20 2)	0	27 10	SSS e 33.8
Almeria	70.1	301	i 11 15	-1	i 20 25	-2	11 24	pP 35.0
Granada	70.8	302	12 0	+40	20 48	+13	e 25 10	SS 35.7
Malaga	z. 71.5	302	e 20 40	S	(e 20 40)	-3	e 26 17	SS 34.9
College	75.5	20	e 21 38	S	(e 21 38)	+10	e 26 19	SS e 38.2
Sitka	85.0	20	—	—	c 23 12	+5	—	e 40.3
Riverview	90.0	130	e 16 37	PP	c 23 29	[-4]	c 23 41	SKKS c 41.2
Weston	103.3	342	—	—	c 38 52	?	—	—
Tinemaha	z. 108.4	19	e 18 59	[+29]	—	—	—	—
Bermuda	110.3	333	e 30 33	?	—	—	—	e 45.6
Boulder City	110.4	17	e 18 57	[+23]	—	—	—	—
Tucson	114.9	15	e 18 44	[+1]	c 29 21	PS	c 19 39	PP e 44.7
San Juan	123.2	327	e 22 31	?	(e 37 9)	SS	—	e 37.2
Bogota	138.9	327	e 19 35	[+6]	—	—	c 23 12	PP e 75.0
La Paz	151.4	296	19 55	[+5]	—	—	—	68.0
Huancayo	153.5	313	e 20 5	[+13]	—	—	—	—

Additional readings and notes:—

New Delhi P<sub>c</sub>N = 2m.32s., S<sub>c</sub>N = 4m.9s., S<sub>c</sub>E = 4m.13s.  
 Calcutta iSN = 3m.12s., iS\*N = 3m.45s.  
 Frunse readings reduced by 2m.  
 Helwan iZ = 8m.44s., SSN = 18m.28s., iEN = 18m.54s.  
 Warsaw eN = 9m.12s., ePPE = 11m.6s., PPPZ = 12m.0s., eE = 12m.28s., SZ = 16m.14s.,  
 ePSN = 16m.28s., SSN = 19m.53s., iSSE = 19m.58s., SSZ = 20m.10s., cSSS?N =  
 20m.43s., SSSE = 21m.21s., iN = 21m.53s.  
 Belgrade ePPP? = 12m.28s., e = 14m.17s.  
 Upsala eSS = 20m.36s.  
 Zagreb eNE = 21m.18s.  
 Copenhagen i = 19m.30s. and 21m.25s.  
 Cheb ePPP = 12m.30s., e = 22m.3s. and 28m.10s.  
 Trieste ePPP = 12m.41s., iSS = 21m.47s.  
 Rome ePPPZ = 12m.57s., eE = 18m.3s., e = 20m.6s., iSS = 21m.42s., i = 22m.53s.  
 Stuttgart iZ = 10m.3s. and 10m.6s., ePP = 12m.21s., ePPP = 14m.25s., ePS? = 20m.10s.  
 Strasbourg e = 11m.11s., eS = 19m.42s., eSS = 22m.2s. and 22m.6s., e = 23m.2s.  
 Paris i = 10m.30s., ePP? = 12m.26s., ePS? = 20m.30s., eSS? = 24m.24s., e = 28m.28s.  
 Clermont-Ferrand eP<sub>c</sub>P = 11m.15s., e = 11m.46s.  
 Kew ePPE = 20m.46s.?, ePPPE = 21m.26s.?, eNZ = 23m.56s., eSSN = 29m.11s.; read-  
 ings wrongly identified.  
 Algiers e = 12m.0s.? and 17m.0s.?  
 Alicante PP = 21m.57s., PPP = 22m.30s., P<sub>c</sub>S = 25m.32s., S<sub>c</sub>S = 30m.4s., Q = 31m.2s.;  
 readings wrongly identified.  
 Almeria P<sub>c</sub>P = 11m.41s., PP = 13m.51s., PPP = 15m.38s., P<sub>c</sub>S = 15m.46s., sS = 20m.42s.,  
 PPS = 21m.4s., S<sub>c</sub>S = 21m.16s., SS = 24m.46s., SSS = 28m.24s.  
 Granada PP = 14m.46s., SSS = 28m.10s.  
 Malaga ePPZ = 22m.44s., QZ = 30m.59s.; readings wrongly identified.  
 College eS = 30m.20s.; readings wrongly identified.  
 Riverview eSN = 23m.58s., iZ = 24m.59s., ePSN = 25m.5s., ePSZ = 25m.14s., iSSE =  
 30m.3s., eQN = 37.7m.  
 Long waves were also recorded at Tananarive, Wellington, Arapuni, Christchurch,  
 Edinburgh, Besançon, Lisbon, and other American stations.

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Feb. 10d. Readings also at 2h. (near Leninakan), 3h. (Jena, New Delhi, Calcutta, and near Stalinabad), 4h. (Hamada, Kyoto, Miyazaki, Kagosima, Utunomiya, Siomisaki, Kobe, Hunatu, Osaka, Tokyo, Morioka, Omaesaki, Sapporo, Mori, Hukuoka, Yokohama, and near Stuttgart), 6h. (Boulder City), 8h. (Riverview), 9h. (San Juan, near Boulder City, and Pierce Ferry), 11h. (Tinemaha and Tucson), 12h. (Tucson), 13h. and 14h. (Istanbul), 15h. (Ksara), 17h. (Helsinki, Copenhagen, Prague, Cheb, Strasbourg, De Bilt, and Paris), 19h. (Auckland, Christchurch, Riverview, Tucson, and near Mineral), 20h. (Pasadena, Riverside, Tinemaha, Tucson, and near Branner), 22h. (San Juan and near Apia), 23h. (San Juan, near Branner, near Almeria, and Malaga).

Feb. 11d. 10h. 3m. 32s. Epicentre 28°·4N, 138°·0E. Depth of focus 0·080.

A = -·6547, B = +·5895, C = +·4731;  $\delta$  = -3;  $h$  = +2;  
D = +·669, E = +·743; G = -·352, H = +·317, K = -·881.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Mizusawa	E.	11·0	13	2 28	- 1	4 27	- 1	—	—
Vladivostok		15·5	343	i 3 14	0	i 5 15	-36	—	—
Irkutsk		34·5	322	i 6 5	+ 1	i 10 58	+ 2	—	—
Calcutta	N.	45·0	274	—	—	i 13 16	-12	—	—
Almata		50·6	304	8 14	+ 3	14 49	+ 4	—	—
Frunse		52·4	303	e 8 25	+ 1	e 15 13	+ 4	—	—
Andijan		54·3	300	8 39	+ 2	i 15 40	+ 6	—	—
Hyderabad	E.	55·4	272	—	—	15 54	+ 6	—	—
Tchimkent		56·1	303	i 8 51	+ 1	16 1	+ 3	—	—
Tashkent		56·5	302	e 8 53	0	e 16 5	+ 2	—	—
Stalinabad		57·4	299	e 9 0	+ 1	—	—	—	—
Bombay	N.	59·8	275	—	—	i 16 49	+ 5	—	—
Sverdlovsk		59·9	321	i 9 15	- 1	i 16 46	0	—	—
Riverview		63·1	167	i 11 21	?	e 17 22	- 3	e 18 37	PS
Baku		70·9	305	—	—	e 19 2	+ 6	—	—
Grozny		72·7	310	i 10 38	+ 4	—	—	—	—
Leninakan		75·0	308	e 10 48	+ 1	20 46	SP	—	—
Grand Coulee		77·5	42	e 10 58	- 3	—	—	—	—
Shasta Dam		78·7	49	i 11 4	- 3	—	—	—	—
Tinemaha		83·3	51	i 11 28 <sub>a</sub>	- 3	—	—	—	—
Santa Barbara	Z.	83·6	54	i 11 30	- 2	—	—	—	—
Ksara		83·8	305	e 12 28 <sub>?</sub>	+55	e 21 14	+ 3	—	—
Haiwee		84·0	51	i 11 32	- 2	—	—	—	—
Copenhagen		84·3	332	11 34	- 2	i 21 7	- 9	—	—
Istanbul		84·6	314	11 34	- 3	—	—	e 14 58	PP
Pasadena		84·8	53	i 11 36 <sub>a</sub>	- 2	—	—	e 13 34	PP
Mount Wilson		84·9	53	e 11 38	- 1	—	—	—	—
Riverside	Z.	85·5	53	i 11 39	- 3	—	—	—	—
Boulder City		86·2	50	i 11 43	- 2	e 21 32	- 2	—	—
Overton		86·2	49	i 11 43	- 2	—	—	—	—
Palomar	Z.	86·2	53	i 11 42 <sub>a</sub>	- 3	—	—	i 14 9	?
Pierce Ferry		86·7	49	i 11 45	- 2	—	—	—	—
Helwan	N.	89·1	303	—	—	e 21 34	[- 2]	e 22 8	S
Stuttgart		90·6	328	i 12 5 <sub>a</sub>	0	—	—	e 15 51	PP
Triest		90·6	324	—	—	e 21 52	[+ 7]	—	—
Tucson		91·0	51	i 12 6	- 1	—	—	i 12 24	pP
Strasbourg		91·4	329	e 12 9	0	e 21 51	[+ 2]	—	c 53·5
Chur		91·8	326	e 12 10 <sub>a</sub>	- 1	—	—	—	—
Zürich		91·9	328	e 12 9 <sub>a</sub>	- 2	—	—	—	—
Basle		92·2	328	e 12 12 <sub>a</sub>	- 1	—	—	—	—
Rome		93·9	322	e 24 15	SP	e 21 59	[- 4]	e 25 17	PPS

Additional readings :—

Riverview iE = 20m.40s.

Tucson iPP = 15m.55s.

Long waves were also recorded at Cheb.

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Feb. 11d. Readings also at 2h. (Vladivostok), 3h. (De Bilt, Strasbourg, Paris, Cheb, Rome, and Warsaw), 8h. (Riverside, Tinemaha, Tucson, Shasta Dam, and near La Paz), 9h. (near Apia), 10h. (Tucson), 11h. (San Francisco), 15h. (Tchimkent, near Obi-garm, Samarkand, and Stalinabad), 16h. (Strasbourg and near Obi-garm), 18h. (Huancayo, San Juan, Bermuda, St. Louis, Tucson, Riverside, Tinemaha, Boulder City, Pierce Ferry, Grand Coulee, and near Berkeley), 19h. (La Paz, Weston, Boulder City, Riverview, De Bilt, Paris, and Strasbourg), 20h. (Calcutta), 21h. (St. Louis and Strasbourg), 23h. (San Juan and near Leninakan).

Feb. 12d. 20h. 7m. 7s. Epicentre  $27^{\circ}6'N$ ,  $128^{\circ}4'E$ . (as on 1944, December 17d.).

$$A = -0.5512, B = +0.6955, C = +0.4609; \quad \delta = -3; \quad h = +3;$$

$$D = +0.784, E = +0.621; \quad G = -0.286, H = +0.361, K = -0.887.$$

		$\Delta$	Az.	P.		O - C.	S.		O - C.	Supp.		L.	
				m.	s.		m.	s.		m.	s.		
Mizusawa		15.7	40	e 3	41	- 3	7	46	L	—	—	(7.8)	
Vladivostok		15.8	10	i 3	34	-11	i 5	54	-48	—	—	—	
Irkutsk		30.5	330	e 6	14	- 3	c 10	58?	-20	—	—	—	
Calcutta	N.	36.5	270	—	—	—	c 13	4	+13	c 15	34	SSS	
Almata		44.0	305	e 8	14	+ 3	—	—	—	—	—	—	
New Delhi	N.	44.9	284	—	—	—	14	56	0	15	28	PS	20.0
Hyderabad	N.	47.0	268	e 8	38	+ 3	15	45	+19	—	—	—	23.6
Andijan		47.4	300	c 8	45	+ 7	—	—	—	—	—	—	—
Obi-garm		49.6	298	8	55?	0	e 15	59?	- 4	—	—	—	—
Tashkent		49.7	302	—	—	—	e 15	59	- 5	—	—	—	—
Stalinabad		50.4	298	i 9	1	0	i 16	18	+ 4	—	—	—	—
Bombay		51.4	273	—	—	—	c 16	7	-21	—	—	—	—
Sverdlovsk		55.3	322	c 9	35	- 3	17	22	+ 1	—	—	—	—
Baku		64.4	304	—	—	—	e 19	17	- 1	—	—	—	—
Grozny		66.5	307	—	—	—	c 24	55	SS	—	—	—	—
Istanbul		78.9	310	—	—	—	e 21	53	-12	—	—	—	e 43.9
Cheb		84.2	325	—	—	—	e 22	53?	- 6	c 27	53?	SS	e 43.9
Shasta Dam		85.6	46	i 12	40	- 1	—	—	—	—	—	—	—
De Bilt		86.4	329	—	—	—	e 24	13	PS	—	—	—	e 43.9
Stuttgart		86.6	324	e 12	45?	- 1	—	—	—	—	—	—	e 43.9
Strasbourg		87.5	325	—	—	—	e 24	12	+41	e 24	59	PS	c 43.9
Uccle		87.7	328	—	—	—	c 33	23	SSS	—	—	—	c 45.9
Florence		88.6	320	c 24	6	S	(e 24	6)	+24	c 34	19	SSS	i 42.5
Rome	z.	89.0	317	e 14	18	?	—	—	—	—	—	—	c 42.3
Paris		89.9	327	—	—	—	e 24	53?	PS	c 44	53?	Q	c 48.9
Tinemaha	z.	90.3	47	i 13	6	+ 2	—	—	—	—	—	—	—
Pasadena	z.	92.0	49	c 13	13	+ 1	—	—	—	—	—	—	—
Riverside	z.	92.6	49	e 13	15	0	—	—	—	—	—	—	—
Overton		93.0	46	e 13	16	- 1	—	—	—	—	—	—	—
Boulder City		93.1	47	e 13	18	+ 1	—	—	—	—	—	—	—
Palomar		93.4	49	i 13	19	+ 1	—	—	—	i 17	1	PP	—
Pierce Ferry		93.6	46	e 13	20	+ 1	—	—	—	—	—	—	—
Tucson		98.0	47	e 13	40	+ 1	—	—	—	c 17	30	PP	—
Alicante		98.8	322	29	30	?	—	—	—	50	44	Q	e 56.6

Additional readings:—

New Delhi  $S_eSN = 19m.10s.$

Cheb  $e = 32m.53s.?$

Strasbourg  $eSSS = 33m.10s., e = 33m.44s. \text{ and } 33m.53s., ePKP, PKP = 40m.40s.$

Paris  $e = 35m.53s.?$

Palomar  $iZ = 14m.3s.$

Long waves were also recorded at Weston, Bermuda, La Paz, Riverview, and other European stations.

Feb. 12d. Readings also at 0h. (near Branner and Lick), 1h. (near Tchimkent, Mineral, Fresno, near Boulder City, Overton, and Pierce Ferry), 2h. (Stuttgart), 3h. (Bombay, Calcutta, New Delhi, and near Malaga), 4h. (Haiwee, Palomar, Riverside, Tinemaha, and Shasta Dam), 5h. (Tucson, Boulder City, Overton, Pierce Ferry, and Stuttgart), 8h. (Tucson, Bogota, and near Balboa Heights), 9h. (Strasbourg), 10h. (Malaga, Riverview, and Tucson), 12h. (Tucson), 13h. (Boulder City, Overton, Pierce Ferry, Stuttgart, Rome, and Bucharest), 15h. (near Obi-garm), 16h. (near Mineral), 17h. (near Pierce Ferry), 20h. (near Branner), 21h. (near Ottawa).

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Feb. 13d. 0h. 13m. 21s. Epicentre  $19^{\circ}0S$ .  $75^{\circ}0W$ . Approximate.

A = +.2449, B = -.9140, C = -.3236;  $\delta = +9$ ;  $h = +5$ ;  
D = -.966, E = -.259; G = -.084, H = +.313, K = -.946.

	$\Delta$	Az.	P.		O-C.	S.		O-C.	L.
	$^{\circ}$	$^{\circ}$	m.	s.	s.	m.	s.	s.	m.
Huancayo	6.9	357	c 2	50	S	(c 2 50)	-15		c 4.2
La Paz	7.0	70	1	47	+ 1	i 3 11	+ 3		i 3.6
St. Louis	z. 59.1	347	i 10	1	- 3	—	—		—
Tucson	61.4	326	c 10	22	+ 2	—	—		—
Pierce Ferry	66.1	326	i 10	52	+ 1	—	—		—
Boulder City	66.4	325	i 10	53	0	—	—		—
Riverside	z. 66.4	322	i 10	53k	0	—	—		—
Overton	66.6	326	i 10	54	0	—	—		—
Mount Wilson	66.9	322	e 10	55	- 1	—	—		—
Pasadena	z. 66.9	322	i 10	56k	0	—	—		—
Haiwee	68.2	323	i 11	3	- 1	—	—		—
Tinemaha	69.1	324	i 11	9k	- 1	—	—		—
Shasta Dam	73.9	324	e 11	32	- 7	—	—		—

Tucson gives also  $i = 10m.43s$ .

Feb. 13d. Readings also at 2h. (De Bilt, Uccle, Strasbourg, Andijan, Samarkand, Tchinkent, near Obi-garm, and Stalinabad), 3h. (Paris), 4h. (Santa Lucia), 5h. (Rome and Shasta Dam (2)), 6h. (De Bilt, Uccle, Paris, and Rome), 9h. (Samarkand, near Andijan, Obi-garm, Stalinabad, Tchinkent, and near Algiers), 10h. (Santa Lucia), 14h. (La Paz, and near Apia), 16h. (Boulder City, Pierce Ferry, St. Louis, and near Tucson), 17h. (near Mizusawa and near Tananarive), 19h., 20h., and 23h. (near Mineral).

Feb. 14d. 17h. Undetermined shock.

Istanbul eP? = 47m.17s., eS = 48m.5s.  
Bucharest eN = 47m.48s., eE = 48m.9s., cN = 48m.52s., iN = 49m.12s., cE = 49m.16s.,  
iE = 49m.28s.  
Florence eP = 48m.6s., iS = 51m.6s., iQ = 53m.43s.  
Zagreb eP = 48m.13s.?, e = 50m.30s.  
Stuttgart eZ = 48m.40s?.  
Strasbourg e = 49m.8s. and 51m.1s.  
Belgrade eP? = 49m.54s., e = 50m.27s., 51m.13s., and 53m.58s.  
Cheb e = 50m.0s., eL = 53m.  
Rome e = 50m.18s., eZ = 50m.48s.  
Paris e = 50m.24s., e? = 51m.4s., eL = 58m.  
Prague e = 51m.36s.  
Long waves were also recorded at Warsaw, Copenhagen, and Uccle.

Feb. 14d. Readings also at 0h. (Andijan, Samarkand, Tchinkent, near Obi-garm, and Stalinabad), 5h. (Tinemaha, Tucson, and near Mineral), 6h. (Riverside, Tinemaha, Tucson, Boulder City, and Pierce Ferry), 8h. (Kew), 9h. (near Florence), 10h. (Tashkent, near Andijan, Frunse, Obi-garm, and Tchinkent), 11h. (near Andijan, Tashkent, and Tchinkent), 13h. (Bomaby and Calcutta), 14h. (near Apia), 15h. (Sotchi, near Erevan, Grozny, and Leninakan), 16h. (Granada and Santa Lucia), 17h. (Tchinkent, near Andijan, Obi-garm, Samarkand, and Stalinabad), 19h. (Grand Coulee).

Feb. 15d. 1h. 7m. 50s. Epicentre  $53^{\circ}4N$ .  $163^{\circ}1W$ . (as on 1946, Aug. 2d.).

A = -.5729, B = -.1741, C = +.8009;  $\delta = -3$ ;  $h = -7$ ;  
D = -.291, E = +.957; G = -.766, H = -.233, K = -.599.

	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m.	s.	s.	m.	s.	s.	m.	m.
College	13.9	28	c 3	23	+ 2	c 6 0	+ 3	—	—	c 7.2
Sitka	16.2	64	c 3	48	- 2	i 7 6	+15	—	—	e 7.5
Shasta Dam	30.1	98	e 6	16	+ 3	—	—	—	—	—
Tinemaha	z. 34.9	99	e 6	58	+ 3	—	—	i 7 15	pP	—
Haiwee	z. 35.7	100	e 7	5	+ 3	—	—	—	—	—

Continued on next page.

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		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.	
		°	°	m. s.	s.	m. s.	s.	m. s.	m.	
Mount Wilson	z.	37.0	102	e 7 12	- 1	—	—	i 7 29	pP	—
Pasadena	z.	37.0	102	e 7 30	pP	—	—	—	—	e 18.2
Riverside	z.	37.5	102	e 7 32	pP	—	—	—	—	—
Overton		37.5	96	e 7 20	+ 3	—	—	—	—	—
Boulder City		37.7	97	i 7 19	0	e 13 15	+ 5	—	—	—
Pierce Ferry		38.0	96	e 7 24	+ 3	—	—	—	—	—
Palomar		38.3	102	i 7 27	+ 3	—	—	i 7 40	pP	—
Tucson		42.6	98	e 8 0	+ 1	—	—	i 8 16	pP	—
Vladivostok		43.1	283	e 10 7	PP	i 18 9	SS	—	—	—
Florissant		50.3	76	e 9 1	+ 1	i 16 12	- 1	—	—	—
St. Louis		50.5	76	i 9 0	- 2	i 16 13	- 3	—	—	e 28.2
Ottawa		54.0	60	e 9 37	+ 9	—	—	—	—	28.2
Weston		58.4	59	i 9 57 <sub>k</sub>	- 3	—	—	—	—	e 30.9
Sverdlovsk		64.5	335	10 38	- 3	19 25	+ 6	—	—	—
Copenhagen		71.2	3	e 11 25	+ 2	e 20 51	+11	—	—	34.2
Warsaw	z.	74.7	357	e 12 40	+57	—	—	—	—	e 41.2
Uccle		75.6	10	—	—	(e 21 10?)	-19	—	—	e 21.2
Paris		77.4	11	i 11 57	- 1	—	—	i 12 8	pP	e 46.2
Stuttgart	z.	78.0	6	e 12 0	- 2	—	—	—	—	—
Strasbourg		78.1	7	e 12 2	0	—	—	—	—	46.2
San Juan		79.5	73	—	—	e 22 16	+ 5	—	—	e 39.8
Rome		85.0	4	e 12 36	- 2	e 23 19	+12	e 18 8	PPP	—
Istanbul		85.3	351	e 12 39	- 1	e 23 19?	+ 9	—	—	—

Long waves were also recorded at Honolulu, Bermuda, and other American and European stations.

Feb. 15d. Readings also at 2h. (Andijan, near Obi-garm and Stalinabad), 3h. (Alicante), 4h. (near Lick (2) and near Tchimkent), 8h. (Tucson, Boulder City, Overton, Pierce Ferry, Shasta Dam, College, St. Louis, and La Paz), 10h. (Alicante), 13h. (Stuttgart, near Basle and Zürich), 16h. (Bombay, Calcutta, Hyderabad, Kodai-kanal, and New Delhi), 17h. (near Bucharest), 18h. (Riverview, Mount Wilson, Pasadena, Riverside, Tinemaha, and Tucson), 19h. (Stuttgart and near Harvard), 22h. (near Bogota).

Feb. 16d. 2h. 15m. 42s. Epicentre 16°·7N. 97°·9W. (as on 1942, Nov. 25d.).

A = -·1317, B = -·9492, C = +·2856;  $\delta$  = -11;  $h$  = +5;  
D = -·991, E = +·137; G = -·039, H = -·283, K = -·958.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.	
		°	°	m. s.	s.	m. s.	s.	m. s.	m.	
Tucson		19.4	327	e 4 31	+ 1	e 7 35	-29	i 4 53	pP	i 10.4
St. Louis		22.9	15	i 4 59	- 7	i 9 3	-10	e 5 15	pP	—
Florissant		23.0	15	i 5 1	- 6	i 9 4	-10	i 9 39	sS	—
Palomar		23.9	318	i 5 18 <sub>k</sub>	+ 2	—	—	i 5 34	pP	—
Pierce Ferry		24.1	327	i 5 20	+ 2	e 12 23	L	i 5 42	pP	(e 12.4)
Boulder City		24.4	325	e 5 22	+ 1	—	—	—	—	e 13.0
Overton		24.6	326	i 5 24	+ 1	—	—	—	—	e 16.2
Riverside	z.	24.6	318	i 5 24	+ 1	—	—	i 5 38	pP	—
Mount Wilson	z.	25.1	318	i 5 30	+ 2	—	—	i 5 44	pP	—
Pasadena	z.	25.2	318	i 5 30	+ 1	—	—	i 5 45	pP	—
Bogota		26.3	114	e 5 44	+ 5	e 10 19	+ 8	i 5 50	pP	—
Haiwee		26.3	322	e 5 40	+ 1	—	—	e 5 55	pP	e 14.6
Chicago		26.5	16	e 5 40	- 1	e 10 5	- 9	—	—	e 10.3
Tinemaha		27.1	323	i 5 48	+ 2	—	—	—	—	e 14.6
San Juan		30.3	82	e 6 35	+20	e 11 4	-11	e 7 34	PP	e 14.3
Shasta Dam		31.9	323	e 6 28	- 1	—	—	—	—	—
Harvard		34.2	37	i 6 43	- 6	—	—	—	—	—
Weston		34.2	37	i 6 43 <sub>k</sub>	- 6	—	—	—	—	—
Grand Coulee		35.6	335	e 7 0	- 1	—	—	—	—	—
Huancayo		36.2	141	e 7 13	+ 7	—	—	—	—	—
La Paz	z.	44.2	137	8 6	- 6	—	—	—	—	—
Paris		84.3	42	e 12 32	- 3	—	—	e 12 48	pP	e 48.8
Strasbourg		87.6	40	e 13 7	+16	—	—	e 13 26	pP	e 49.3
Stuttgart	z.	88.4	40	e 12 58	+ 3	—	—	—	—	—

For Notes see next page.

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NOTES TO FEBRUARY 16d. 2h. 15m. 42s.

Additional readings :—

Tucson isP = 5m.3s.

St. Louis iZ = 5m.27s., isSE = 9m.35s.

Florissant iZ = 5m.38s.

Palomar iZ = 5m.42s.

Riverside iZ = 5m.47s.

Tinemaha iZ = 5m.51s. and 6m.10s.

Long waves were also recorded at Bermuda and Salt Lake City.

Feb. 16d. 9h. 19m. 34s. Epicentre 33°·1N. 134°·8E. (as on 1946, Dec. 24d.).

Intensity V at Numazima (Hyogo Pref.); IV at Sumoto, Owase, Koti, Siomisaki, Kobe, Osaka, Kashiwara, Hikone, and Tokusima; II-III at Tsuruga, Matsue, Tottori, and Toyooka. Macroseismic radius > 300km. Shallow. Epicentre 33°·1N. 134°·6E.

Seismo. Bull. Cent. Met. Obs., Japan for 1947, Tokyo, 1950, pp. 10, 11 with macroseismic chart.

$$A = -0.5915, B = +0.5956, C = +0.5435; \delta = 0; h = +1;$$

$$D = +0.710, E = +0.705; G = -0.383, H = +0.386, K = -0.839.$$

	$\Delta$	Az.	P.	O - C.	S.	O - C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Siomisaki	0.9	67	0 21 <sub>a</sub>	+ 1	0 34	0	—
Koti	1.2	293	0 20 <sub>k</sub>	- 4	0 34	- 7	—
Sumoto	1.3	3	0 26 <sub>a</sub>	+ 1	0 33	- 11	—
Owase	1.5	50	0 28 <sub>a</sub>	0	0 49	0	—
Kobe	1.6	11	0 29 <sub>a</sub>	- 1	0 51	0	—
Osaka	1.7	21	0 33	+ 2	0 56	+ 2	—
Kyoto	2.1	22	0 37 <sub>k</sub>	0	1 1	- 3	—
Kameyama	2.2	38	0 37	- 1	1 14	+ 8	—
Toyooka	2.4	0	0 41 <sub>k</sub>	0	1 18	+ 6	—
Hirosima	2.4	303	0 38	- 3	1 6	- 6	—
Hikone	2.5	29	0 42 <sub>a</sub>	- 1	1 20	S*	—
Gihu	2.8	35	0 48	+ 1	1 32	S*	—
Hamada	2.9	308	0 51	+ 3	1 33	S*	—
Miyazaki	3.1	247	0 48 <sub>k</sub>	- 3	1 41	S*	—
Omaesaki	3.2	62	0 52	0	1 44	S*	—
Kumamoto	3.4	266	0 53 <sub>a</sub>	- 2	1 39	+ 2	—
Shizuoka	3.5	58	0 55	- 2	—	—	—
Hukuoka	3.7	279	0 47	- 13	—	—	—
Kagosima	3.9	247	0 58 <sub>k</sub>	- 4	2 4	S*	—
Misima	4.0	59	1 14	+ 10	2 22	S*	—
Hunatu	4.1	53	1 7	+ 2	2 14	S*	—
Osima	4.1	66	1 8	+ 3	1 57	+ S*	—
Toyama	4.1	29	1 4	- 1	2 6	S*	—
Nagano	4.5	38	1 25	P <sub>r</sub>	2 24	S*	—
Mera	4.6	66	1 17	+ 5	2 2	- S*	—
Wazima	4.6	22	1 21	P*	2 37	S*	—
Yokohama	4.7	59	1 15	+ 1	2 30	S*	—
Maebasi	4.8	46	1 35	P <sub>r</sub>	2 42	S*	—
Kumagaya	4.9	50	1 27	P*	2 36	S*	—
Tukubasan	5.3	54	1 30	P*	2 53	S*	—
Kakioka	5.4	54	1 31	+ 7	2 55	S*	—
Utunomiya	5.4	50	1 37	P*	3 2	S*	—
Onahama	6.3	51	1 44	+ 8	3 26	S*	—
Yamagata	6.8	40	1 36	- 8	—	—	—
Sendai	7.2	43	1 56	+ 7	3 46	S*	—
Akita	7.9	32	2 29 <sub>k</sub>	P <sub>r</sub>	3 40	+ 10	—
Mizusawa	7.9	39	e 2 7	+ 8	4 10	S <sub>r</sub>	—
Mori	10.1	26	2 34	+ 6	—	—	—
Vladivostok	10.3	348	e 4 38	S	(e 4 38)	+ 8	—
Sapporo	11.2	26	2 50	+ 6	—	—	—
Irkutsk	29.2	319	e 6 9	+ 4	e 11 5	+ 7	—
Calcutta	N. 42.1	268	—	—	e 14 26	+ 10	—
Samarkand	53.8	298	e 8 50	- 36	—	—	—
Sverdlovsk	54.4	219	i 9 29	- 2	i 17 8	- 1	—
Moscow	67.1	323	10 56	- 1	e 19 51	0	—

Continued on next page.

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		$\Delta$	Az.	P.	O-C.	S.	O-C.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.
Warsaw	z.	77.3	325	e 12 0	+ 2	—	—	e 39.9
Shasta Dam		77.8	50	i 11 59	- 2	—	—	—
Copenhagen		78.8	332	12 5	- 1	e 22 12	+ 8	38.4
Berkeley		79.5	52	i 12 8	- 2	—	—	—
Prague		81.8	327	—	—	e 32 28	SSS	e 40.4
Tinemaha		82.5	51	e 12 26	0	—	—	—
Haiwee		83.3	52	i 12 28	- 2	—	—	—
Pasadena		84.3	53	i 12 34 <sub>a</sub>	- 1	—	—	—
Mount Wilson		84.3	53	i 12 35 <sub>a</sub>	0	—	—	—
Riverside	z.	84.9	53	i 12 36	- 2	—	—	—
Stuttgart		85.2	327	e 12 37	- 2	—	—	—
Overton		85.3	49	i 12 40	0	—	—	—
Boulder City		85.4	50	i 12 40	0	—	—	—
Palomar		85.6	53	i 12 41 <sub>a</sub>	0	—	—	—
Uccle		85.7	332	e 12 49	+ 7	—	—	e 44.4
Pierce Ferry		85.8	49	i 12 43	+ 1	—	—	—
Strasbourg		85.9	329	e 12 44	+ 1	—	—	43.4
Paris		88.0	332	e 12 51	- 2	—	—	e 51.4
Tucson		90.3	51	e 13 4	0	—	—	—
Huancayo		145.4	61	e 19 41	[+ 1]	—	—	—
La Paz	z.	153.6	57	e 19 50	[- 3]	—	—	—

Additional readings:—

Stuttgart eZ = 12m.43s.

Palomar iN = 12m.58s.

Huancayo e = 20m.30s.

Long waves were also recorded at New Delhi, Cheb, De Bilt, and Búdapest.

Feb. 16d. Readings also at 1h. (Riverview, Santa Lucia, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, and Shasta Dam), 4h. (Granada, near Obi-garm, and near Mizusawa), 6h. (near Tashkent), 8h. (Stuttgart, Samarkand, near Andijan, Frunse, Obi-garm, Almata, and Tchimkent), 10h. (near Andijan, Frunse, Obi-garm, Samarkand, Almata, Stalinabad, and Tchimkent), 11h. (near Granada), 12h. (Copenhagen, Strasbourg, Stuttgart, La Paz, Samarkand, Almata, near Andijan, Obi-garm, Stalinabad, Tchimkent, and near Mizusawa), 16h. (Tucson), 19h. (Calcutta, New Delhi, near Grozny, and near Balboa Heights), 20h. (Belgrade, Samarkand, near Obi-garm, and Stalinabad), 21h. (Overton and near Pierce Ferry).

Feb. 17d. 0h. 12m. 31s. Epicentre 44°·8N. 7°·3E.

Intensity V-VI in the High Alps, Lower Alps, and Maritime Alps as far as Nice, Marseilles and Grenoble. Epicentre 44°45'N. 7°16'E.

Annales de l'Institut de Physique du Globe de Strasbourg, 2ème partie, Séismologie, Nouvelle Série, Tome XII, 1947, Strasbourg, 1952, p. 8.

A = +·7061, B = +·0905, C = +·7023;  $\delta = -1$ ;  $h = -3$ ;

D = +·127, E = -·992; G = +·697, H = +·089, K = -·712.

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Pavia	z.	1.4	74	e 0 28	+ 1	—	—	—	e 0.9
Marseilles		2.0	223	i 0 42	$P_r$	i 1 2	+ 1	—	—
Neuchatel		2.2	354	e 0 40	+ 2	e 1 14	+ 8	e 0 44	$P_r$
Chur		2.6	38	e 0 43	- 1	—	—	—	—
Basle		2.7	4	e 0 47	+ 2	e 1 14	- 5	—	—
Zürich		2.7	18	e 0 43	- 2	e 1 20	+ 1	e 0 49	$P^*$
Besançon		2.9	327	e 0 47	- 1	i 1 19	- 5	—	—
Florence		3.0	109	e 1 12	$P_r$	i 1 44	$S_r$	—	—
Clermont-Ferrand		3.1	289	e 1 0	$P_r$	1 43	$S_r$	1 28	?
Strasbourg		3.8	5	e 1 2	+ 1	i 1 48	+ 1	e 1 8	$P^*$
Stuttgart		4.2	18	e 1 4	- 3	e 2 0	+ 3	e 1 24	$P_r$
Triest		4.6	77	e 1 31	$P_r$	e 2 40	$S_r$	—	—
Rome		4.8	126	e 1 25	$P^*$	e 2 15	+ 3	—	—
Barcelona		5.1	230	2 6	+46	—	—	—	e 2.6
Paris		5.2	322	i 1 21	0	i 2 20	- 2	i 1 41	$P_r$

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Zagreb	6.2	77	e 1 39	+ 4	e 3 2	S*	c 2 11 P <sub>g</sub>	c 3.7
Cheb	6.3	31	—	—	e 3 16	S*	c 3 34 S <sub>g</sub>	—
Uccle	6.3	343	e 1 37?	+ 1	e 2 51	+ 1	c 2 3? P <sub>g</sub>	c 4.3
Tortosa	N. 6.4	234	1 35	- 3	3 34	S <sub>g</sub>	3 20 S*	—
Jena	N. 6.8	21	e 1 45	+ 1	e 3 44	S <sub>g</sub>	c 2 17 P <sub>g</sub>	—
Prague	7.2	40	c 2 38	P <sub>g</sub>	e 4 2	S <sub>g</sub>	—	—
De Bilt	7.4	350	—	—	e 3 49	S*	—	c 4.5
Jersey	7.8	308	—	—	e 3 53	S*	c 4 12 S <sub>g</sub>	c 4.8
Kew	8.4	325	i 2 11	+ 5	i 3 58	+15	—	c 5.1
Alicante	8.7	225	3 22	+72	4 50	+60	3 30 PPP	—
Belgrade	9.3	85	e 2 41	PPP	—	—	—	—
Almeria	10.8	226	e 2 52	+13	e 4 34	- 8	3 7 PPP	—
Malaga	z. 12.0	232	—	—	e 5 23	SS	i 6 49 Q	8.3
Lisbon	13.7	249	4 42	?	—	—	—	7.2
Tucson	84.9	312	e 12 47	P <sub>c</sub> P	—	—	—	—

Additional readings:—

Strasbourg e = 1m.5s., eP<sub>g</sub> = 1m.19s., iP<sub>g</sub> = 1m.25s., iS = 2m.8s., iS<sub>g</sub> = 2m.15s.

Stuttgart iP<sub>g</sub> = 1m.25s., iS<sub>g</sub> = 2m.28s.

Paris i = 1m.24s. and 1m.51s., iS<sub>g</sub> = 2m.57s.

Uccle eN = 1m.42s., eZ = 3m.30s., iS<sub>g</sub>N = 3m.38s., eE = 4m.10s.

Tortosa P<sub>g</sub>?N = 1m.54s., P<sub>g</sub>N = 2m.0s. and 2m.13s., P<sub>g</sub>S<sub>g</sub>N = 2m.25s., 2m.42s., 2m.47s., 2m.54s., 3m.10s. and 3m.13s., S<sub>g</sub>N = 3m.25s. and 3m.29s.

Jena eN = 2m.40s.

Kew iZ = 3m.20s., e = 4m.32s. and 4m.51s.

Alicante SS = 4m.53s., P<sub>c</sub>P = 9m.34s.

Long waves were also recorded at Copenhagen and Warsaw.

Feb. 17d. 9h. 48m. 54s. Epicentre 38°.4S. 176°.5E. Depth of focus 0.040.  
(as on 1945, Oct. 5d.).

A = -0.7842, B = +0.0480, C = -0.6186;  $\delta$  = -6; h = -1;  
D = +0.061, E = +0.998; G = +0.617, H = -0.038, K = -0.786.

	$\Delta$	Az.	P.	O-C.	S.	O-C.
	°	°	m. s.	s.	m. s.	s.
Tuai	0.6	128	0 39	+ 1	1 10	+ 3
Auckland	2.0	318	0 41?	- 5	1 16?	- 6
Bunnythorpe	2.0	200	—	—	1 26	+ 4
New Plymouth	2.0	251	0 46	0	1 23	+ 1
Wellington	3.2	205	0 59	+ 2	1 46	+ 4
Kaimata	5.6	221	1 24	- 1	2 29	- 2
Christchurch	5.9	309	1 30?	+ 2	2 42	+ 4

Feb. 17d. Readings also at 1h. (Andijan, Tchimkent, near Obi-garm, and Stalinabad), 4h. (New Delhi, Bombay, and Almeria), 6h. (near Andijan), 12h. (near Andijan, Obi-garm, Samarkand, and Stalinabad), 14h. (Samarkand, near Obi-garm, and Stalinabad), 17h. (Frunse, near Andijan and Tchimkent), 18h. (near Branner), 22h. (Copenhagen), 23h. (Tucson and Istanbul).

Feb. 18d. 13h. 30m. 27s. Epicentre 32°.9N. 136°.9E. Depth of focus 0.060.  
(as on 1946, March 12d.).

Intensity V at Tukubasan and Utunomiya; IV at Yokohama, Tokyo, Kumagaya, Kakioka, Mito, Hokusima, Osima, Onahama, Ito, and Misima; II-III at Kashiwara, Kobe, Osaka, Mera, Maebasi, Miyako, Sendai, and Hatinohe.

Macroseismic radius > 300km.. Epicentre 33°.0N. 136°.8E. Depth of focus 400km.

Seismo. Bull. Cent. Met. Obs., Japan, 1947, Tokyo, 1950, p.p. 11, 12 with macroseismic chart.

A = -0.6143, B = +0.5748, C = +0.5406;  $\delta$  = +1; h = +1;  
D = +0.683, E = +0.730; G = -0.395, H = +0.369, K = -0.841.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Siomisaki	1.1	300	0 52 <sub>a</sub>	- 1	1 35	0	—	—
Owase	1.3	333	0 54 <sub>a</sub>	0	1 38	+ 2	—	—
Omaesaki	2.0	33	1 4 <sub>k</sub>	+ 6	1 47	+ 4	—	—
Osaka	2.1	327	0 59 <sub>a</sub>	+ 1	1 46	+ 2	—	—
Sumoto	2.2	311	0 58 <sub>a</sub>	- 1	1 43	- 2	—	—

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	$\Delta$ °	Az. °	P.		O-C.	S.		O-C.	Supp.		L.
			m.	s.	s.	m.	s.	m.	s.	m.	
Kobe	2.3	321	0	58 <sub>a</sub>	- 2	1	46	0	—	—	—
Kyoto	2.3	335	0	57	- 3	—	—	—	—	—	—
Nagoya	2.3	1	0	57	- 3	1	46	0	—	—	—
Hikone	2.4	347	1	3 <sub>a</sub>	+ 3	—	—	—	—	—	—
Shizuoka	2.4	31	1	1 <sub>k</sub>	+ 1	1	53	+ 5	—	—	—
Gihu	2.5	357	1	3	+ 2	1	51	+ 2	—	—	—
Misima	2.8	37	1	5	+ 2	2	0	+ 7	—	—	—
Osima	2.8	48	1	6	+ 3	—	—	—	—	—	—
Koti	2.9	283	1	2 <sub>a</sub>	- 2	1	51	- 3	—	—	—
Hunatu	3.0	31	1	7	+ 2	2	0	+ 4	—	—	—
Mera	3.1	50	1	7 <sub>k</sub>	+ 1	2	0	+ 3	—	—	—
Toyooka	3.1	327	1	6 <sub>a</sub>	0	1	57	0	—	—	—
Yokohama	3.4	41	1	11 <sub>k</sub>	+ 3	2	6	+ 4	—	—	—
Tokyo	3.6	40	1	14 <sub>k</sub>	+ 4	2	7	+ 2	—	—	—
Kumagaya	3.8	32	1	15	+ 3	2	17	+ 9	—	—	—
Toyama	3.8	4	1	10 <sub>a</sub>	- 2	2	8	0	—	—	—
Maebasi	3.9	26	1	15 <sub>k</sub>	+ 3	2	12	+ 2	—	—	—
Nagano	3.9	15	1	15 <sub>a</sub>	+ 3	2	12	+ 2	—	—	—
Hirosima	4.0	292	1	13	0	2	12	+ 1	—	—	—
Tukubasan	4.2	38	1	15	0	2	5	- 9	—	—	—
Kakioka	4.3	38	1	16 <sub>k</sub>	0	2	14	- 2	—	—	—
Utunomiya	4.4	32	1	17 <sub>k</sub>	0	2	17	- 1	—	—	—
Hamada	4.5	297	1	17 <sub>a</sub>	- 1	2	19	- 1	—	—	—
Mito	4.5	39	1	19 <sub>k</sub>	+ 1	2	22	+ 2	—	—	—
Wazima	4.5	0	1	29 <sub>a</sub>	+11	2	29	+ 9	—	—	—
Miyazaki	4.7	259	2	16	S	(2	16)	- 7	—	—	—
Kumamoto	5.2	271	1	23	- 2	2	28	- 4	—	—	—
Onahama	5.2	38	1	18 <sub>k</sub>	- 7	2	27	- 5	—	—	—
Izuka	5.3	280	1	22	- 4	2	28	- 6	—	—	—
Hukuoka	5.5	279	1	20 <sub>k</sub>	- 8	2	29	- 9	—	—	—
Hokusima	5.6	30	1	30 <sub>a</sub>	0	2	40	0	—	—	—
Kagosima	5.6	258	1	28	- 2	2	35	- 5	—	—	—
Yamagata	6.0	27	1	37	+ 3	2	49	+ 2	—	—	—
Sendai	6.3	29	1	57 <sub>k</sub>	+20	3	10	+17	—	—	—
Tomie	6.8	270	1	21	-22	—	—	—	—	—	—
Mizusawa	7.1	28	1	49	+ 3	3	10	0	—	—	—
Akita	7.3	20	1	50 <sub>k</sub>	+ 2	3	12	- 2	—	—	—
Morioka	7.6	25	1	52	0	3	18	- 2	—	—	—
Miyako	7.9	30	1	53 <sub>k</sub>	- 2	3	21	- 5	—	—	—
Hatinohe	8.5	25	2	7 <sub>a</sub>	+ 5	3	42	+ 4	—	—	—
Mori	9.6	16	2	14 <sub>a</sub>	0	4	3	+ 2	—	—	—
Sapporo	10.7	18	2	22 <sub>a</sub>	- 5	4	26	+ 2	—	—	—
Vladivostok	10.9	340	i 2	26	- 3	i 4	27	- 1	—	—	—
Nemuro	12.4	31	2	46	0	5	1	+ 2	—	—	—
Irkutsk	30.5	318	i 5	34	- 4	i 10	5	- 5	—	—	—
Calcutta	N.	43.9	e 7	30	+ 1	i 13	28	- 2	i 9	23	sP
Almata		47.4	7	54	- 3	14	13	- 6	—	—	—
Frunse		49.2	e 8	5	- 5	i 14	37	- 6	—	—	—
New Delhi	N.	50.9	e 8	22	- 1	i 14	59	- 7	i 17	19	sS
Andijan		51.2	8	21	- 4	i 15	5	- 6	—	—	—
Tashkent		53.4	e 8	28	-13	e 15	31	- 9	—	—	—
College		54.5	—	—	—	—	—	—	e 17	46	S <sub>c</sub> S
Hyderabad		54.5	8	39	-10	15	46	- 8	19	34	SS
Stalinabad		54.5	i 8	43	- 6	i 15	47	- 7	—	—	—
Samarkand		55.5	i 8	50	- 6	i 15	59	- 9	—	—	—
Sverdlovsk		55.9	i 8	54	- 5	i 16	5	- 8	i 10	20	pP
Bombay		58.5	i 9	8	- 9	i 16	39	- 8	10	40	pP
Riverview		67.7	e 10	13 <sub>k</sub>	- 3	i 18	37	- 2	i 11	40	pP
Moscow		68.3	10	17	- 3	18	38	- 8	11	47	pP
Grozny		69.1	e 10	19	- 5	i 18	47	- 9	—	—	—

Continued on next page.

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	$\Delta$ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	Supp. m. s.	L. m.
Erevan	71.3	305	e 10 35	- 3	e 19 17	- 4	—	—
Leninakan	71.5	306	e 10 35	- 4	e 19 9	-14	—	—
Helsinki	71.9	330	e 12 9 <sub>k</sub>	pP	i 19 20	- 8	e 24 4	SS
Sotchi	72.8	310	10 43	- 3	19 30	- 8	—	—
Grand Coulee	74.8	42	e 10 55	- 3	—	—	—	—
Upsala	75.1	332	12 0	pP	i 19 52	-11	e 22 33	sS e 36.6
Scoresby Sund	75.8	352	i 11 0 <sub>a</sub>	- 3	i 20 10	0	23 1	sS
Shasta Dam	76.6	50	i 11 5	- 3	—	—	—	—
Berkeley	78.2	52	i 11 14	- 2	—	—	—	—
Warsaw	78.4	325	12 48 <sub>k</sub>	pP	i 20 32	- 6	e 23 22	sS e 38.6
Branner	78.5	52	e 11 16	- 2	—	—	—	—
Copenhagen	79.9	331	i 11 20	- 5	i 20 45	- 8	i 12 57	pP 38.6
Ksara	80.5	303	e 11 33	+ 4	e 20 52	- 7	—	—
Bucharest	80.6	317	—	—	i 20 57	- 3	—	—
Istanbul	80.9	312	e 11 33	+ 2	—	—	—	—
Tinemaha	81.2	52	i 11 31	- 1	e 21 12	+ 5	i 13 14	pP
Santa Barbara	81.8	54	i 11 33	- 2	e 21 13	0	i 13 12	pP
Haiwee	82.0	52	i 11 35	- 1	e 21 15	0	—	—
Potsdam	82.0	328	—	—	i 21 6?	- 9	—	e 44.6
Logan	82.5	44	i 11 39	0	e 21 12	- 8	i 12 57	pP
Christchurch	82.8	154	—	—	21 15	- 8	e 24 0	sS 34.7
Mount Wilson	83.0	53	e 11 41	0	e 21 24	- 1	—	—
Pasadena	83.0	53	i 11 39 <sub>a</sub>	- 2	i 21 23	- 2	i 13 18	pP e 33.8
Prague	83.0	326	e 11 48	+ 7	21 15	-10	—	e 36.6
Riverside	83.6	53	i 11 42	- 2	e 20 55	-36	i 13 21	pP
Cheb	83.9	327	—	—	e 21 27	- 6	e 24 20	sS
Overton	84.0	50	i 11 46	0	i 21 32	- 2	—	—
Boulder City	84.1	50	i 11 45	- 2	e 21 32	- 3	—	—
La Jolla	84.3	54	e 11 47	- 1	—	—	—	—
Palomar	z. 84.3	53	i 11 45	- 3	—	—	i 13 29	pP
Pierce Ferry	84.6	50	i 11 48	- 1	e 21 32	- 8	—	—
De Bilt	85.4	332	e 11 46	- 7	i 21 41	- 7	i 13 27	pP
Durham	85.7	337	—	—	i 21 45	- 6	i 24 3	sS
Rapid City	85.8	38	i 11 55	0	e 21 33	[- 6]	e 13 21	pP
Helwan	85.9	302	e 11 52	- 4	i 21 33	[- 6]	e 13 29	pP
Stuttgart	86.3	328	e 11 53	- 4	e 21 50	- 6	e 13 30	pP e 46.6
Triest	86.4	323	—	—	i 21 35	[- 8]	—	—
Uccle	86.7	332	—	—	e 21 40	[- 4]	e 27 45	SS e 34.6
Strasbourg	87.0	328	e 13 35	pP	i 21 57	- 6	e 24 56	sS
Kew	88.0	334	i 22 3	S	(i 22 3)	- 9	e 27 58	SS
Tucson	89.0	51	e 12 9	- 1	—	—	e 13 51	pP
Paris	89.1	331	i 13 45	pP	i 22 16	- 6	e 25 33?	sS 49.6
Rome	89.7	321	—	—	e 22 17	-10	24 57	sS e 45.6
Jersey	90.5	334	e 22 3	SKS	e 22 24	-10	e 25 18	sS
Florissant	96.2	35	i 16 42	PP	i 22 35	[- 4]	i 18 8	pPP
St. Louis	96.4	35	i 12 42	- 2	i 22 37	[- 3]	i 14 21	pP
Bogota	132.5	44	e 21 52	PP	—	—	—	—
Huancayo	143.9	63	e 18 45	[- 2]	—	—	e 20 37	pPKP
La Paz	z. 152.1	59	i 19 1 <sub>a</sub>	[+ 1]	—	—	i 20 57	pPKP

Additional readings :—

- Calcutta iSSN = 15m.43s.
- New Delhi iN = 18m.46s. and 21m.16s.?
- Hyderabad E = 10m.45s., iN = 17m.44s.
- Bombay sP?N = 11m.31s., sSN = 19m.20s.
- Riverview isPZ = 12m.25s., iS<sub>c</sub>SE = 19m.36s., isSE = 21m.17s., iE = 22m.32s.
- Moscow sS = 21m.23s.
- Helsinki e = 19m.55s. and 22m.5s.
- Upsala pPE = 12m.28s., eSS = 24m.54s.
- Scoresby Sund 20m.37s.
- Berkeley iN = 32m.41s., iE = 33m.13s.
- Warsaw esSN = 23m.27s., SSN = 25m.42s.
- Branner iE = 11m.29s.
- Copenhagen i = 23m.29s., ISS = 26m.3s.
- Istanbul e = 13m.9s.
- Tinemaha eN = 21m.33s.
- Santa Barbara iZ = 13m.23s.

Continued on next page.

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Logan esS = 24m.8s.  
 Christchurch eN = 29m.6s., eEN = 30m.57s.  
 Pasadena iZ = 14m.50s., eE = 24m.18s.  
 Riverside iZ = 12m.2s.  
 Cheb e = 23m.31s., eSS = 26m.57s., eSSS = 29m.33s.?, e = 33m.41s.  
 Palomar iZ = 13m.35s. and 15m.8s.  
 De Bilt esS = 24m.35s., iSS = 27m.31s.  
 Durhan iE = 23m.53s. and 27m.35s.  
 Rapid City esS = 24m.44s.  
 Helwan eEN = 27m.36s.  
 Uccle iSE = 21m.52s.  
 Strasbourg iS = 22m.7s., esS = 25m.2s., e = 27m.53s., eSS = 28m.9s., e = 31m.2s., 34m.16s., and 34m.45s.  
 Kew ePP?EN = 25m.1s. and ePPP?E = 26m.47s.?  
 Paris i = 13m.49s. and 13m.57s., e = 27m.27s. and 30m.26s., eQ = 47.6m.  
 Rome SSS = 34m.25s.  
 Florissant esSE = 26m.24s.  
 St. Louis isSKSN = 25m.39s., isSN = 26m.24s., eE = 29m.13s., iE = 30m.57s., isSS?E = 32m.55s., iE = 38m.58s.  
 Huancayo esPKP = 21m.16s.  
 La Paz iZ = 19m.19s.

Feb. 18d. Readings also at 0h. (Helwan, Ksara, Copenhagen, Stuttgart, Strasbourg, and Paris), 3h. (Lisbon and Paris), 5h. (near Andijan, Almata, Frunse, and Tchimkent), 6h. (Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Shasta Dam (2), and Huancayo), 7h. (near Fresno, Lick, Boulder City, Overton, and Pierce Ferry), 9h. (Overton), 10h. (near Apia), 11h. (near Andijan and Tchimkent), 14h. (Copenhagen and Jena), 15h. (Samarkand near Andijan, Obi-garm, and Stalinabad), 17h. (near Malaga), 18h. (near Andijan), 23h. (Branner).

Feb. 19d. Readings at 3h. (near Pierce Ferry), 7h. (Bermuda, Bogota, Huancayo, La Paz, De Bilt, Uccle, Warsaw, Cheb, and Copenhagen), 9h. (Tinemaha and Shasta Dam), 10h. (Pierce Ferry and Overton), 11h. (near Lick), 12h. (Tucson and Tinemaha), 16h. (Tchimkent, near Obi-garm and Andijan), 18h. (Riverside, Shasta Dam, Grand Coulee, Tinemaha, and Tucson), 19h. (near Obi-garm), 20h. (Grand Coulee), 21h. (Tucson), 22h. (Tucson and Tinemaha), 23h. (Tucson).

Feb. 20d. Readings also at 0h. (near Obi-garm), 3h. (Tucson), 5h. (Tinemaha, Tucson, Auckland, Christchurch, Almata, Samarkand, Frunse, and near Andijan), 6h. (Arapuni, Wellington, Riverview, and near Leninakan), 11h. (Alicante (4)), 13h. (Berkeley), 14h. (Strasbourg), 15h. (Stuttgart, Almata, and near Andijan, Obi-garm, Tashkent, Stalinabad, Tchimkent, and Samarkand), 16h. (Balboa Heights), 17h. (La Plata, Tucson, Palomar, Pierce Ferry, Pasadena, Riverside, Overton, and Haiwee), 18h. (Haiwee, Pasadena, Riverside, Tinemaha, Tucson, Overton, Pierce Ferry, Shasta Dam, Sitka, Bozeman, and Butte), 19h. (Shasta Dam, Overton, Boulder City, Pierce Ferry, near Branner, Fresno, Lick, and Mineral), 21h. (Tucson, Santa Lucia, Grozny, near Erevan and Leninakan, and near Mizusawa), 22h. (Christchurch), 23h. (Tucson, Auckland, and Wellington).

Feb. 21d. 6h. 6m. 39s. Epicentre  $34^{\circ}7'N$ .  $137^{\circ}9'E$ . Depth of focus 0.005.  
 (as on 1945, June 21d.).

Intensity V at Omaesaki; IV at Shizuoka, Nagoya, Misima, Ito, and Iida; II-III at Hunatsu, Ibukiyama, Hikone, Tokyo, Tsuruga, Kumagaya, Kashiwara, and Kakioka.  
 Macro seismic radius between 200 and 300km.  
 Epicentre  $34^{\circ}8'N$ .  $138^{\circ}0'E$ . Depth of focus 20km.

The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year 1947, Tokyo, 1950, p.p. 12-13, macro seismic chart p.12.

A = - .6114, B = + .5524, C = + .5667;  $\delta = +10$ ;  $h = 0$ ;  
 D = + .670, E = + .742; G = - .420, H = + .380, K = - .824.

	$\Delta$	Az.	P.	O - C.	S.	O - C.
	°	°	m. s.	s.	m. s.	s.
Omaesaki	0.3	111	0 5 <sub>a</sub>	- 7	0 11	- 9
Shizuoka	0.5	57	0 6 <sub>k</sub>	- 7	0 11	- 11
Nagoya	0.9	296	0 13 <sub>a</sub>	- 5	0 25	- 6
Misima	1.0	64	0 13 <sub>k</sub>	- 6	0 23	- 10
Hunatu	1.1	42	0 16 <sub>a</sub>	- 4	0 28	- 8

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	$\Delta$	Az.	P.		O - C.	S.		O - C.
	°	°	m.	s.	s.	m.	s.	s.
Gifu	1.2	307	0	18	- 4	0	33	- 5
Kameyama	1.2	277	0	22	0	0	39	+ 1
Hikone	1.5	293	0	25 <sub>a</sub>	- 1	0	46	+ 1
Owase	1.5	246	0	29	+ 3	0	53	+ 8
Mera	1.6	82	0	28	+ 1	0	46	- 1
Yokohama	1.6	63	0	25 <sub>a</sub>	- 2	0	48	+ 1
Kyoto	1.8	280	0	31	+ 1	0	53	+ 1
Tokyo	1.8	57	0	30	0	0	53	+ 1
Kumagaya	1.9	40	0	32 <sub>a</sub>	+ 1	0	57	+ 3
Nagano	2.0	7	0	31 <sub>a</sub>	- 1	0	56	- 1
Osaka	2.0	271	0	51	PPP	—	—	—
Toyama	2.1	344	0	37 <sub>a</sub>	+ 3	1	2	+ 3
Siomisaki	2.2	235	0	44	PP	—	—	—
Kobe	2.3	270	0	33	- 4	1	7	+ 3
Tukubasan	2.3	29	0	45	PP	—	—	—
Kakioka	2.4	50	0	40	+ 2	1	10	+ 3
Utunomiya	2.4	41	0	40	+ 2	1	12	+ 5
Sumoto	2.5	262	0	42	+ 3	1	19	+ 10
Mito	2.7	51	0	43	+ 1	1	13	- 1
Toyooka	2.7	288	0	38	- 4	—	—	—
Wazima	2.8	343	0	24	- 20	1	5	- 12
Onahama	3.3	47	0	50	- 1	1	28	- 1
Hokusima	3.7	33	0	58	+ 2	1	45	+ 6
Koti	3.8	254	1	2	+ 4	—	—	—
Sendai	4.3	33	1	8	+ 3	2	8	+ 14
Hamada	4.8	274	1	13	+ 1	—	—	—
Mizusawa	5.1	29	1	18	+ 2	2	33	SSS
Akita	5.3	18	0	37	- 42	1	20	- 59
Morioka	5.6	26	1	23	0	2	41	SSS
Miyazaki	6.1	245	1	13	- 17	2	33	- 6
Hukuoka	6.3	263	1	38	+ 6	2	26	- 18
Vladivostok	9.6	333	e 2	12	- 6	e 4	16	+ 11
Shasta Dam	74.8	51	i 11	37	+ 2	—	—	—
Stuttgart	z. 85.2	329	e 12	32	+ 1	—	—	—
Tucson	87.3	53	e 9	54	?	—	—	—

Feb. 21d. 22h. 0h. 52s. Epicentre 32°·9N. 133°·9E. (as on 2d.).

Intensity V at Koti; IV at Sumoto, Wazima, Matsue, and Tottori; II-III at Shionomizaki, Kobe, Hiroshima, Osaka, Kashiwara, Mizusawa, Hukuoka, and Hamada. Macro seismic radius greater than 300km. Epicentre 33°·1N, 134°·5E. Depth of focus 40km.

The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year, 1947, Tokyo, 1950, p.p. 13-14, macro seismic chart p.13.

A = -·5833, B = +·6062, C = +·5406;  $\delta = -3$ ;  $h = +1$ .

	$\Delta$	Az.	P.		O - C.	S.		O - C.	Supp.	L.
	°	°	m.	s.	s.	m.	s.	s.	m.	m.
Koti	0.7	335	0	17 <sub>a</sub>	0	0	29	+ 1	—	—
Siomisaki	1.7	71	0	23 <sub>k</sub>	- 8	0	37	- 17	—	—
Sumoto	1.7	29	0	27 <sub>a</sub>	- 4	0	46	- 8	—	—
Hirosima	1.9	320	0	37	+ 3	1	7	+ 8	—	—
Kobe	2.1	31	0	31 <sub>a</sub>	- 6	0	53	- 11	—	—
Osaka	2.2	37	0	41	+ 3	1	9	+ 3	—	—
Owase	2.2	59	0	33 <sub>k</sub>	- 5	0	54	- 12	—	—
Miyazaki	2.3	245	0	45 <sub>a</sub>	+ 5	1	15	S <sub>g</sub>	—	—
Hamada	2.5	323	0	40 <sub>a</sub>	- 3	1	23	S <sub>g</sub>	—	—
Kyoto	2.6	36	1	19	+ 35	1	50	+ 33	—	—
Kumamoto	2.7	268	0	47 <sub>a</sub>	+ 2	1	36	S <sub>g</sub>	—	—
Toyooka	2.7	16	0	42 <sub>a</sub>	- 3	1	21	+ 2	—	—
Izuka	2.8	286	0	48 <sub>a</sub>	+ 1	1	41	S <sub>g</sub>	—	—
Kayeama	2.9	47	0	50	+ 2	1	24	0	—	—
Hukuoka	3.0	283	0	53 <sub>a</sub>	+ 3	1	49	S <sub>g</sub>	—	—

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	$\Delta$ °	Az. °	P.		O-C.	S.		O-C.	Supp.		L.
			m.	s.	s.	m.	s.	m.	s.	m.	
Hikone	3.1	39	0	54 <sub>a</sub>	+ 3	1	32	+ 3	—	—	—
Kagosima	3.1	245	1	0 <sub>a</sub>	P <sub>g</sub>	2	5	+36	—	—	—
Unzendake	3.1	267	1	16 <sub>k</sub>	+25	2	13	+44	—	—	—
Gihu	3.4	44	1	0 <sub>a</sub>	P*	—	—	—	—	—	—
Nagoya	3.4	48	0	52	- 3	1	25	-12	—	—	—
Omaesaki	4.0	64	0	54	-10	2	6	S*	—	—	—
Shizuoka	4.3	61	1	11	+ 3	2	17	S <sub>g</sub>	—	—	—
Toyama	4.6	35	1	29	P <sub>g</sub>	2	21	S*	—	—	—
Misima	4.7	61	1	15	+ 1	—	—	—	—	—	—
Hunatu	4.8	57	1	19	+ 4	2	16	+ 4	—	—	—
Osima	4.9	66	1	23	+ 6	2	28	S*	—	—	—
Wazima	5.1	28	1	23	+ 3	2	7	-13	—	—	—
Nagano	5.2	42	1	38	P <sub>g</sub>	2	40	S*	—	—	—
Yokohama	5.4	61	1	34	P*	2	36	S*	—	—	—
Maebasi	5.5	50	0	58	-27	2	11	-19	—	—	—
Kumagaya	5.6	53	1	40	P*	—	—	—	—	—	—
Utunomiya	6.1	52	1	42	+ 8	2	55	SS	—	—	—
Kakioka	6.2	55	1	35	0	2	58	SS	—	—	—
Mito	6.4	56	2	4	P <sub>g</sub>	3	5	SS	—	—	—
Sendai	7.8	45	2	1	+ 3	4	46	+78	—	—	—
Akita	8.4	35	2	6	0	3	25	-18	—	—	—
Mizusawa	8.5	41	2	25	+18	4	5	+20	—	—	—
Morioka	9.0	39	2	18	+ 5	3	52	- 6	—	—	—
Miyako	9.4	42	2	26	PP	—	—	—	—	—	—
Vladivostok	10.3	352	1	2	30	- 2	i 4	45	+15	—	—
Sapporo	11.7	28	2	50	- 1	5	19	SS	—	—	—
Irkutsk	28.8	321	6	0	- 2	10	55	+ 4	—	—	—
Calcutta	N. 41.4	267	e 9	40	PP	i 15	58	?	i 19	13	?
Almata	45.2	301	8	20	0	—	—	—	—	—	—
Frunse	47.0	300	i 8	36	+ 1	—	—	—	—	—	—
Tchimkent	50.7	300	i 9	2	- 1	i 16	18	0	—	—	—
Tashkent	51.2	299	e 9	6	- 1	e 16	22	- 3	—	—	—
Obi-garm	51.5	296	9	8	- 1	16	20	- 9	—	—	—
Hyderabad	51.9	267	9	10	- 2	16	41	+ 6	11	10	PP
Stalinabad	52.2	296	i 9	15	0	—	—	—	—	—	26.0
Samarkand	53.2	297	9	19	- 3	—	—	—	—	—	—
Sverdlovsk	54.2	320	i 9	8?	-21	16	43?	-23	—	—	—
College	55.8	30	—	—	—	e 17	21	- 7	—	—	e 27.4
Bombay	56.0	272	i 9	43	0	e 17	32	+ 2	—	—	26.8
Sitka	63.3	37	—	—	—	e 19	15	+11	—	—	e 26.2
Moscow	66.8	322	10	52	- 4	19	44	- 4	—	—	—
Grozny	67.1	308	e 10	59	+ 2	19	47	- 4	—	—	—
Riverview	68.3	164	—	—	—	i 20	9	+ 3	e 21	8	PPS
Erevan	69.3	305	e 11	32?	P <sub>c</sub> P	—	—	—	—	—	e 33.2
Leninakan	69.4	306	e 11	9	- 3	—	—	—	—	—	—
Sotchi	70.9	310	e 11	19	- 2	—	—	—	—	—	—
Scoresby Sund	75.5	352	—	—	—	21	28	0	—	—	47.1
Grand Coulee	76.5	41	e 11	50	- 4	—	—	—	i 11	58	P <sub>c</sub> P
Warsaw	77.0	324	e 11	55	- 1	e 22	12	PS	—	—	e 40.1
Shasta Dam	78.5	49	e 12	1	- 3	—	—	—	—	—	—
Copenhagen	78.6	331	i 12	2	- 3	e 21	56	- 6	27	8	SS
Istanbul	79.0	312	12	25	P <sub>c</sub> P	—	—	—	—	—	—
Budapest	E. 80.9	321	e 12	17	0	—	—	—	—	—	44.1
Prague	81.6	326	—	—	—	e 30	37	SSS	—	—	e 38.6
Belgrade	81.9	318	i 12	29	+ 6	e 22	39	+ 3	e 15	49	PP
Jena	N. 82.3	327	e 12	21	- 4	—	—	—	—	—	—
Cheb	82.5	327	—	—	—	e 22	17	-25	e 32	8?	SSS
Tinemaha	83.2	50	e 12	27	- 2	—	—	—	i 12	35	P <sub>c</sub> P
Helwan	83.7	301	i 12	30 <sub>k</sub>	- 2	e 22	50	- 4	—	—	—
Haiwee	E. 84.0	50	i 12	39	+ 6	—	—	—	—	—	—

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
De Bilt	84.2	331	—	—	e 22 33	-26	—	c 44.1
Stuttgart	84.9	326	e 12 36 <sub>a</sub>	- 2	—	—	e 12 43	P <sub>c</sub> P e 47.1
Mount Wilson	z. 85.0	52	i 12 44	+ 6	—	—	—	—
Pasadena	z. 85.0	52	e 12 43	+ 5	—	—	—	c 43.1
Uccle	85.5	331	e 12 44	+ 3	e 22 56	[- 8]	—	c 44.1
Riverside	z. 85.6	52	e 12 40	- 1	—	—	—	—
Strasbourg	85.7	327	e 12 40	- 2	e 23 13	- 1	—	e 44.5
Overton	86.0	48	e 12 47	+ 4	—	—	i 12 50	P <sub>c</sub> P
Chur	86.1	325	e 12 41	- 3	—	—	—	c 54.8
Boulder City	86.1	49	e 12 47	+ 3	—	—	i 12 50	P <sub>c</sub> P
Pierce Ferry	86.5	48	e 12 53	+ 7	—	—	—	—
Basle	86.6	326	e 14 44	+118	—	—	—	—
Paris	87.8	330	e 12 50	- 2	e 25 8	PPS	e 12 58	P <sub>c</sub> P
Rome	88.1	320	e 12 52	- 2	e 23 24	[+ 3]	e 16 18	PP c 45.1
Tucson	91.0	50	e 13 5	- 2	—	—	—	c 45.2
Huancayo	146.0	60	e 19 43	[+ 2]	—	—	—	—
La Paz	z. 154.2	56	19 58	[+ 5]	—	—	—	—

Additional readings :—

Hyderabad PSE = 16m.59s., S<sub>c</sub>SE = 18m.55s.

Warsaw eN = 30m.40s., eE = 30m.45s.

Belgrade ePPP? = 17m.50s.

Cheb eSS = 27m.40s.

Rome eSE = 24m.9s.

Long waves were also recorded at Berkeley, Florissant, Kew, and other European stations.

Feb. 21d. Readings also at 1h. (Ksara, Erevan, Grozny, and near Leninakan), 4h. (Almata, Tchimkent, Tashkent, and near Andijan, Obi-garm, and Frunse), 6h. (near Mineral and near Mizusawa), 14h. (La Paz, Tucson, Riverside, Pasadena, Mount Wilson, Haiwee, Tinemaha, and near Andijan, Obi-garm, Stalinabad, and Tchimkent), 15h. (Strasbourg and near Misusawa), 16h. (Strasbourg), 17h. (near Tchimkent), 19h. (Berkeley), 20h. (New Delhi), 22h. (Almeria, Alicante, and Florence), 23h. (Samarkand, Almata, and near Andijan, Frunse, and Tchimkent).

Feb. 22d. 2h. 10m. 53s. Epicentre 51°·6N. 131°·2W. (as on 1945, Oct. 29d.).

A = -·4108, B = -·4693, C = +7817;  $\delta = +5$ ;  $h = -6$ ;

D = -·752, E = +·659; G = -·515, H = -·588, K = -·624.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Grand Coulee	8.7	110	e 2 11	+ 1	—	—	—	i 5.0
Shasta Dam	12.5	147	e 2 58	- 4	—	—	—	—
Mineral	E. 13.1	146	e 3 5	- 5	—	—	—	—
Bozeman	14.6	106	—	—	e 6 46	+33	—	c 7.6
Berkeley	15.1	152	e 3 36	0	i 6 12	-13	—	—
Logan	16.5	119	i 3 57	+ 3	—	—	i 4 33	PP e 9.6
Salt Lake City	17.2	121	e 5 4	+61	e 8 38	+84	—	e 9.7
Tinemaha	z. 17.2	143	e 4 2	- 1	—	—	—	—
Haiwee	18.1	143	i 4 29	+15	—	—	—	—
Santa Barbara	z. 19.0	149	e 4 27	+ 1	—	—	—	—
Overton	19.2	135	i 4 27	- 1	—	—	—	—
Boulder City	19.5	136	i 4 31	0	—	—	—	—
Pierce Ferry	19.7	135	i 4 34	0	—	—	—	—
Mount Wilson	19.8	146	i 4 33	- 2	—	—	—	—
Pasadena	z. 19.8	146	i 4 36	+ 1	—	—	—	—
Rapid City	20.2	101	i 4 45	+ 6	—	—	i 5 7	pP e 11.6
Riverside	z. 20.3	146	i 4 39	- 1	—	—	—	—
Palomar	21.0	144	i 4 47	0	—	—	—	—
La Jolla	21.3	146	e 4 57	+ 7	—	—	—	—
Tucson	24.4	134	e 5 24	+ 3	e 9 47	+ 8	e 7 53	P <sub>c</sub> P c 10.3

Additional readings :—

Berkeley eN = 3m.32s. iN = 5m.31s.

Tinemaha i = 4m.7s., iZ = 4m.11s.

Tucson i = 5m.43s.

Long waves were also recorded at other American stations.

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Feb. 22d. 4h. 9m. 51s. Epicentre  $19^{\circ}5N$ .  $63^{\circ}0W$ .

A = +.4282, B = -.8405, C = +.3318;  $\delta = -11$ ;  $h = +5$ ;  
D = -.891, E = -.454; G = +.151, H = -.296, K = -.943.

	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.
			m.	s.		m.	s.		m.	s.	
San Juan	3.2	250	i 0	48	- 4	i 1	21	-11	—	—	i 1.7
Fort de France	5.1	159	e 1	17	- 3	2	35	+ 5	1	30	P*
Bermuda	12.9	354	c 3	25	PP	—	—	—	—	—	e 5.4
Bogota	18.3	218	c 4	12	- 5	i 7	46	+ 7	—	—	—
Columbia	21.6	316	—	—	—	c 8	25	-24	—	—	e 8.9
Huancayo	33.6	202	c 6	40	- 4	e 12	17	+11	c 7	11	? e 13.4
La Paz	36.1	188	7	18	+13	i 15	9	SS	—	—	18.9
Tucson	44.5	297	e 8	16	+ 1	—	—	—	—	—	—
Pierce Ferry	47.5	301	e 8	39	+ 1	—	—	—	—	—	—
Overton	47.9	302	e 8	42	0	—	—	—	—	—	—
Boulder City	48.2	301	e 8	44	0	—	—	—	—	—	—
Palomar	z. 49.7	298	e 8	55	- 1	—	—	—	—	—	—
Riverside	z. 50.1	299	e 8	56	- 3	—	—	—	—	—	—
Mount Wilson	z. 50.7	299	e 9	8	+ 5	—	—	—	—	—	—
Pasadena	z. 50.8	299	e 9	9	+ 5	—	—	—	—	—	e 28.1
Tinemaha	z. 51.0	302	e 9	6	0	—	—	—	—	—	—
Stuttgart	z. 63.9	45	e 10	40	+ 3	—	—	—	—	—	—
Cheb	66.0	43	e 20	10	PPS	—	—	—	—	—	e 31.2
Prague	66.8	43	—	—	—	—	—	—	e 30	39	Q e 36.2

Fort de France gives also  $iP_gS = -2m.3s.$  and  $sS_g = 2m.31s.$

Long waves were also recorded at other American and European stations.

Feb. 22d. Readings also at 0h. (near Andijan), 4h. (Tinemaha (2) and Tucson (2) ), 5h. (Haiwee, Mount Wilson, Palomar, Riverside, Tinemaha, Tucson, Overton, Pierce Ferry, and Sitka), 10h. (near Andijan and near Irkutsk), 15h. (near Mineral), 17h. (near Branner and Ksara), 18h. (Palomar, Tinemaha, and Tucson), 22h. (Haiwee, Mount Wilson, Riverside, Tinemaha, Tucson, Boulder City, Overton, and Pierce Ferry), 23h. (near Bogota).

Feb. 23d. 22h. 40m. 52s. Epicentre  $46^{\circ}0N$ .  $10^{\circ}1E$ .

Felt at Brescia.

Annales de l'Institut de Physique du Globe de Strasbourg, 2e partie, Séismologie, Nouvelle série, Tome XII, 1947, Strasbourg 1952, p. 8. Epicentre as adopted.

A = +.6863, B = +.1222, C = +.7170;  $\delta = +3$ ;  $h = -4$ ;  
D = +.175, E = -.985; G = +.706, H = +.126, K = -.697.

	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.
			m.	s.		m.	s.		m.	s.	
Chur	1.0	335	e 0	22	+ 1	e 0	39	+ 3	—	—	—
Pavia	z. 1.0	219	e 0	14	- 7	e 0	26	-10	—	—	—
Zürich	1.7	323	e 0	32 <sub>a</sub>	+ 1	e 1	1	$S_g$	c 0	36	$P_g$
Basle	2.3	312	e 0	9	?	e 1	20	$S_g$	—	—	—
Neuchatel	2.4	295	e 0	40	- 1	e 1	11	- 1	—	—	—
Florence	2.4	160	e 1	6	S	(e 1	6)	- 6	e 1	25	$S_g$
Triest	2.6	98	e 1	10	S	(e 1	10)	- 7	i 1	22	$S_g^*$
Stuttgart	2.8	348	e 0	49	+ 2	e 1	26	+ 4	i 1	1 <sub>k</sub>	$P_g$
Strasbourg	3.0	329	e 0	49	- 1	e 1	36	$S_g$	e 1	2	$P_g$
Besançon	3.1	294	e 1	11	$P_g$	i 1	43	$S_g$	—	—	—
Clermont-Ferrand	4.9	270	1	19	+ 2	—	—	—	—	—	2.4
Jena	N. 5.1	11	e 1	34	$P_g^*$	e 1	40	$P_g$	e 2	55	$S_g$
Paris	5.9	302	e 1	28	- 3	e 3	15	$S_g$	i 2	1	$P_g$

Additional readings:—

Stuttgart  $iP_g = 1m.6s.$ ,  $iS = 1m.29s.$ ,  $iS^*? = 1m.43s.$ ,  $iS_gZ = 1m.48s.$

Strasbourg  $iS_g = 1m.48s.$

Paris  $eP_g = 1m.42s.$

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Feb. 23d. Readings also at 0h. (near Berkeley (2), Branner (2), and Lick (2)), 1h. (Bombay, Calcutta, Almata, and Tashkent), 3h. (Tucson, Boulder City, Overton, and Pierce Ferry), 4h. (Boulder City, Overton, Pierce Ferry, and Shasta Dam), 6h. (near Almata), 7h. (near Mizusawa), 17h. (Mount Wilson, Pasadena, Riverside, Tine-maha, Shasta Dam, and Riverview), 19h. (Leninakan and Sverdlovsk), 20h. (near Apia), 21h. (near Ottawa), 23h. (Triest).

Feb. 24d. 6h. 35m. 46s. Epicentre  $41^{\circ}8'N$ .  $71^{\circ}7'E$ . (as on 1946, Dec. 9d.).

A = +.2348, B = +.7099, C = +.6641;  $\delta = +12$ ;  $h = -2$ ;  
D = +.949, E = -.314; G = +209, H = +.630, K = -.748.

	$\Delta$ °	Az. °	P.		O-C.	S.		O-C.	Supp.		L.
			m.	s.	s.	m.	s.	m.	s.	m.	
Andijan	1.2	155	e 0	15	- 9	i 0	30	-11	0 24	P	—
Tchimkent	1.6	288	i 0	37	+ 7	i 1	6	+15	—	—	—
Tashkent	1.9	255	0	40	+ 6	e 1	9	+10	—	—	—
Frunse	2.4	63	i 0	31?	-10	—	—	—	—	—	—
Obi-garm	3.5	207	i 0	56	- 1	i 1	35	- 5	—	—	—
Stalinabad	3.9	216	i 1	4	+ 2	i 1	49	- 1	—	—	—
Almata	4.2	67	i 0	47?	-20	1	37	-20	—	—	—
Samarkand	4.2	241	1	8	+ 1	2	0	+ 3	—	—	—
Sverdlovsk	16.6	338	3	51	- 5	6	47	-13	—	—	—
Grozny	19.1	283	e 4	30	+ 3	—	—	—	—	—	—
Leninakan	20.9	277	e 4	48	+ 2	—	—	—	—	—	—
Bombay	22.8	177	e 5	4	- 1	e 9	14	+ 3	—	—	c 12.2
Sotchi	23.5	285	e 5	21	+ 9	—	—	—	—	—	—
Irkutsk	24.4	53	e 5	10?	-11	e 9	36	- 3	—	—	—
Hyderabad	N. 25.0	165	e 5	23	- 4	9	46	- 3	—	—	—
Warsaw	35.4	304	—	—	—	e 13	12	+38	—	—	c 20.2
Upsala	37.4	318	—	—	—	e 14	3	+58	—	—	c 22.2
Copenhagen	40.2	312	7	38	- 2	—	—	—	—	—	22.2
Jena	N. 41.4	303	e 7	47	- 3	—	—	—	—	—	—
Stuttgart	43.4	301	e 8	4	- 2	—	—	—	c 9 49	PP	—
Strasbourg	44.4	302	e 8	6	- 8	—	—	—	—	—	—
Paris	47.6	304	e 8	38	- 1	—	—	—	—	—	—

Additional readings:—

Warsaw eZ = 14m.38s., eE = 14m.42s., eZ = 15m.2s. and 15m.25s., eN = 15m.56s., eZ = 18m.11s., eE = 18m.33s. and 19m.19s., eZ = 19m.36s., eE = 19m.49s.  
Upsala eN = 15m.49s. and 19m.13s.?  
Jena eN = 7m.54s.  
Strasbourg e = 8m.12s.

Feb. 24d. 17h. 31m. 36s. Epicentre  $15^{\circ}5'S$ .  $68^{\circ}8'W$ . Depth of focus 0.005.

Destructive at Consata. Intensity V recorded at La Paz and felt with considerable strength over a very large area.

Epicentres  $15^{\circ}30'S$ .  $68^{\circ}45'W$ . with deep focus (La Paz).  
 $15^{\circ}6'S$ .  $68^{\circ}36'W$ . (Strasbourg).

Bull. Séismique de l'Observatoire San Calixto, La Paz, Bolivia, p. 6.

A = +.3486, B = -.8989, C = -.2656;  $\delta = +9$ ;  $h = +6$ ;  
D = -.932, E = -.362; G = -.096, H = +.248, K = -.964.

	$\Delta$ °	Az. °	P.		O-C.	S.		O-C.	Supp.		L.
			m.	s.	s.	m.	s.	m.	s.	m.	
La Paz	1.2	147	i 0	18k	- 4	—	—	—	—	—	—
Montezuma	7.1	181	—	—	—	e 2	49	-15	—	—	c 4.2
Huancayo	7.2	297	i 1	45	0	i 3	13	+ 7	—	—	i 3.6
Copiapo	11.9	187	4	9	?	5	9	+ 8	—	—	5.8
Santa Lucia	E. 17.9	185	4	16	+10	7	40	+20	—	—	9.4
La Plata	E. 21.6	153	i 4	36	-10	8	26	-10	—	—	11.2
	N. 21.6	153	i 4	40	- 6	8	33	- 3	5 12	PP	11.0
	Z. 21.6	153	4	43	- 3	i 8	40	+ 4	—	—	11.7
Balboa Heights	26.5	336	e 5	34	+ 1	e 10	0	- 1	—	—	—
Fort de France	31.0	15	e 6	7	- 7	—	—	—	—	—	—
San Juan	33.8	4	e 6	36	- 2	e 11	50	- 6	—	—	e 13.7

Continued on next page.



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	$\Delta$	Az.	P.		O - C.	S.		O - C.	Supp.		L.	
			m.	s.		m.	s.		m.	s.		
Bermuda	47.8	5	e 8	33	0	i 15	22	- 2	e 10	29	PP	e 19.7
Columbia	50.6	346	e 8	58	+ 4	e 16	2	- 1	e 18	37	ScS	e 20.5
Philadelphia	55.5	354	—	—	—	e 17	6	- 3	—	—	—	e 26.6
Fordham	56.3	355	e 9	33	- 3	e 17	19	- 1	—	—	—	—
Pennsylvania	56.6	351	i 9	37	- 2	i 17	21	- 3	—	—	—	e 29.2
St. Louis	57.5	339	i 9	38	- 7	i 17	30	- 6	i 11	37	PP	—
Weston	57.6	357	i 9	44	- 2	e 19	27	ScS	—	—	—	—
Florissant	57.7	339	e 9	51	+ 5	i 17	35	- 3	i 19	24	ScS	—
Chicago	59.6	343	—	—	—	e 17	56	- 7	e 19	44	ScS	e 24.7
Ottawa	60.9	355	10	5	- 3	18	18	- 2	22	54	SS	28.4
Tucson	62.2	320	e 10	14	- 3	e 18	40	+ 4	i 13	50	PPP	e 26.0
Seven Falls	62.4	358	10	15	- 3	18	37	- 2	24	42	SSS	30.4
Pierce Ferry	66.8	321	e 10	44	- 3	—	—	—	—	—	—	—
Rapid City	67.1	337	e 10	48	- 1	i 19	38	+ 2	e 11	19	PcP	e 33.3
Boulder City	67.2	320	e 10	47	- 2	—	—	—	e 39	20	P'P'	—
Overton	67.3	321	e 10	47	- 3	—	—	—	e 39	22	P'P'	—
Riverside	67.5	316	e 10	59	+ 8	—	—	—	—	—	—	—
Mount Wilson	68.1	316	e 11	0	+ 5	—	—	—	i 39	20	P'P'	—
Pasadena	68.1	316	e 10	55	0	e 19	56	+ 8	e 39	21	P'P'	e 37.4
Salt Lake City	68.8	326	e 12	54	PP	e 20	57	+ 60	e 25	33	SS	e 29.0
Haiwee	69.2	319	e 11	5	+ 3	—	—	—	—	—	—	—
Tinemaha	70.0	319	i 11	7	0	—	—	—	i 22	29	?	—
Bozeman	71.9	330	—	—	—	i 20	40	+ 7	e 34	37	Q	e 37.8
Berkeley	73.0	318	e 11	32	+ 7	e 20	49	+ 4	e 20	52	S	e 37.6
Shasta Dam	74.8	320	e 11	31	- 4	—	—	—	—	—	—	—
Saskatoon	74.9	337	—	—	—	i 21	12	+ 6	—	—	—	33.4
Grand Coulee	77.4	328	e 11	49	- 1	—	—	—	—	—	—	—
Lisbon	77.5	43	11	50	0	21	40	+ 5	14	8	PP	35.4
Iviglut	78.2	10	11	58	+ 4	21	40	- 2	—	—	—	—
Malaga	79.8	47	i 11	58	- 5	i 22	0	+ 1	i 12	4	pP	38.7
Granada	80.6	47	i 12	15k	+ 8	i 22	19	+ 11	12	32	PcP	i 40.3
Almeria	81.3	48	i 12	7	- 4	22	23	+ 8	15	19	PP	40.4
Alicante	83.3	47	i 12	29	+ 8	i 22	38	+ 3	12	57	pP	—
Tortosa	85.1	45	i 12	36	+ 6	i 22	59	+ 6	15	30	PP	e 42.4
Algiers	85.3	50	i 12	39	+ 8	22	59	+ 4	—	—	—	e 46.4
Barcelona	86.5	45	e 12	42	+ 5	i 23	7	+ 1	—	—	—	e 42.1
Clermont-Ferrand	88.9	42	i 12	52k	+ 4	i 23	13	[+ 3]	—	—	—	41.4
Kew	89.2	35	i 12	56a	+ 6	e 23	34	+ 2	e 16	22	PP	e 42.4
Edinburgh	89.7	31	—	—	—	e 23	16	[+ 1]	—	—	—	—
Paris	89.7	39	e 12	52	0	e 23	18	[+ 3]	i 16	22	PP	e 41.4
Durham	90.0	33	e 16	41	PP	i 23	13	[- 4]	i 24	50	PS	—
Aberdeen	90.9	30	—	—	—	i 23	48	+ 1	i 23	8	SKS	e 41.6
Sitka	91.0	330	—	—	—	e 23	52	+ 4	e 29	20	SS	e 43.8
Besançon	91.3	42	—	—	—	e 23	24	[ 0]	—	—	—	e 46.4
Scoresby Sund	91.6	14	e 13	11	+ 10	23	29	[+ 3]	23	57	S	—
Uccle	91.6	37	e 13	6k	+ 5	e 23	27	[+ 1]	e 16	33	PP	e 41.4
Neuchatel	91.8	42	e 13	0	- 2	—	—	—	e 16	19	PP	—
Basle	92.4	41	e 13	7	+ 2	e 23	35	[+ 4]	—	—	—	—
De Bilt	92.6	36	i 13	11k	+ 5	e 24	1	- 1	e 16	45	PP	e 38.4
Strasbourg	92.9	40	i 12	41k	- 26	e 23	35	[+ 1]	e 16	14	PP	e 43.5
Zürich	93.0	41	e 13	4	- 4	e 23	27	[- 7]	e 16	40	PP	—
Chur	93.4	43	e 13	6	- 3	—	—	—	e 16	49	PP	e 48.0
Florence	93.6	47	e 13	19	+ 9	e 24	7	- 4	i 16	48	PP	i 46.9
Stuttgart	93.8	40	e 13	7	- 4	e 23	39	[ 0]	—	—	—	e 45.4
Rome	93.9	48	e 13	14	+ 2	e 23	42	[+ 3]	e 16	54	PP	e 42.4
Bergen	95.7	28	e 13	24	+ 4	24	24?	- 4	e 16	54	PP	45.4
Triest	95.8	45	e 12	54?	- 26	i 23	34?	[- 15]	e 16	34?	PP	e 44.4
Jena	96.0	39	e 13	18	- 3	e 24	29	- 2	e 17	2	PP	—
Cheb	96.2	40	e 13	29	+ 7	e 23	55	[+ 4]	e 16	31	PP	e 46.4
Prague	97.5	40	e 14	32	+ 64	e 24	59	+ 15	25	42	SKKS	e 43.4

Continued on next page.

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	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.	
	°	°	m.	s.	s.	m.	s.	s.	m.	s.	m.	
Copenhagen	97.8	34	i 13	37	+ 8	i 24	49	+ 3	i 17	26	PP	46.4
Christchurch	98.8	220	17	44	PP	24	14	[+ 9]	26	39	PS	46.0
College	99.3	335	—	—	—	c 24	54	- 5	c 31	18	SS	e 39.9
Budapest	E. 99.8	44	c 16	24?	PP	26	41	PS	—	—	—	e 49.4
Belgrade	100.2	47	e 14	25	+45	c 26	13	PS	i 27	50	PPS	42.4
Upsala	101.5	31	c 15	16	?	i 24	15	[- 3]	18	14	PP	e 46.4
Warsaw	102.0	39	c 17	16k	PP	i 28	5	PPS	—	—	—	e 53.4
Bucharest	104.1	48	18	24?	PP	34	24?	?	—	—	—	—
Helsinki	105.2	30	c 18	26	PP	c 24	34	[- 1]	c 20	32	PPP	e 49.4
Istanbul	105.9	52	c 14	8	P	c 27	2	PS	—	—	—	—
Helwan	106.2	64	14	13	P	24	44	[+ 4]	18	24	PP	—
Ksara	110.5	61	c 19	13	PP	c 28	43	PS	—	—	—	—
Moscow	111.9	36	19	7	PP	25	3	[+ 3]	26	4	SKKS	—
Leninakan	117.0	52	20	0	PP	29	35	PS	—	—	—	—
Erevan	117.6	53	—	—	—	c 29	27	PS	—	—	—	—
Riverview	117.9	217	c 19	53	PP	i 25	37	[+11]	c 29	41	PS	e 54.9
Grozny	118.3	49	i 20	3	PP	—	—	—	—	—	—	—
Brisbane	121.1	224	—	—	—	c 25	40	[+ 3]	—	—	—	—
Sverdlovsk	124.0	31	18	51	[ 0]	25	47	[ 0]	i 20	31	PP	—
Tashkent	135.7	46	c 22	40	PKS	28	35	SKKS	—	—	—	—
Stalinabad	136.3	50	i 19	16	[+ 2]	c 21	46	PP	i 19	28	pPKP	—
Irkutsk	142.9	8	19	27	[+ 1]	c 26	32	[+ 5]	23	3	PKS	—
Bombay	143.2	79	i 19	32	[+ 5]	—	—	—	i 22	47	PP	—
New Delhi	N. 146.0	62	i 19	42	[+10]	i 33	11	PS	22	59	PP	—
Kodaikanal	E. 146.7	94	c 19	45	[+12]	—	—	—	—	—	—	—
Vladivostok	147.3	332	i 19	37	[+ 3]	26	29	[- 5]	c 22	22	PP	—
Colombo	E. 148.1	102	19	46	[+11]	—	—	—	—	—	—	77.2
Hyderabad	148.6	82	19	47	[+11]	29	53	SKKS	23	3	PP	66.5
Calcutta	N. 157.3	68	c 20	31	PKP <sub>2</sub>	c 26	21	[-25]	—	—	—	—

Additional readings :—

Huancayo i = 2m.15s.  
 La Plata E = 6m.54s.  
 Bermuda eSS = 18m.24s.  
 Columbia eSS = 19m.49s.  
 Philadelphia iS = 17m.13s.  
 St. Louis iZ = 9m.46s.  
 Weston i = 10m.1s.  
 Tucson ePKP, PKP = 39m.37s.  
 Pasadena i = 11m.2s.  
 Grand Coulee e = 11m.57s.  
 Lisbon iZ = 11m.57s.k  
 Malaga iPPZ = 15m.8s., iPPPZ = 17m.0s., sSZ = 22m.30s., PSZ = 22m.52s.  
 Granada PP = 14m.56s., PPP = 17m.2s., PS = 22m.5s., SS = 26m.40s.  
 Almeria PPP = 17m.7s., PS = 23m.7s., i = 24m.15s., SS = 27m.35s., SSS = 31m.7s.  
 Alicante P<sub>c</sub>P = 12m.37s., PP = 15m.58s., PPP = 17m.46s., S<sub>c</sub>S = 23m.8s., PS = 23m.30s.,  
 PPS = 23m.56s., sS = 25m.6s., SSS = 31m.24s.  
 Tortosa PPPE = 17m.50s., S<sub>c</sub>SE = 22m.49s.  
 Kew eSKSE = 23m.6s.?, ePSN = 24m.35s., ePPSEZ = 24m.56s., eSSE = 29m.6s.,  
 eSSSN = 33m.26s., ePKKS?E = 33m.52s.  
 Paris e = 12m.57s., iPPS = 24m.46s., e = 26m.44s., eSS = 28m.30s., eSSS? = 31m.24s.?  
 Durham iEN = 23m.42s.  
 Aberdeen iEN = 24m.58s.  
 Uccle ePSN = 25m.5s., eSSE = 29m.42s.  
 De Bilt eSKS = 23m.33s., ePS = 25m.19s.  
 Strasbourg ePPP? = 16m.47s., ePS = 25m.19s., e = 28m.34s., and 30m.34s.  
 Florence eS = 24m.51s., iPS = 25m.44s.  
 Stuttgart e = 13m.16s. and 24m.54s.  
 Rome eS?E = 23m.52s., ePS? = 24m.48s., eE = 30m.34s.  
 Bergen eE = 32m.20s.  
 Trieste eSKS = 23m.14s.?, iPPS = 24m.44s.?  
 Jena eE = 23m.52s.  
 Cheb ePS = 25m.54s., eSS = 31m.24s.?, eSSS = 34m.24s.?, ePPP ( $\Delta > 180^\circ$ ) = 38m.24s.?,  
 e = 45m.24s.?  
 Copenhagen i = 24m.2s., PS = 26m.12s., PPS = 26m.56s., SS = 31m.42s.  
 Christchurch SSEZ = 31m.10s., SSSE = 35m.58s., eE = 37m.47s.  
 College eSSS = 36m.52s.  
 Upsala SKSN = 24m.10s., ePSE = 26m.43s., eSSE = 32m.24s.?, SSSN = 36m.5s.  
 Warsaw eZ = 20m.10s., eE = 20m.18s., iPPZ = 21m.17s., ePPE = 21m.40s., eZ = 22m.15s.,  
 and 23m.3s., iPPPZ = 23m.33s., SZ = 28m.49s., SE = 29m.11s., PSZ = 30m.15s.,  
 iPPSE = 30m.54s., PPSZ = 30m.57s., eN = 31m.15s., eE = 36m.17s., eN = 36m.25s.,  
 eE = 40m.15s., eN = 40m.59s., iZ = 41m.7s.

Continued on next page.

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Helsinki e = 27m.38s. and 33m.8s.  
 Helwan PPPZ = 20m.44s., ePSE = 27m.39s.  
 Moscow PS = 28m.39s.  
 Riverview iPPZ = 20m.6s., ePSE = 29m.51s., ePSZ = 29m.56s., eE = 31m.5s., eSSE = 36m.4s.  
 Sverdlovsk SKKS = 27m.21s., PS = 30m.14s., PPS = 31m.44s., SS = 37m.0s., SSS = 42m.18s.  
 Irkutsk ePPP = 25m.25s., eSKKS = 29m.11s., SS = 40m.48s., SSS = 46m.24s.?  
 New Delhi SSN = 41m.40s., SSSN = 45m.44s.  
 Vladivostok PKS = 23m.1s., iSS = 42m.1s.  
 Hyderabad SSN = 42m.6s.  
 Long waves were also recorded at Butte, Lincoln, Potsdam, Zagreb, Arapuni, Auckland, Wellington, and Tananarive.

Feb. 24d. Readings also at 5h. (Samarkand, near Almata, Andijan, Frunse, and Obi-garm), 9h. (Bogota), 10h. (Tinemaha, Tucson, Overton, and Pierce Ferry), 16h. (Jena, Basle, Strasbourg, Stuttgart, Barcelona, and near Tortosa), 18h. (near Branner), 19h. (near Andijan and Frunse), 20h. (near Almata, Andijan, Obi-garm (2), Samarkand (2), Stalinabad (2), Tashkent (2), and Tchimkent (2)), 23h. (Almata Tashkent, near Andijan, Frunse and Tchimkent).

Feb. 25d. 23h. Japanese shock.

Mizusawa ePN = 25m.10s., SE = 25m.52s.  
 Shasta Dam iP = 35m.37s.  
 Palomar iPZ = 35m.51s., iZ = 36m.7s. and 36m.32s.  
 Tinemaha iPZ = 36m.6s., iZ = 36m.21s.  
 Haiwee iPZ = 36m.7s.  
 Copenhagen P = 36m.8s.  
 Mount Wilson iPZ = 36m.14s., i = 36m.32s.  
 Riverside iPZ = 36m.15s.  
 Boulder City eP = 36m.19s.  
 Pierce Ferry eP = 36m.23s.  
 Pasadena iZ = 36m.32s.  
 Stuttgart eZ = 36m.42s.  
 Tucson eP = 36m.45s.

Feb. 25d. Readings also at 2h. (Boulder City, near Pierce Ferry and Overton), 5h. (Moscow), 7h. (near Apia), 8h. (near Balboa Heights), 9h. (near Andijan), 11h. (Tucson and near Fresno), 12h. (near Fresno and near Obi-garm, Stalinabad, and Samarkand), 15h. (near Helwan), 18h. (Berkeley and near Irkutsk), 20h. (near Mineral), 22h. (near Andijan).

Feb. 26d. 1h. 50m. 28s. Epicentre 10°·5N. 88°·2W.

A = +·0309, B = -·9830, C = +·1811;  $\delta$  = +4; h = +6;  
 D = -1·000, E = -·031; G = +·006, H = -·181, K = -·984.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Bogota	15·2	111	(e 3 23)	-15	(i 6 47)	SS	(e 3 44)	PP
San Juan	22·7	67	e 4 58	- 6	—	—	e 5 43	PP e 10·8
Huancayo	25·8	149	e 6 14	PP	e 10 45	SS	—	e 12·5
St. Louis	28·1	357	i 5 55	0	i 10 45	+ 5	i 6 14	? 15·5
Florissant	28·3	357	e 5 55	- 2	i 10 51	+ 8	—	— 15·5
Tucson	30·1	319	e 6 12	- 1	e 11 18	+ 6	i 7 1	PP e 13·9
Chicago	31·4	2	e 7 6	PP	e 11 36	+ 4	—	— e 12·9
La Paz	33·4	142	e 6 43	+ 1	—	—	—	— 21·5
Pierce Ferry	34·6	322	i 6 53	0	—	—	—	—
Palomar	34·8	315	i 6 55 <sub>a</sub>	+ 1	—	—	i 8 14	PP
Boulder City	35·0	321	i 6 56	0	—	—	i 7 4	? —
Overton	35·1	322	i 6 57	0	—	—	—	—
Riverside	z. 35·5	316	i 7 1	+ 1	—	—	e 9 42	P <sub>c</sub> P —
Mount Wilson	z. 36·1	316	i 7 6	+ 1	—	—	i 7 16	? —
Pasadena	36·1	316	i 7 6	+ 1	—	—	e 8 29	PP e 20·5
Ottawa	36·3	15	c 7 10	+ 3	—	—	—	— 19·5
Haiwee	z. 37·1	318	e 7 15	+ 1	—	—	—	—
Tinemaha	37·9	319	i 7 21	+ 1	—	—	i 9 49	P <sub>c</sub> P —
Shasta Dam	42·6	321	e 7 59	0	—	—	i 10 3	P <sub>c</sub> P —

For Notes see next page.

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NOTES TO FEBRUARY 26d. 1h. 50m. 28s.

Additional readings:—

Bogota eS<sub>c</sub>S? = (14m.42s.), readings reduced by 1m.

Tucson iP = 6m.17s., i = 6m.26s. and 6m.49s.

Palomar iNZ = 7m.7s.

Long waves were also recorded at Bermuda, College, Fort de France, Salt Lake City, Butte, Harvard, Weston, Warsaw, Strasbourg, Paris, De Bilt, Uccle, Copenhagen, Cheb, and Istanbul.

Feb. 26d. 5h. 42m. 38s. Epicentre 39°·0N. 15°·2E. Depth of focus 0·030.  
(as on 1943, Sept. 17d.).

A = +·7519, B = +·2043, C = +·6268;  $\delta = -3$ ;  $h = -1$ ;  
D = +·262, E = -·965; G = +·605, H = +·164, K = -·779.

	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Chur	8·9	334	e 2 8	+ 2	c 3 51	+ 7	—	—
Zürich	9·7	332	e 2 16 <sub>a</sub>	0	c 4 2	0	—	—
Neuchatel	10·0	326	e 2 20	0	c 4 10	+ 1	—	—
Basle	10·2	330	e 2 22	0	c 4 8	- 6	—	—
Besançon	10·6	324	e 2 27	0	4 23	0	—	—
Stuttgart	10·7	338	e 2 28	- 1	c 4 26	+ 1	e 3 19	? e 4·7
Istanbul	10·8	75	—	—	c 4 58	SS	—	—
Strasbourg	11·0	333	e 2 33	+ 1	c 4 32	0	e 2 50	PP
Clermont-Ferrand	11·2	311	e 2 27	- 8	—	—	e 2 38	PP
Jena	N. 12·2	349	c 2 47	- 1	e 5 4	+ 4	—	—
Paris	13·4	321	i 3 2	- 1	—	—	i 3 11	PP
Warsaw	13·8	15	3 9 <sub>a</sub>	+ 1	5 48	+12	c 8 33	P <sub>c</sub> P
Helwan	Z. 16·2	120	i 3 34 <sub>k</sub>	- 3	e 6 30	+ 1	3 46	PP
Copenhagen	16·8	354	c 3 39	- 5	i 6 40	- 2	—	—
Ksara	17·4	100	c 3 51	+ 1	c 7 6	+11	—	—
Leninakan	21·9	75	c 4 40	+ 4	—	—	—	—
Moscow	22·4	34	4 38	- 2	8 28	+ 1	—	—
Sverdlovsk	34·5	43	6 11?	-18	—	—	—	—
Weston	62·9	304	i 9 58	- 6	—	—	—	—
St. Louis	Z. 76·8	309	e 11 25	- 3	—	—	—	—

Additional readings:—

Strasbourg e = 4m.30s. and 4m.53s.

Paris i = 3m.6s.

Warsaw eN = 8m.1s.

Feb. 26d. Readings also at 3h. (Andijan, Samarkand, near Obi-garm and Stalinabad), 4h. (Colombo, Calcutta, Hyderabad, Kodaikanal, Bombay, and New Delhi), 5h. (Riverview), 8h. (near Obi-garm, Stalinabad, and Andijan), 11h. (near Frunse), 13h. (near Andijan, Frunse, and Tchimkent), 14h. (Tinemaha, Mount Wilson, Tucson, Christchurch, and near Granada), 15h. (Riverview, Brisbane, and Jena), 16h. (near Lick), 20h. (near Branner), 21h. (Grand Coulee), 22h. (Tucson).

Feb. 27d. Readings at 1h. (Tinemaha, Riverside, and Tucson), 2h. (near Obi-garm), 8h. (Strasbourg), 10h. (near Balboa Heights), 15h. (near Andijan, Frunse, and Tchimkent), 16h. (Branner and near Lick), 17h. (Mount Wilson, Tinemaha, and Tucson), 18h. (near Grozny), 20h. (St. Louis, Tinemaha (2), Tucson (2), Prague, Cheb, Uccle, Strasbourg, Stuttgart (2), and near Malaga), 21h. (Lick, Strasbourg, Uccle, and Cheb).

Feb. 28d. Readings at 0h. (near Branner), 1h. (near Bogota), 3h. (near Bagota and near San Juan), 4h. (Riverside, Tinemaha, Tucson, Shasta Dam, Christchurch, Riverview, and Stuttgart), 6h. (St. Louis), 9h. (Riverside, Tinemaha, Tucson, La Paz, and near Montezuma), 10h. (Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, Pierce Ferry, and Shasta Dam), 13h. (Strasbourg), 18h. (near Istanbul), 19h. (Copenhagen, Stuttgart, Haiwee, Mount Wilson, Riverside, Tinemaha, Tucson, Boulder City, Shasta Dam, Overton, Pierce Ferry, near Mizusawa, and near Andijan), 20h. (Istanbul), 21h. (Copenhagen, Strasbourg, Stuttgart, and Branner), 22h. (near Leninakan and near Mizusawa), 23h. (Tucson, Sotchi, near Piatigorsk (2), Grozny (2), Erevan, and Leninakan (2)).

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March 1d. 3h. East Indies. Russian stations are all in approximately the same Azimuth.

Andijan eP = 20m.29s., eS = 28m.7s  
 Almata eP = 20m.32s.  
 Frunse eP = 20m.43s.  
 Tashkent eP = 20m.44s.?, eS = 28m.32s.?  
 Samarkand eP = 20m.45s.  
 Sverdlovsk iP = 22m.22s., eS = 31m.37s.  
 Shasta Dam eP = 30m.2s.  
 Riverside eP = 30m.9s.  
 Tinemaha iP = 30m.13s., i = 30m.28s., e = 33m.21s.  
 Haiwee iP = 30m.14s.  
 Tucson eP? = 30m.14s., e = 30m.29s. and 33m.58s.  
 Mount Wilson eP = 30m.16s., i = 30m.31s., e = 32m.32s.  
 Pasadena eP = 30m.16s., e = 30m.30s.  
 Florissant ePEN? = 30m.36s.  
 St. Louis ePNZ? = 30m.36s., iZ = 30m.51s.

March 1d. Readings also at 3h. (St. Louis), 4h. (Tinemaha and Tucson), 8h. (near Mizusawa), 9h. (Strasbourg), 10h. (Tucson, Shasta Dam, Lick, near Fresno, Boulder City, Overton, and Pierce Ferry), 12h. (Haiwee, Mount Wilson, Riverside, Tinemaha, Tucson, Shasta Dam, and Pierce Ferry), 13h. (Almata, Samarkand, near Andijan, Frunse, Obi-garm, Stalinabad, and Tashkent), 15h. (near Mizusawa), 19h. (Tinemaha, Tucson, and Shasta Dam), 21h. (Pasadena (2), Mount Wilson (2), Palomar (2), Riverside (2), Tinemaha (2), Tucson (2), Overton, Pierce Ferry, Shasta Dam, Florissant, St. Louis, and Harvard (2)).

March 2d. 19h. 9m. 28s. Epicentre 5°·0S. 144°·5E. (focus at Base of Superficial Layers).

Not intended as approximate determination.

A = -·8110, B = +·5785, C = -·0866;  $\delta$  = -12;  $h$  = +7;  
 D = +·581, E = +·814; G = +·071, H = -·050, K = -·996.

	N.	$\Delta$		Az.		P.		O - C.		S.		O - C.		Supp.		L. m.	
		°	°	m.	s.	s.	m.	s.	s.	m.	s.	m.	s.				
Brisbane		23·8	161	15	7	-	4	i	9	24	+ 3	15	32	PP	1	13·4	
Riverview		29·4	168	i	6	1 <sub>a</sub>	-	1	i	10	55	+ 2	i	7	0	PP	—
Perth		37·9	220	i	7	17	+ 1	i	13	5	0	i	8	42	PP	—	
Kagosima		38·7	340	e	7	38	+16	—	—	—	—	—	—	—	—	—	
Miyazaki		38·8	342	e	7	8	-15	i	13	14	- 4	—	—	—	—	16·1	
Siomisaki		39·1	349	7	35	+ 9	—	13	14	- 9	—	—	—	—	—	—	
Koti		39·7	345	e	7	24	- 7	13	31	- 1	—	—	—	—	—	—	
Sumoto		40·2	348	7	36	+ 1	—	13	32	- 7	—	—	—	—	—	—	
Misima		40·3	354	e	7	37	+ 1	13	32	- 9	—	—	—	—	—	—	
Osaka		40·3	349	e	7	31	- 5	—	—	—	—	—	—	—	—	—	
Yokohama		40·5	354	e	7	13	-24	e	12	10	?	—	—	—	—	—	
Hunatu		40·7	353	7	38	- 1	—	13	37	-10	—	—	—	—	—	—	
Tokyo		40·7	354	7	39	0	—	9	56	PPP	—	—	—	—	—	—	
Mito		41·3	355	e	7	51	+ 7	—	—	—	—	—	—	—	—	—	
Hamada		41·4	343	e	7	48	+ 3	—	—	—	—	—	—	—	—	—	
Utunomiya		41·6	354	e	7	46	0	13	46	-14	—	—	—	—	—	—	
Nagano		41·9	351	e	7	50	+ 1	—	—	—	—	—	—	—	—	—	
Auckland		42·1	142	7	56	+ 6	—	14	9	+ 1	—	—	—	—	—	18·5	
New Plymouth		43·2	145	8	1	+ 1	—	14	32	+ 8	17	56	S <sub>c</sub> S	—	—	—	
Arapuni		43·4	143	—	—	—	—	15	2	+35	18	8	S <sub>c</sub> S	—	—	23·7	
Mizusawa		44·0	357	8	5	- 1	—	14	30	- 5	—	—	—	—	—	—	
Nanking		44·2	328	e	11	29	?	—	—	—	e	17	50	S <sub>c</sub> S	—	—	
Miyako		44·5	358	8	9	- 1	—	14	38	- 4	—	—	—	—	—	—	
Morioka		44·6	357	e	8	9	- 2	—	—	—	—	—	—	—	—	—	
Akita		44·7	355	e	8	21	+ 9	—	—	—	—	—	—	—	—	—	
Tuai		44·8	143	8	14	+ 2	—	—	—	—	18	0	S <sub>c</sub> S	—	—	—	
Wellington		45·1	147	8	12	- 3	—	14	48	- 3	8	27	sP	—	—	—	
Christchurch		45·7	151	e	8	17	- 3	15	1	+ 1	10	0	PP	—	—	21·5	
Mori		47·0	356	e	8	42	+12	e	15	13	- 5	1	10	26	PP	—	
Sapporo		47·9	357	e	8	41	+ 4	—	—	—	—	—	—	—	—	—	

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	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.	
	°	°	m.	s.	s.	m.	s.	s.	m.	s.	m.	
Vladivostok	49.2	347	i 8	47	0	i 15	53	+ 4	i 10	47	PP	—
Calcutta	61.3	299	e 10	14	0	i 18	26	- 5	i 19	5	sS	—
Honolulu	62.3	63	e 10	37	+16	i 18	44	0	e 23	44	SS	e 25.8
Colombo	65.6	280	10	43	0	(19 49)		+25	—		—	19.8
Irkutsk	66.5	334	10	45	- 3	19	48	PS	i 23	43	SS	—
Hyderabad	68.9	290	10	58	- 5	20	0	- 4	13	27	PP	33.4
New Delhi	72.7	302	i 10	54	-32	i 20	43	- 5	21	12	PS	—
Bombay	74.4	291	i 11	35	- 1	i 21	4	- 3	25	59	SS	31.6
Almata	77.4	317	e 11	54	+ 1	21	38	- 2	—		—	—
Frunse	78.9	315	e 12	2	0	e 21	54	- 2	—		—	—
Andijan	79.9	312	12	6	- 1	i 22	3	- 4	—		—	—
Obi-garm	81.4	310	12	13	- 2	22	18	- 4	—		—	—
Stalinabad	82.0	310	i 12	20	+ 2	i 22	27	- 2	—		—	—
Tashkent	82.3	313	e 12	18	- 2	e 22	29	- 3	—		—	—
Tchimkent	82.3	314	i 12	20	0	i 22	27	- 5	—		—	—
Samarkand	83.6	310	i 12	24	- 2	22	40	- 5	—		—	—
College	85.2	24	e 12	32	- 2	i 22	47	[- 6]	e 15	44	PP	e 38.7
Sitka	88.9	32	e 12	49	- 3	i 23	17	[ 0]	i 29	42	SS	e 36.1
Sverdlovsk	90.8	327	i 12	58	- 3	i 23	46	- 7	16	37	PP	—
Tananarive	94.9	251	e 17	29	PP	24	24	- 5	23	55	SKS	e 45.3
Victoria	95.1	42	e 17	0	PP	i 24	56	PS	—		—	42.5
Berkeley	95.6	53	i 13	24	+ 1	i 23	53	[- 2]	i 17	18	PP	e 43.1
Shasta Dam	95.6	49	e 13	22	- 1	—		—	—		—	—
Santa Clara	95.8	53	i 17	33	PP	e 31	37	SSP	—		—	e 44.0
Grand Coulee	98.1	42	e 13	34	0	—		—	—		—	—
Tinemaha	98.8	53	e 13	37	- 1	e 24	10	[- 2]	—		—	—
Pasadena	98.8	56	e 13	37	- 1	i 24	10	[- 2]	e 17	54	PP	i 45.1
Mount Wilson	98.9	56	i 13	40	+ 2	e 24	14	[+ 2]	—		—	—
Haiwee	99.0	54	e 13	39	+ 1	e 24	13	[ 0]	—		—	—
Riverside	99.5	56	e 13	40	- 1	e 24	13	[- 2]	—		—	—
Grozny	99.8	312	e 14	7	+25	24	45	[+28]	i 18	17	PP	—
Palomar	99.9	57	i 13	44	+ 1	i 24	19	[+ 2]	e 17	50	PP	—
Boulder City	101.5	54	e 13	50	0	e 24	28	[+ 3]	e 17	55	PP	—
Pierce Ferry	102.2	54	e 13	51	- 2	i 24	31	[+ 2]	e 17	19	PP	—
Butte	102.6	43	—		—	i 24	32	[+ 2]	e 25	39	S	e 42.7
Logan	103.5	48	e 17	19	PP	i 24	34	[ 0]	i 27	21	PS	e 47.6
Salt Lake City	103.6	49	e 17	39	PP	i 24	37	[+ 2]	e 27	17	PS	e 42.7
Moscow	103.6	327	13	57	- 2	24	31	[- 4]	i 18	14	PP	—
Bozeman	103.7	43	—		—	i 24	31	[- 4]	e 25	7	S	e 56.9
Tucson	105.1	58	e 14	6	0	e 24	43	[+ 2]	e 17	58	PKP	—
Saskatoon	105.5	37	18	56	PP	25	6	[+23]	27	59	PS	49.5
Ksara	108.2	303	e 18	18	[- 6]	e 28	58	PS	—		—	—
Helsinki	108.7	333	e 18	57	PP	e 24	54	[- 4]	e 26	18	S	e 46.5
Rapid City	109.4	44	i 18	59	PP	e 24	58	[- 2]	e 26	34	S	e 52.4
Upsala	112.1	334	19	18	PP	25	24	[+13]	26	52	S	e 50.5
Istanbul	112.3	313	i 19	17	PP	e 28	29	PS	—		—	—
Helwan	112.5	301	e 14	38	P	27	2	S	19	11	PP	—
Bucharest	113.6	317	e 19	8	PP	e 28	42	PS	—		—	40.5
Scoresby Sund	114.0	355	19	37	PP	e 25	19	[ 0]	28	59	PS	—
Warsaw	114.0	326	e 19	2	?	e 25	20	[+ 1]	i 19	24	PP	e 55.5
Lincoln	114.9	47	i 19	52	PP	i 25	20	[- 2]	e 30	15	PPS	e 52.5
Hergen	116.7	340	e 20	7	PP	—		—	—		—	58.5
Copenhagen	116.7	332	e 18	40	[- 1]	25	26	[- 2]	i 29	20	PS	—
Budapest	117.1	322	e 19	51	PP	e 25	32	[+ 2]	e 29	42	PS	e 57.5
Belgrade	117.2	319	e 18	43	[+ 1]	e 25	34	[+ 3]	e 19	51	PP	e 54.5
Prague	118.7	326	e 19	47	[+62]	e 26	26	[+49]	e 20	38	PP	e 54.5
Cheb	119.8	327	e 20	14	PP	e 25	38	[- 2]	e 29	57	PS	e 58.5
Jena	119.8	328	e 18	51	[+ 4]	—		—	—		—	—
Florissant	120.1	48	i 20	28	PP	i 25	42	[+ 1]	i 30	4	PS	—
St. Louis	120.3	48	e 18	48	[ 0]	i 25	42	[+ 1]	i 20	16	PP	—
Chicago	121.0	43	e 22	51	PPP	i 25	40	[- 4]	e 30	11	PS	e 48.5
Triest	121.2	322	e 20	42	PP	e 25	42	[- 3]	e 23	7	PPP	—
Stuttgart	122.2	327	e 18	51k	[ 0]	e 30	10	PS	i 20	34	PP	e 58.5
De Bilt	122.3	332	e 20	32	PP	e 37	3	SS	e 23	17	PPP	e 55.5
Strasbourg	123.1	328	e 18	49	[- 4]	e 26	1	[+10]	e 20	35	PP	e 50.5

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	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.
	$^{\circ}$	$^{\circ}$	m.	s.	s.	m.	s.	s.	m.	s.	m.
Durham	123.3	337	i 20	9	PP	i 40	29	SSS	---	---	---
Zürich	123.4	326	e 18	51	[- 3]	---	---	---	---	---	---
Uccle	123.5	332	e 20	38	PP	e 22	9	PKS	e 30	25	PS e 56.5
Rome	123.7	318	i 18	54	[- 0]	e 25	49	[- 4]	i 20	32	PP
Kew	125.2	334	i 20	49	PP	e 27	41	?	i 23	44	PPP e 57.5
Paris	125.7	330	i 18	58	[- 0]	e 25	36?	[- 23]	i 20	51	PP e 64.5
Ottawa	126.7	34	18	58	[- 2]	e 25	58	[- 4]	20	32?	PP 56.5
Clermont-Ferrand	127.4	326	e 18	33	[- 29]	e 22	13	PKS	e 21	4	PP 60.5
Seven Falls	128.2	29	19	2	[- 1]	e 26	4	[- 2]	21	14	PP 60.5
Columbia	128.9	49	e 22	18	PKS	e 29	44	S	e 38	28	SS e 51.1
Philadelphia	130.1	40	e 20	48	PP	i 22	22	PKS	i 38	38	SS e 46.8
Fordham	130.5	38	e 21	36	PP	i 22	26	PKS	e 38	47	SS e 64.5
Barcelona	130.6	323	---	---	---	e 22	28	PKS	---	---	e 66.4
Weston	131.0	34	i 22	27	PKS	e 39	6	SS	---	---	e 58.9
Tortosa	131.9	323	21	36	PP	24	47	PPP	22	59	PKS e 77.5
Algiers	132.6	317	e 18	32	[- 40]	e 29	32?	SKKS	i 21	55	PP
Alicante	134.0	322	19	20	[+ 6]	25	4	?	24	14	PPP e 53.2
La Plata	135.0	153	19	14	[- 2]	22	42	PKS	21	47	PP
Almería	136.2	321	i 19	16	[- 2]	26	10	[- 14]	19	36	pPKP 64.5
Granada	136.7	323	i 20	19	[+ 60]	e 27	4	[+ 39]	i 20	34	pPKP 65.8
Huancayo	136.9	114	e 19	22	[+ 3]	i 22	54	PKS	e 19	39	pPKP e 55.6
Malaga	z. 137.5	323	19	22	[+ 1]	i 26	27	[+ 1]	19	34	pPKP e 72.8
Lisbon	138.8	329	19	25 <sup>a</sup>	[+ 2]	22	19	PKS	22	56	PP 73.4
La Paz	141.3	125	i 19	22	[- 5]	29	40	SKKS	i 19	50	pPKP 74.5
Bermuda	141.5	42	i 19	36	[+ 8]	i 25	49	[- 43]	i 22	44	PP e 56.7
Bogota	z. 141.6	89	e 19	29	[+ 1]	---	---	---	---	---	---
San Juan	147.3	63	i 19	41	[+ 3]	i 29	50	SKKS	e 23	24	PP e 61.9
Fort de France	153.0	68	e 19	32	[- 14]	---	---	---	---	---	---

Additional readings :—

Brisbane  $iP_cPN = 8m.43s.$   
 Riverview  $iNZ = 6m.42s., iPPPNZ = 7m.13s., isSN = 11m.10s., iN = 11m.34s., iEZ = 11m.50s., iSS?Z = 12m.21s.$   
 Tokyo  $e = 8m.21s., i = 8m.49s.$   
 New Plymouth  $i = 8m.25s.$   
 Wellington  $i = 8m.49s., P_cP = 10m.16s., pP_cPZ = 12m.43s., P_cS? = 13m.52s., sSS = 16m.57s., S_cS = 18m.2s., sS_cS = 18m.32s.$   
 Christchurch  $iP = 8m.21s., EZ = 11m.8s., P_cSE = 13m.42s., S_cSN = 18m.8s., QE = 18m.29s.$   
 Vladivostok  $PPP = 11m.36s., iSS = 19m.4s.$   
 Calcutta  $SSN = 22m.53s.$   
 Honolulu  $eS = 18m.36s., e = 20m.54s.$   
 Hyderabad  $P_cPE = 11m.12s., PSE = 20m.24s., S_cSE = 21m.9s., SSE = 24m.2s.$   
 New Delhi  $iN = 11m.37s. and 21m.47s., SSN = 25m.14s.$   
 Bombay  $SSE = 26m.6s.$   
 College  $i = 12m.47s., ePS = 23m.42s., eSS = 28m.1s., eSSS = 32m.18s.$   
 Sitka  $i = 13m.7s. and 25m.19s., iPPS = 25m.44s.$   
 Sverdlovsk  $iSKS = 23m.23s., PS = 24m.56s., SS = 29m.54s., SSS = 33m.42s.$   
 Tananarive  $SSN = 30m.7s.$   
 Victoria  $i = 22m.58s.$   
 Berkeley  $iE = 31m.24s.$   
 Santa Clara  $ePPE = 22m.58s.$   
 Pasadena  $eZ = 16m.40s., iZ = 24m.40s., ePSEZ = 26m.21s., eQN = 40m.56s.$   
 Palomar  $eE = 17m.29s.$   
 Pierce Ferry  $ePS = 27m.5s., e = 34m.9s.$   
 Butte  $iSKKS? = 25m.2s., ePS = 27m.40s., e = 30m.14s., eSS = 32m.16s.$   
 Salt Lake City  $ePP = 18m.33s., iSKKS = 25m.12s., ePPS = 28m.40s., e = 31m.8s., eSS = 33m.30s., eSSS = 36m.47s.$   
 Moscow  $SKKS = 25m.4s., S = 25m.39s., PS = 27m.13s.$   
 Bozeman  $e = 27m.19s., eSSS? = 36m.40s.$   
 Tucson  $iPP = 18m.24s., e = 22m.6s., eSKKS = 25m.13s., eS = 26m.10s., iPS = 27m.32s., i = 28m.9s., iPKKP = 30m.4s., e = 31m.42s., eSS = 33m.17s., e = 33m.58s., ePKP, PKP = 37m.47s., e = 40m.38s. and 40m.58s.$   
 Saskatoon  $PPS = 29m.3s., SSS = 38m.32s.$   
 Helsinki  $eSKS = 25m.28s., eSKKS = 25m.44s., ePS = 28m.20s., eSS = 34m.1s., e = 38m.24s. and 41m.31s.$   
 Rapid City  $i = 19m.16s., ePS = 28m.13s., ePPS = 29m.26s.$   
 Upsala  $SKKSE = 26m.7s., eN = 26m.30s.?, ePSN = 28m.56s., eSSN = 34m.56s., eSSSN = 38m.32s., eN = 45m.32s.?$   
 Helwan  $PSEZ = 28m.50s., PPSZ = 29m.56s.$   
 Scoresby Sund  $26m.20s. and 34m.34s.$

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Warsaw eE = 19m.34s., eSE = 26m.23s., SN = 27m.9s., iPSZ = 28m.58s., PSE = 29m.3s., PSN = 29m.6s., PPSZ = 29m.56s., PPSE = 30m.18s., eN = 35m.4s., eSSE = 35m.39s., eSSZ = 35m.48s., eSSN = 40m.1s., eZ = 41m.45s., eN = 42m.32s.  
 Lincoln eSS = 35m.29s.  
 Copenhagen i = 19m.50s. and 22m.20s., iSKKS = 26m.41s., 30m.32s., SS = 35m.47s., 36m.57s., SSS = 40m.14s.  
 Budapest eN = 20m.7s.  
 Belgrade ePKP? = 16m.37s., eSKS = 25m.20s., e = 26m.50s.  
 Prague ePPP = 22m.44s., eSKKS = 27m.50s., ePS = 29m.56s., eE = 32m.2s., eSS = 37m.2s., eSSS = 41m.32s.  
 Cheb eSS = 36m.38s., eSSS = 39m.45s.  
 Florissant iSKKSE = 27m.6s., iSSN? = 37m.4s.  
 St. Louis iE = 20m.31s., iN = 20m.36s., iSKKSEN = 27m.11s., iPSE = 30m.12s., iPSN = 30m.18s., iSS?N = 36m.27s.  
 Chicago ePPS? = 32m.17s., eSS = 36m.3s., e = 39m.1s., eSSS = 40m.57s.  
 Trieste eSKKS = 28m.12s., ePS = 30m.2s.  
 Stuttgart iPZ = 18m.54s., eZ = 19m.38s., ePP? = 23m.4s., ePS? = 31m.32s., eSS? = 37m.2s.  
 Strasbourg eSKP = 21m.50s., ePPP = 23m.12s., eSKS? = 26m.17s., eSKKS = 27m.22s., eSKKS? = 27m.32s., ePS = 30m.11s., 30m.18s., and 30m.29s., eSS = 36m.49s., eSSS = 42m.47s.  
 Uccle eSSN = 37m.12s., eSSE = 37m.15s.  
 Rome iPPPZ = 23m.18s., ePSE = 30m.24s., ePPSN = 31m.46s., SS = 37m.24s.  
 Kew iPPZ = 21m.53s., eSKKS?E = 28m.55s., ePSE = 31m.29s., ePPS?N = 32m.32s.?, eSSN = 37m.39s., eSSS = 42m.22s.?, eQN = 50.5m.  
 Paris iPKP = 19m.1s., e = 19m.15s., i = 21m.8s., iSKKS? = 27m.42s., iPS = 30m.44s., ePPS = 32m.8s., eSS? = 36m.10s., eSSS = 42m.32s.?  
 Ottawa SKP = 22m.10s., SKKS = 27m.47s., PPS = 32m.20s., SS = 38m.2s.  
 Clermont-Ferrand ePS = 30m.57s., e = 32m.54s.  
 Seven Falls SKP = 22m.26s., e = 30m.46s., SS = 38m.12s., SSS = 43m.14s., SSSS = 50m.14s.  
 Philadelphia e = 24m.27s., iSKSP = 31m.40s., iPPPS = 34m.36s.  
 Fordham e = 41m.5s.  
 Weston i = 22m.59s., e = 40m.14s., and 57m.50s.  
 Algiers i = 22m.43s., ePPS = 33m.32s.?, eSS = 38m.56s.  
 Alicante PPP = 25m.20s., PKKS = 28m.34s., PPS = 35m.45s., SS = 41m.20s.  
 La Plata SE = 22m.47s.  
 Almeria PP = 21m.56s., pPP = 22m.15s., PKS = 22m.52s., PPP = 24m.47s., P<sub>c</sub>P, PKP = 27m.35s., SKKS = 28m.41s., PS = 32m.9s., PPS = 33m.56s., SS = 39m.47s., SSS = 44m.48s.  
 Granada iPP = 22m.55s., pPP = 23m.49s., eSKS = 28m.7s., PPS = 35m.27s., SS = 41m.25s.  
 Huancayo i = 19m.26s., ePP = 22m.8s., i = 23m.52s., iSKSP? = 31m.16s., ePS = 32m.39s., ePPS = 34m.2s., eSS = 40m.22s., e = 40m.32s., eSSS = 45m.26s.  
 Malaga PKP, Z = 20m.9s., iPKSZ = 23m.1s., PPZ = 26m.46s., PPPZ = 27m.44s.  
 Lisbon Z = 22m.31s., 23m.25s., and 34m.47s., Q = 66m.56s.  
 La Paz pPKPN = 20m.32s., sPKPN = 21m.6s., iPPN = 23m.10s., iN = 25m.22s., iPPPN = 26m.56s., SKKSN = 29m.46s., PSKS = 33m.20s., iN = 41m.10s., SSN = 42m.20s., SSSN = 46m.12s.  
 Bermuda iSKKS? = 29m.32s., i = 30m.32s., eSKSP = 32m.31s., ePPS = 34m.52s., e = 35m.48s. and 36m.13s., eSS = 40m.32s.  
 San Juan ePKS = 24m.26s., iSKSP = 32m.23s., eSS = 42m.2s.  
 Long waves were also recorded at Aberdeen.

March 2d. Readings also at 0h. (Christchurch, Wellington, Auckland, La Paz, and Istanbul), 1h. (Tucson, De Bilt, Uccle, Copenhagen, Stuttgart, Strasbourg, Trieste, Istanbul, and Warsaw), 2h. (Cheb and Paris), 3h. (Tucson), 4h. (Frunse, near Andijan, Tchimkent, and near Lick), 8h. (near Almata, Andijan, Frunse, Obi-garm, Samarkand, Stalinabad, Tashkent, and Tchimkent), 14h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Stuttgart, near Almata, Andijan, Frunse, Samarkand, Stalinabad, Tashkent, and Tchimkent), 20h. (Tucson), 21h. (Rapid City and near Pierce Ferry), 22h. (Mount Wilson and Tucson), 23h. (Tucson).

March 3d. Readings at 5h. (near Andijan, Frunse, Samarkand, Almata, Tchimkent, Tashkent, Obi-garm, and Stalinabad), 6h. (Tucson), 8h. (near Leninakan and near Mizusawa), 10h. (near Tananarive), 11h. (near Andijan), 12h. (Santa Lucia and near Granada), 13h. (near Balboa Heights), 14h. (near Obi-garm and near Mizusawa), 15h. (Tucson), 17h. (Almata, Andijan, and near Tchimkent), 20h. (Punta Arenas), 21h. (Grand Coulee), 23h. (near Apia).

March 4d. Readings also at 1h. (Malaga), 3h. (near Alicante), 4h. (Boulder City, Overton, Grand Coulee, and near Pierce Ferry), 6h. (Tucson), 8h. (Mount Wilson, Palomar, Riverside, and Tucson), 9h. (Santa Lucia), 12h. (near Malaga), 17h. (Auckland, Christchurch, Wellington, Riverview, Mount Wilson, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Pierce Ferry, Shasta Dam, and Stuttgart).



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March 5d. Readings at 7h. and 9h. (Tucson), 10h. (near La Paz), 11h. (near Triest), 16h. (near Bogota), 17h. (Tucson, Riverview, Auckland, Wellington, and Christchurch), 20h. (Leninakan, near Grozny, and near Malaga), 23h. (Samarkand, near Stalinabad and Obi-garm).

March 6d. Readings at 0h. (near Santa Lucia, Riverside, Pierce Ferry, Palomar, and Tucson), 5h. (Paris), 7h. (near Grozny and near Leninakan), 13h. (Tucson, Bogota, near La Paz, and near Huancayo), 14h. (Cheb, Strasbourg, Copenhagen, and near La Paz), 15h. (near Santa Lucia, La Plata, and near La Paz), 20h. (near Malaga and near Istanbul).

March 7d. 4h. Undetermined shock.

Shasta Dam eP = 32m.47s.  
 Berkeley eEN = 33m.0s.  
 Seattle eP = 33m.51s.  
 Tinemaha iP = 33m.56s.  
 Haiwee ePZ = 34m.17s.  
 Mount Wilson ePZ = 34m.22s., iZ = 34m.32s. and 34m.53s.  
 Overton eP = 34m.31s.  
 Boulder City eP? = 34m.32s.  
 Pierce Ferry eP = 34m.37s.  
 Pasadena eZ = 34m.44s. and 34m.56s., eL = 37.2m.  
 Palomar ePZ = 34m.56s., iZ = 35m.10s.  
 Tucson eP = 35m.38s., i = 35m.46s., e = 40m.26s.  
 Rapid City eP? = 35m.45s., i = 36m.8s., e = 38m.28s., eL = 43m.15s.  
 Salt Lake City eS? = 36m.58s.  
 St. Louis eZ = 37m.38s., iE = 42m.31s., iN = 45m.41s.  
 Sitka eS? = 38m.34s.  
 College e = 41m.17s., eL = 44m.6s.  
 Florissant eE = 42m.18s.  
 Weston e = 53m.14s.

Long waves were also recorded at Honolulu, Bermuda, Bozeman, Butte, Chicago, Philadelphia, Logan, Strasbourg, Uccle, and De Bilt.

March 7d. Readings also at 10h. (near Andijan, Tashkent, Frunse, Almata, Stalinabad, Obi-garm, and Samarkand), 11h. (Santa Lucia), 14h. (Strasbourg and near Zagreb and near Istanbul), 15h. (Basle), 16h. (Shasta Dam, Tinemaha, Haiwee, Mount Wilson, Pasadena, Palomar, Boulder City, Tucson, and St. Louis), 17h. (New Delhi), 18h. (Tucson), 20h. (Pierce Ferry and Boulder City), 23h. (Fresno).

March 8d. 14h. 33m. 5s. Epicentre 24°·9N. 94°·7E. (as on 1938, May 6d.).

A = -·0744, B = +·9050, C = +·4187;  $\delta$  = -13; h = +3;  
 D = +·997, E = +·082; G = -·034, H = +·417, K = -·908.

		$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
New Delhi	N.	16·1	287	—	—	e 6 23	-26	—	i 8·9
Hyderabad	N.	16·9	247	e 4 14	PP	e 6 39	-28	—	—
Bombay		21·2	258	e 4 56	+ 7	i 8 31	-10	—	—
Kodaikanal	E.	21·9	232	e 4 35	-22	—	—	—	—
Colombo	E.	22·9	221	4 58	- 8	(8 58)	-15	—	9·0
Almata		23·4	327	5 11?	0	9 8	-13	—	—
Andijan		24·4	315	e 5 18	- 3	—	—	—	—
Frunse		24·4	322	e 5 17	- 4	e 9 29	-10	—	—
Obi-garm		24·6	309	5 23	0	9 40	- 2	—	—
Stalinabad		25·8	308	e 5 39	+ 5	i 10 21	+19	—	—
Tashkent		26·7	314	e 5 33?	-10	e 10 6?	-11	—	—
Tchimkent		27·0	316	e 5 43	- 2	i 10 20	- 2	—	—
Irkutsk		28·3	12	e 5 57	0	i 10 38	- 5	—	—
Vladivostok		35·4	49	—	—	e 12 16	-18	—	—
Sverdlovsk		40·2	331	i 7 35	- 5	i 13 37	-11	—	—
Baku		40·3	304	—	—	e 13 42	- 7	—	—
Leninakan		44·9	304	e 8 36	+18	—	—	—	—
Helwan		55·9	290	—	—	e 17 11	-18	—	—
Istanbul		56·2	304	e 10 1	+17	—	—	—	—
Stuttgart	z.	68·8	315	e 11 0	- 8	—	—	e 11 23	P <sub>c</sub> P

Long waves were also recorded at Riverview and Brisbane.

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March 8d. 15h. Undetermined shock.

Mizusawa SE = 2m.51s.  
 Shasta Dam eP = 7m.56s.  
 Tinemaha iP = 8m.29s., iZ = 8m.52s.  
 Haiwee ePZ = 8m.36s.  
 Santa Barbara ePZ = 8m.36s.  
 Mount Wilson iPZ = 8m.42s., iZ = 8m.58s.  
 Pasadena ePEZ = 8m.42s., iEZ = 8m.46s.  
 Riverside iPZ = 8m.45s., iZ = 9m.5s.  
 Boulder City iP = 8m.48s.  
 Pierce Ferry iP = 8m.49s.  
 Palomar iPZ = 8m.50s.k, iZ = 8m.54s.  
 Tucson eP = 9m.19s., i = 9m.31s.  
 Copenhagen P = 9m.28s., L = 33m.0s.  
 Warsaw eZ = 9m.32s., eLE = 39m.0s.  
 St. Louis eP?Z = 9m.57s., iZ = 10m.8s.  
 Stuttgart eP = 10m.9s., eQ? = 39m.0s.  
 Istanbul eP = 10m.10s.?, eL = 46m.  
 Strasbourg e = 10m.11s., 10m.37s. and 16m.1s., eL = 36m.0s.  
 Paris i = 10m.36s. and 10m.40s., eL = 37m.0s.  
 Kodaikanal eE = 18m.50s.  
 New Delhi eN = 21m.35s. and 35m.34s.  
 Christchurch eEZ = 24m.16s. and 26m.30s., eZ = 32m.0s., E = 36m.44s., NZ = 38m.24s.  
 Long waves were also recorded at other European stations.

March 8d. Readings also at 9h. (Mizusawa, Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Pierce Ferry, Shasta Dam, St. Louis, Paris, and Stuttgart), 12h. (near Malaga), 13h. (Istanbul, Trieste, Zagreb, Tinemaha, Pasadena, Mount Wilson, Palomar, Pierce Ferry, Tucson, and near Apia), 15h. (St. Louis), 22h. (near Istanbul, Zagreb, Trieste, and Stuttgart).

March 9d. Readings at 1h. (Shasta Dam), 4h. (near Balboa Heights), 5h. (near Bogota), 10h. (Riverview and near Malaga), 15h. (St. Louis and near Tchimkent), 17h. (Ksara and near Granada), 18h. (near Granada), 20h. (near Obi-garm, Stalinabad and Samarkand), 21h. (Mineral, Boulder City, Pierce Ferry, Tucson, Shasta Dam, St. Louis, and near Fresno), 22h. (Jena).

March 10d. 1h. 53m. 13s. Epicentre 9°·0S. 14°·5W.

A = +·9564, B = -·2474, C = -·1554;  $\delta = +6$ ;  $h = +7$ ;  
 D = -·250, E = -·968; G = -·150, H = +·039, K = -·988.

	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Malaga	z. 46·5	11	—	—	(18 50)	SS	—	18·8
Almeria	47·0	13	8 34	- 1	15 8	-18	9 23	PP 23·3
Granada	47·1	11	18 46	+11	i 15 14	-14	i 10 18	PP i 22·0
Alicante	48·9	14	10 32	PP	i 15 29	-24	11 4	PPP e 22·1
Tortosa	E. 51·5	14	—	—	—	—	19 41	SS e 24·8
La Paz	52·7	256	e 9 19	+ 1	—	—	24 47	Q 30·3
Rome	56·4	24	e 9 44	- 1	e 17 22	-14	e 21 18	SS —
Florence	57·5	22	e 22 1	SS	e 26 5	Q	—	e 27·5
Helwan	58·6	47	i 9 57k	- 4	17 57	- 7	—	—
Paris	59·5	12	e 10 7	0	—	—	i 27 41	Q e 30·8
Huancayo	59·8	261	—	—	—	—	e 25 47	? —
Triest	60·0	22	—	—	e 23 23	SS	—	e 27·1
Strasbourg	60·6	17	—	—	e 18 11	-19	e 22 0	SS e 26·8
Stuttgart	61·2	18	e 10 14	- 5	e 18 35	- 3	e 22 7	SS e 27·8
Uccle	61·8	12	—	—	e 18 23	-23	e 22 47?	SS e 27·8
De Bilt	63·2	13	—	—	e 18 47	-16	e 19 10	PS e 26·8
Cheb	63·3	18	e 13 47?	PP	e 24 47?	SS	e 27 47?	Q e 30·8
Istanbul	63·9	36	e 10 29?	- 8	18 41	-31	—	—
Prague	64·0	20	e 15 22	PPP	e 22 52	SS	e 26 5	SSS e 28·8
Durham	64·5	7	i 16 42	?	i 19 2	-17	i 25 53	SSS —

Continued on next page.

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	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.	
	°	°	m.	s.	s.	m.	s.	s.	m.	s.	m.	
Copenhagen	68.2	16	11	0	- 4	19	49	-15	23	53	SS	29.8
Warsaw	68.2	22	—	—	—	e 18	47	?	—	—	—	e 35.8
Baku	77.0	45	—	—	—	e 21	41	- 4	—	—	—	—
Moscow	77.6	27	e 12	1	+ 1	e 22	9	+18	—	—	—	—
St. Louis	84.6	310	e 12	53	+17	e 24	11	PS	—	—	—	e 42.0
Sverdlovsk	89.5	32	e 13	8	+ 8	23	39	[+ 9]	24	28	PS	—
Tashkent	91.2	49	e 12	59	- 9	e 23	46	[+ 6]	—	—	—	—

Additional readings :—

Almeria SS = 17m.19s.

Granada PPP = 11m.12s., iSS = 18m.29s.

Alicante P<sub>c</sub>P = 11m.12s., PS = 15m.32s., SS = 18m.42s., SSS = 19m.3s., S<sub>c</sub>S = 19m.32s.

Helwan eZ = 10m.6s., eE = 17m.44s.

Paris eP = 10m.11s.

De Bilt eSS = 22m.47s.

Warsaw eE = 18m.56s.

Long waves were also recorded at other European stations and Ksara.

March 10d. Readings also at 4h. (Stuttgart, Cheb, San Juan, St. Louis, Tucson, Boulder City and Pierce Ferry), 6h. (Ksara), 11h. (Tucson), 15h. (near Balboa Heights), 22h. (La Paz and Huancayo), 23h. (near Leninakan).

March 11d. 5h. 16m. 10s. Epicentre 34°·7N., 137°·9E. (as on Feb. 21d.).

Intensity VI at Shizuoka; V at Omaesaki, Hunatsu, Ito, Kumagaya and Hukui; IV at Titibu, Gihu, Tokyo, Yokohama, and Kakioka; II-III at Tsu, Mera, Nagano, Toyama, Osaka, Mito, Oshima, and Tokushima. Macro seismic radius greater than 300km. Epicentre 34°·9N. 138°·4E. Focal depth 20km.

The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year 1947, Tokyo, 1950, pp. 14-15, macro seismic chart p.14.

$$A = +.6114, B = +.5524, C = +.5667; \quad \delta = +10; \quad h = 0;$$

$$D = +.670, E = +.742; \quad G = -.420, H = +.380, K = -.824.$$

	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.	
	°	°	m.	s.	s.	m.	s.	s.	m.	s.
Omaesaki	0.3	111	0	17	+ 6	0	25	+ 7	—	—
Shizuoka	0.5	57	0	13	- 1	0	17	- 6	—	—
Nagoya	0.9	296	0	26 <sub>a</sub>	+ 6	0	42	+ 8	—	—
Misima	1.0	64	0	18 <sub>a</sub>	- 3	0	25	-11	—	—
Hunatu	1.1	42	0	21 <sub>k</sub>	- 1	—	—	—	—	—
Gihu	1.2	307	0	31 <sub>a</sub>	+ 7	0	52	+11	—	—
Osima	1.2	87	0	26	+ 2	0	36	- 5	—	—
Hikone	1.5	293	0	39 <sub>k</sub>	+11	1	0	+11	—	—
Owase	1.5	246	0	44 <sub>k</sub>	+16	1	9	+20	—	—
Mera	1.6	82	0	31	+ 1	0	48	- 3	—	—
Yokohama	1.6	63	0	34 <sub>a</sub>	P <sub>g</sub>	0	51	0	—	—
Kyoto	1.8	280	1	16 <sub>a</sub>	+44	1	43	+47	—	—
Tokyo	1.8	57	0	32 <sub>k</sub>	0	0	51	- 5	—	—
Kumagaya	1.9	40	0	34 <sub>k</sub>	0	0	53	- 6	—	—
Maebasi	1.9	29	0	37 <sub>k</sub>	P <sub>g</sub>	0	58	- 1	—	—
Nagano	2.0	7	0	39 <sub>k</sub>	P <sub>g</sub>	1	3	+ 1	—	—
Osaka	2.0	271	0	45 <sub>a</sub>	P <sub>g</sub>	1	20	S <sub>g</sub>	—	—
Toyama	2.1	344	0	41 <sub>a</sub>	P <sub>g</sub>	1	10	S <sub>g</sub>	—	—
Siomisaki	2.2	235	0	58	+20	1	28	S <sub>g</sub>	—	—
Kobe	2.3	270	0	50	P <sub>g</sub>	1	19	S <sub>g</sub>	—	—
Tukubasan	2.3	29	0	40	0	1	5	- 4	—	—
Kakioka	2.4	50	0	40	- 1	1	5	- 7	—	—
Utunomiya	2.4	41	0	40 <sub>k</sub>	- 1	1	6	- 6	—	—
Sumoto	2.5	262	0	54	P <sub>g</sub>	1	35	S <sub>g</sub>	—	—
Mito	2.7	51	0	48	+ 3	1	17	- 2	—	—
Toyooka	2.7	288	0	54 <sub>a</sub>	P <sub>g</sub>	1	36	S <sub>g</sub>	—	—
Wazima	2.8	343	0	59	P <sub>g</sub>	1	28	S <sub>g</sub>	—	—
Onahama	3.3	47	0	55 <sub>k</sub>	+ 2	1	21	-14	—	—
Hukushima	3.7	33	0	56 <sub>k</sub>	- 4	1	36	- 9	—	—
Kotl	3.8	254	2	11	+70	2	58	+71	—	—

Continued on next page.

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		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.
		°	°	m. s.	s.	m. s.	s.	m. s.
Sendai		4.3	33	1 7	- 1	—	—	—
Hirosima		4.5	268	0 54	-17	—	—	—
Hamada		4.8	274	1 23	P*	2 21	S*	—
Mizusawa	E.	5.1	29	1 22	+ 2	2 27	S*	—
Akita		5.3	18	1 34	P*	2 38	+13	—
Morioka		5.6	26	1 27	0	2 37	+ 4	—
Miyako		5.9	32	1 26	- 5	2 49	+ 9	—
Kumamoto		6.3	255	1 51	P*	2 43	- 7	—
Hatinohe		6.5	25	1 30	- 9	3 18	S*	—
Kagosima		6.9	245	2 4	P*	3 18	S*	—
Mori		7.7	15	2 45	P <sub>g</sub>	5 8	?	—
Sapporo		8.8	16	2 27	P*	—	—	—
Vladivostok		9.6	333	e 2 24	+ 3	e 4 23	+11	—
Shasta Dam		74.8	51	e 11 44	0	—	—	—
Copenhagen		78.7	332	12 7	+ 1	—	—	—
Pasadena	Z.	81.2	55	i 12 18	- 2	—	—	e 12 28 P <sub>c</sub> P
Mount Wilson	Z.	81.3	55	i 12 17	- 3	—	—	i 12 30 P <sub>c</sub> P
Riverside	Z.	81.9	55	i 12 33	P <sub>c</sub> P	—	—	—
Overton		82.3	50	e 12 22	- 3	—	—	i 12 36 P <sub>c</sub> P
Boulder City		82.4	52	e 12 26	+ 1	—	—	—
Palomar	Z.	82.6	55	i 12 36	P <sub>c</sub> P	—	—	—
Pierce Ferry		82.8	51	e 12 27	0	—	—	—
Tucson		87.3	53	e 13 0	P <sub>c</sub> P	—	—	e 16 12 PP

Tucson gives also e = 14m.0s.

March 11d. 17h. Undetermined shock.

Belgrade iP = 8m.18s., i = 9m.12s. and 10m.16s., eS = 11m.52s., eSS? = 12m.42s., e = 14m.21s.  
 Helwan ePZ = 8m.59s., eZ = 9m.21s., eE = 10m.45s.  
 Zagreb P = 9m.18s., e = 11m.38s., eNE = 12m.17s. and 12m.55s., eNW = 13m.23s.  
 Budapest PE = 9m.31s., LE = 14m.0s.  
 Ksara e = 9m.31s., and 12m.24s.  
 Istanbul P = 9m.33s.?, S<sub>r</sub> = 10m.52s.  
 Rome eP? = 9m.40s., eS? = 11m.16s.  
 Bucharest eP?EN = 9m.42s., eN = 11m.5s.  
 Chur eP = 10m.7s.k, eS = 12m.44s.  
 Stuttgart eP = 10m.24s., eZ = 10m.38s., ePP?Z = 10m.44s., eS? = 14m.20s., eQ? = 16m.0s.  
 Strasbourg e = 10m.34s., L = 16.2m.  
 Jena eN = 10m.38s. and 11m.1s.  
 Cheb e = 11m.0s., eL = 13.4m.  
 Paris iP = 11m.16s., eP<sub>c</sub>P? = 15m.30s.  
 Copenhagen P = 11m.22s., S = 15m.20s., L = 18.1m.  
 Clermont-Ferrand e = 11m.25s.  
 Leninakan eP = 11m.11s.  
 Grozny P = 11m.20s., S = 15m.0s.  
 Trieste eP? = 11m.26s., eS? = 13m.10s.  
 Prague e = 13m.6s., eS? = 14m.39s., eL = 15m.12s.  
 St. Louis iP?Z = 19m.0s., iZ = 19m.3s.  
 Long waves were also recorded at Uccle, De Bilt, Kew, and Helsinki.

March 11d. Readings also at 2h. (Santa Lucia and near La Paz (2) ), 5h. (Boulder City, Overton, and near Pierce Ferry), 10h. (Tucson), 11h. (Pierce Ferry, Overton, Boulder City, near Tucson, and St. Louis), 16h. (near Granada (2) ), 19h. (Christchurch, Wellington, Obi-garm, Tchinkent, and near Frunse, Almata, Andijan, and Tashkent), 22h. (La Paz), 23h. (Pasadena, Mount Wilson, Riverside, Tucson (2), Weston, St. Louis, and Riverview).

March 12d. Readings at 1h. (near Leninakan and Erevan), 2h. (Samarkand, near Obi-garm, Stalinabad, and near Tananarive), 3h. (near Almata, Andijan, Frunse, and Tchinkent), 4h. (near Andijan), 5h. (near Almata, Frunse, Obi-garm, Samarkand, Tashkent and Tchinkent), 7h. (Stuttgart, near Trieste, Zagreb, and near Obi-garm), 8h. (Tucson and near Balboa Heights), 9h. (Overton, Pierce Ferry, Tucson, and St. Louis), 10h. (near Chur, Zürich, Stuttgart, and Florence), 15h. (near Almata, Andijan, Frunse, Obi-garm, Samarkand, and Tashkent), 18h. (Mount Wilson, Pasadena, Tinemaha, Tucson, Shasta Dam, and near Apia), 19h. (near Mizusawa), 20h. (Tucson), 23h. (Harvard).

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March 13d. Readings at 0h. (Huancayo, La Paz, and near Bogota), 4h. (Santa Lucia and near Mizusawa), 6h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, La Paz, La Plata, and Huancayo), 8h. (Santa Lucia), 10h. (Copenhagen, near Almata, Andijan, Frunse, Stalinabad, Tashkent, and Tchimkent), 13h. (Copenhagen), 14h. (Copenhagen, Kalossa, near Belgrade, Bucharest, Budapest, and Istanbul), 16h. (near Obi-garm), 21h. (near Andijan), 22h. (Jena, Strasbourg, Stuttgart, and near Bogota).

March 14d. Readings at 2h. (Weston), 8h. (Mount Wilson, Palomar (2), Tinemaha (2), Tucson (2), Boulder City (2), Overton and Pierce Ferry (2)), 9h. (Santa Lucia), 11h. (Palomar, Mount Wilson, Pasadena, Tinemaha, Tucson, Boulder City, Overton, Pierce Ferry, near Mineral, Ferndale, and near Apia), 12h. (Jena and Stuttgart), 13h. (Mount Wilson, Pasadena, Palomar, Riverside, Tucson, Boulder City, Overton, Pierce Ferry, Shasta Dam, and near Granada (3)), 14h. (near Granada), 17h. (Mount Wilson, Pasadena, Palomar, Tinemaha, Tucson, Boulder City, Pierce Ferry, near Overton, and Stuttgart), 18h. (near Grand Coulee and Butte), 20h. (Pierce Ferry), 22h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, Pierce Ferry, and Shasta Dam), 23h. (St. Louis and near Pierce Ferry).

March 15d. 5h. 24m. 58s. Epicentre  $41^{\circ}2N$ .  $141^{\circ}0E$ .

Intensity V at Hatinohe ; IV at Miyako and Morioka ; II-III at Mori and Sendai. Epicentre as adopted. Macroseismic radius 200-300km.

Seismo. Bull. Cent. Met. Obs., Japan, for 1947, Tokyo, 1950, p. 16 with macroseismic chart.

$$A = -.5864, B = +.4749, C = +.6561; \quad \delta = -14; \quad h = -2; \\ D = +.629, E = +.777; \quad G = -.510, H = +.413, K = -.755.$$

	$\Delta$	Az.	P.		O-C.	S.		O-C.
			m.	s.		m.	s.	
Hatinohe	0.8	149	0	22k	+ 4	0	31	0
Mori	1.0	340	0	21k	0	0	33	- 6
Morioka	1.5	175	0	40a	+12	1	3	+14
Akita	1.6	205	1	10	?	1	30	?
Miyako	1.7	154	0	23a	- 8	0	56	+ 2
Sapporo	1.9	8	0	35	+ 1	1	0	+ 1
Mizusawa	N. 2.1	177	i	0 39	+ 2	i	1 7	+ 3
Sendai	2.9	182	0	52	+ 4	1	29	+ 5
Hukusima	3.5	187	1	2	+ 5	1	46	+ 6
Nemuro	4.0	56	1	21	P <sub>r</sub>	2	17	S <sub>r</sub>
Onahama	4.3	181	1	13	+ 5	2	2	+ 2
Utunomiya	4.7	192	0	57	-17	1	20	?
Mito	4.8	185	1	19	+ 4	2	23	+11
Kakioka	5.0	188	1	22	+ 4	2	30	+12
Maebasi	5.0	198	1	24	+ 6	2	39	S*
Nagano	5.0	207	1	34	P <sub>r</sub>	2	55	S <sub>r</sub>
Wazima	5.0	222	1	17	- 1	—	—	—
Tukubasan	5.0	189	1	22	+ 4	2	24	+ 6
Kumagaya	5.2	195	1	37	P*	2	45	S*
Tokyo	5.6	191	1	32	+ 5	2	35	+ 2
Hunatu	5.9	198	1	26	- 5	3	21	S <sub>r</sub>
Yokohama	5.9	191	1	36	+ 5	2	59	S*
Mera	6.3	189	2	0	P <sub>r</sub>	—	—	—
Osima	6.5	192	1	39	0	—	—	—
Shizuoka	6.5	200	1	50	P*	3	19	S*
Gihu	6.7	212	1	38	- 4	—	—	—
Nagoya	6.8	209	1	49	+ 5	3	24	S*
Omaesaki	7.0	200	1	40	- 6	2	35	-33
Shasta Dam	68.9	54	e	11 8	- 1	—	—	—
Tinemaha	z. 73.6	56	i	11 39	+ 2	—	—	—
Mount Wilson	z. 75.6	57	i	11 49	+ 1	—	—	—
Pasadena	z. 75.6	57	i	11 48	0	—	—	—
Riverside	z. 76.2	57	i	11 51	- 1	—	—	—
Overton	76.3	53	i	11 53	+ 1	—	—	—
Boulder City	76.5	54	i	11 54	0	—	—	—
Palomar	z. 76.9	57	i	11 56	0	—	—	—
Pierce Ferry	76.9	54	i	11 56	0	—	—	—
Stuttgart	z. 80.8	330	e	12 16	- 1	—	—	—
Tucson	81.4	55	e	12 21	+ 1	—	—	—
St. Louis	z. 87.8	39	i	12 41	-11	—	—	—

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March 15d. 14h. Pasadena suggests Central America.

St. Louis ePZ = 15m.41s., ipPZ = 16m.1s., iS?N = 20m.3s., iSSE = 20m.43s.  
 Tucson iP = 16m.4s., e = 20m.0s., 24m.8s., and 27m.16s.  
 Pierce Ferry iP = 16m.27s., epP = 16m.45s., i = 17m.6s., eS = 26m.30s.  
 Palomar iP = 16m.30s., i = 16m.47s., iEZ = 17m.8s., i = 17m.18s. and 19m.36s.  
 Boulder City iP = 16m.31s., i = 16m.49s.  
 Overton iP = 16m.32s.  
 Riverside ePZ = 16m.35s., eZ = 16m.52s., iPcPZ = 19m.37s., iZ = 19m.56s.  
 Pasadena ePZ = 16m.39s., iZ = 16m.59s. and 17m.18s., ePcPZ = 19m.37s., eZ = 19m.58s. and 20m.16s.  
 Mount Wilson iPZ = 16m.40s., iZ = 16m.58s. and 17m.18s.  
 Huancayo eP? = 16m.50s.  
 Tinemaha iP = 16m.57s., iZ = 17m.15s., iPcPZ = 19m.44s., iZ = 20m.3s.  
 Shasta Dam eP = 17m.34s.  
 Florissant eS?E = 19m.49s., iS?E = 20m.9s., iSS?E = 20m.52s.

March 15d. 16h. 39m. 23s. Epicentre 39°·1N. 141°·1E. Depth of focus 0·010.  
 (as on 1944, December 1d.).

Intensity V at Yonezato (Iwate Pref.); IV at Miyako and Morioka; II-III at Hatinohe and Mizusawa. Macroseismic radius 200-300km., depth 60km.

Seismo. Bull., Cent. Met. Obs., Japan, for 1947, Tokyo, 1950, p. 17, with macroseismic chart.

A = -·6056, B = +·4886, C = +·6281;  $\delta = -1$ ;  $h = -1$ ;  
 D = +·628, E = +·778; G = -·489, H = +·394, K = -·778.

	$\Delta$	Az.	P.	O - C.	S.	O - C.
	°	°	m. s.	s.	m. s.	s.
Mizusawa	0·0	—	1 0 13	0	1 0 25	+ 1
Morioka	0·6	5	0 17 <sub>k</sub>	0	0 31	+ 2
Miyako	0·9	52	0 20 <sub>a</sub>	+ 1	0 34	0
Sendai	0·9	191	0 17	- 2	0 31	- 3
Akita	1·0	309	0 22 <sub>a</sub>	+ 2	0 40	+ 4
Hatinohe	1·5	13	0 17	- 10	0 39	- 8
Hokusima	1·5	200	0 25	- 2	0 44	- 3
Utunomiya	2·7	201	0 41	- 2	1 12	- 2
Mito	2·8	190	0 36	- 8	1 6	- 11
Kakioka	2·9	194	0 40	- 5	1 13	- 6
Tukubasan	3·0	195	0 41	- 6	1 13	- 9
Mori	3·0	352	0 46	- 1	1 24	+ 2
Maebasi	3·1	211	1 23	S	(1 23)	- 1
Kumagaya	3·2	205	1 3	+ 13	1 26	- 1
Wazima	3·7	244	1 2	+ 6	1 39	0
Yokohama	3·8	198	1 37	S	(1 37)	- 5
Hunatu	4·0	208	0 59	- 1	1 38	- 8
Sapporo	4·0	3	1 38	S	(1 38)	- 8
Shizuoka	4·6	208	1 56	S	(1 56)	- 5
Nagoya	5·1	221	1 51	S	(1 51)	- 23

March 15d. Readings also at 2h. (near La Paz), 3h. (near Obi-garm), 6h. (Mount Wilson, Pasadena, Riverside, Tinemaha, Tucson, Shasta Dam, and near Malaga), 7h. (Helwan and Ksara), 8h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, Pierce Ferry, Shasta Dam, Bozeman, Butte, Salt Lake City, Rapid City, Florissant, St. Louis, Chicago, and Philadelphia), 14h. (Shasta Dam), 16h. (Obi-garm, near Andijan, and Samarkand), 17h. (Platigorsk, near Erevan, Grozny, and Leninakan), 18h. (near Malaga), 21h. (Stuttgart, near Obi-garm, and Stallnabad), 23h. (La Paz).

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March 16d. 9h. 32m. 34s. Epicentre 24°·3N. 122°·3E. (as on 1945, April 10d.).

A = -·4876, B = +·7713, C = +·4092;  $\delta$  = +10;  $h$  = +4;  
D = +·845, E = +·534; G = -·219, H = +·346, K = -·912.

		$\Delta$ °	Az. °	P.		O-C. s.	S.		O-C. s.	Supp.		L. m.	
				m.	s.		m.	s.		m.	s.		
Nanking		8·3	339	3	25	?	5	13	?	—	—	—	
Vladivostok		20·4	22	e 4	36	- 5	8	34	+ 9	—	—	—	
Irkutsk		31·1	338	e 6	54	PP	—	—	—	—	—	—	
New Delhi	N.	40·4	287	—	—	—	i 13	56	+ 6	i 17	11	SSS	i 21·4
Hyderabad	N.	41·4	269	—	—	—	17	31	SSS	—	—	—	—
Almata		41·6	309	e 8	3	+12	—	—	—	—	—	—	—
Frunse		43·2	308	e 8	7	+ 3	—	—	—	—	—	—	—
Andijan		44·6	304	e 8	19	+ 3	—	—	—	—	—	—	—
Kodaikanal	E.	44·8	261	e 15	3	PS	—	—	—	—	—	—	—
Bombay		46·1	274	e 8	31	+ 3	—	—	—	—	—	—	—
Obi-garm		46·5	302	8	32	+ 1	15	24	+ 5	—	—	—	—
Tashkent		46·9	305	e 8	34	0	e 15	25	0	—	—	—	—
Stalinabad		47·2	301	e 8	47	+11	e 15	39	+10	—	—	—	—
Samarkand		48·6	302	8	46	- 1	—	—	—	—	—	—	—
Sverdlovsk		54·6	324	9	31	- 1	e 17	11	0	—	—	—	—
Baku		61·6	305	e 10	22	0	—	—	—	—	—	—	—
Leninakan		66·1	306	e 10	34	-17	—	—	—	—	—	—	—
Ksara		74·1	300	11	37	- 3	e 21	21?	+ 9	—	—	—	—
Warsaw		77·7	322	12	57	+57	—	—	—	16	40	PPP	e 42·4
Helwan		79·1	298	i 12	8a	0	e 22	9	+ 2	—	—	—	—
Copenhagen		80·7	327	12	15	- 1	—	—	—	—	—	—	39·4
Trieste		85·0	319	e 32	0	?	(e 32	0)	SSS	—	—	—	—
Stuttgart		86·0	322	e 12	42	- 1	—	—	—	—	—	—	e 46·4
Strasbourg		86·9	323	e 34	48	?	—	—	—	—	—	—	e 44·4
Grand Coulee		89·5	37	e 12	58	- 2	—	—	—	—	—	—	—
Paris		89·6	325	e 13	2	+ 1	—	—	—	i 20	9	?	e 46·4
Shasta Dam		91·8	44	e 13	8	- 3	—	—	—	—	—	—	—
Tinemaha	z.	96·5	45	i 12	31	-61	—	—	—	—	—	—	—
Tucson		104·3	45	e 18	19	PKP	—	—	—	—	—	—	—

Long waves were also recorded at Riverview and Weston and at other European stations.

March 16d. Readings also at 10h. (near Balboa Heights), 11h. (Samarkand, and near Obi-garm, Stalinabad, and Andijan), 14h. (Andijan, Samarkand, near Obi-garm, and Stalinabad), 15h. (Jena), 17h. (Apia and near Mizusawa), 18h. (Tinemaha, Tucson, Balboa Heights, and Helwan (2) ), 22h. (Mineral (5), and Lick), 23h. (Mineral (3) ).

March 17d. 6h. Shock in region of North Pacific. Records confined to P observed at many American stations.

College iP? = 29m.42s., i = 30m.9s.

Sitka iP = 31m.24s.

Grand Coulee iP = 34m.4s., i = 34m.31s.

Shasta Dam iP = 34m.47s.

Tinemaha iPZ = 35m.30s., iZ = 35m.59s., e = 36m.42s., iZ = 36m.49s. and 38m.11s.

Overton iP = 35m.45s.

Boulder City iP = 35m.49s.

Pierce Ferry iP = 35m.51s.

Mount Wilson iPZ = 35m.52s., iZ = 36m.21s., 36m.38s., and 38m.17s.

Pasadena ePZ = 35m.52s., eZ = 36m.20s.

Riverside iPZ = 35m.55s., eZ = 36m.11s. and 36m.24s.

Palomar iP = 36m.2s., iZ = 36m.19s. and 36m.32s.

Tucson iP = 36m.30s., e = 37m.38s. and 38m.31s.

St. Louis iPZ = 36m.49s., iZ = 37m.7s.

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March 17d. 8h. 19m. 32s. Epicentre 33°·5N. 99°·5E.

A = -·1379, B = +·8241, C = +·5493;  $\delta = -11$ ;  $h = +1$ ;  
D = +·986, E = +·165; G = -·091, H = +·542, K = -·836.

	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.	
	°	°	m.	s.	s.	m.	s.	s.	m.	s.	m.	
Calcutta	N. 14·7	225	e 3	58	+27	i 6	28	+12	—	—	9·0	
Nanking	16·3	90	4	51	+59	i 8	7	+74	—	—	i 9·7	
Dehra Dun	N. 18·5	265	e 4	55	+36	i 8	2	+18	—	—	i 10·8	
Irkutsk	19·1	8	i 4	26	- 1	—	—	—	—	—	—	
New Delhi	E. 19·7	261	i 4	30 <sub>a</sub>	- 4	i 8	5	- 5	4	50	PP	—
Almata	20·2	306	4	41	+ 2	8	32	+11	—	—	—	
Frunse	21·6	303	i 4	55	+ 1	i 9	7	+18	—	—	—	
Andijan	22·8	296	5	8	+ 3	9	23	+12	—	—	—	
Obi-garm	24·6	292	5	24	+ 1	—	—	—	—	—	—	
Hyderabad	24·8	235	5	24	- 1	9	47	+ 1	6	1	PP	—
Tchimkent	25·1	299	i 5	29	+ 1	—	—	—	—	—	—	
Tashkent	25·2	297	e 5	29	0	e 10	3	+11	—	—	—	
Stalinabad	25·3	291	i 5	33	+ 3	—	—	—	—	—	—	
Hukuoka	25·7	81	5	10 <sub>a</sub>	-23	e 9	42	-19	—	—	e 12·3	
Unzendake	25·7	83	5	32	- 1	10	16	+15	—	—	—	
Kumamoto	26·1	82	e 5	38	+ 1	—	—	—	—	—	—	
Kagosima	26·2	85	i 5	44	+ 6	10	14	+ 5	—	—	—	
Hamada	26·9	78	5	39	- 6	10	38	+18	—	—	—	
Miyazaki	26·9	84	e 5	46	+ 1	e 10	39	+19	—	—	e 12·6	
Vladivostok	27·0	60	i 5	44 <sub>?</sub>	- 1	—	—	—	—	—	—	
Bombay	27·9	245	e 5	54	0	i 10	38	+ 1	—	—	14·0	
Kôti	28·3	79	e 6	5	+ 8	11	0	+17	—	—	—	
Sumoto	29·3	78	6	5	- 1	11	22	+23	—	—	—	
Kobe	29·4	77	i 6	6	- 1	11	5	+ 4	—	—	—	
Osaka	29·8	77	6	10	- 1	11	35	+28	—	—	—	
Kyoto	29·9	76	e 6	9	- 3	11	19	+10	—	—	—	
Siomisaki	30·2	79	e 6	14	0	11	45	+32	—	—	—	
Owase	30·4	78	e 6	17	+ 1	—	—	—	—	—	—	
Wazima	30·6	71	e 6	20	+ 2	11	27	+ 7	—	—	—	
Gihu	30·7	75	e 6	18	- 1	—	—	—	—	—	—	
Kodaikanal	E. 30·8	227	i 6	31	+11	—	—	—	—	—	—	
Nagoya	30·9	75	6	16	- 4	11	55	+31	—	—	—	
Toyama	30·9	72	e 6	24	+ 4	11	18	- 6	—	—	—	
Hunatu	32·0	74	6	30	0	11	53	+11	—	—	—	
Colombo	E. 32·1	218	6	22	- 9	11	50	+ 7	—	—	15·0	
Shizuoka	32·1	75	6	31	0	—	—	—	—	—	—	
Maebasi	32·4	73	6	40	+ 6	—	—	—	—	—	—	
Osima	32·9	76	e 6	38	0	—	—	—	—	—	—	
Akita	33·0	67	7	48	+69	14	26	L	—	—	(14·4)	
Yokohama	33·0	75	e 6	37	- 2	12	15	+18	—	—	e 15·4	
Tokyo	33·1	74	e 5	43	-57	12	0	+ 1	6	53	PP	—
Kakioka	33·3	73	e 6	39	- 2	—	—	—	—	—	—	
Mori	33·3	61	e 6	50	+ 9	12	44	+42	—	—	e 16·7	
Mito	33·5	73	6	58	+15	—	—	—	—	—	—	
Sendai	33·7	69	e 6	45	0	12	16	+ 8	—	—	—	
Morioka	33·8	66	e 7	42	+56	—	—	—	—	—	—	
Sapporo	33·9	59	e 6	48	+ 1	e 12	12	+ 1	—	—	16·1	
Miyako	34·4	66	e 6	50	- 1	—	—	—	—	—	—	
Sverdlovsk	35·3	323	i 6	58	- 1	i 12	38	+ 5	—	—	—	
Baku	39·8	295	7	37	+ 1	e 13	47	+ 5	—	—	—	
Grozny	42·6	299	e 7	54	- 5	—	—	—	—	—	—	
Erevan	43·9	295	e 8	15	+ 5	14	53	+11	—	—	—	
Leninakan	44·3	296	8	18	+ 5	—	—	—	—	—	—	
Piatigorsk	44·5	301	7	59	-16	—	—	—	—	—	—	
Sotchi	46·9	300	8	37	+ 3	—	—	—	—	—	—	
Moscow	47·5	317	e 8	35	- 3	e 15	31	- 3	—	—	—	
Yalta	50·7	302	e 9	3	0	e 16	20	+ 2	—	—	—	
Ksara	52·2	289	e 9	17	+ 2	e 16	56 <sub>?</sub>	+17	20	40	SS	—
Helsinki	54·1	324	e 9	28	- 1	e 17	7	+ 2	e 19	23	ScS	e 21·0
Istanbul	55·2	300	i 9	33	- 4	e 17	22	+ 2	—	—	—	

Continued on next page.



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		$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Bucharest	E.	56.3	305	e 9 47	+ 2	e 17 40	+ 6	—	25.5
Helwan		57.2	286	i 9 49 <sup>k</sup>	- 2	i 16 52	- 54	21 46	SS
Warsaw	E.	57.6	314	e 9 55	+ 1	i 17 55	+ 4	e 10 39	P <sub>c</sub> P e 26.5
	N.	57.6	314	e 10 0	+ 6	18 9	+ 18	e 10 55	P <sub>c</sub> P e 26.5
	Z.	57.6	314	i 9 52 <sup>a</sup>	- 2	17 59	+ 8	i 11 55	PP e 26.5
Upsala		57.7	324	i 9 53 <sup>a</sup>	- 2	i 17 56	+ 3	i 12 2	PP e 27.5
Belgrade		60.1	306	i 11 15	+ 64	e 18 22	- 2	e 11 58	PP e 28.5
Budapest		60.1	310	i 10 11	0	18 28	+ 4	13 21	PPP e 28.5
Kalossa		60.5	309	e 10 14	0	—	—	—	e 28.5
Copenhagen		61.5	320	10 18	- 3	i 18 43	+ 1	—	29.5
Potsdam	E.	62.2	317	i 10 27	+ 1	e 18 56	+ 5	i 20 22	S <sub>e</sub> S e 29.5
Prague		62.2	314	10 24	- 2	e 18 48	- 3	e 22 52	SS e 28.5
Zagreb		62.7	308	e 10 29 <sup>a</sup>	0	e 18 59	+ 2	e 19 6	PS i 35.3
Cheb		63.4	314	e 12 28	PP	e 20 18	+ 72	i 25 24	SSS e 35.5
Bergen		63.5	327	10 34	0	e 19 8	+ 1	19 38	PS e 25.8
Jena		63.6	314	e 10 33	- 2	e 19 11	+ 3	e 26 4	SSS e 31.0
Triest		64.2	309	i 10 38 <sup>a</sup>	- 1	i 19 16	0	e 13 1	PP
Stuttgart		65.9	313	e 10 47	- 3	i 19 38	+ 1	i 13 4	PP i 31.6
Chur		66.4	311	e 10 50	- 3	e 19 48	+ 5	—	—
Florence		66.6	308	i 10 50	- 4	i 19 50	+ 5	i 12 49	PP i 33.3
De Bilt		66.8	318	i 10 56 <sup>a</sup>	0	i 19 55	+ 7	i 20 19	PS e 30.5
Strasbourg		66.8	314	i 10 55	- 1	i 19 49	+ 1	i 11 27	P <sub>c</sub> P i 30.5
Zürich		66.8	312	e 10 53	- 3	e 19 52	+ 4	e 13 20	PP
Perth		66.9	164	i 17 54	?	i 19 58	+ 9	—	—
Rome		67.0	306	i 10 51 <sup>a</sup>	- 6	i 19 49	- 1	i 11 20	pP
Basle		67.4	312	e 10 58 <sup>a</sup>	- 1	e 19 56	+ 1	—	—
Uccle		67.9	317	e 11 2 <sup>a</sup>	0	i 20 3	+ 2	e 11 38	P <sub>c</sub> P e 31.5
Neuchatel		68.0	312	e 11 1	- 2	e 20 4	+ 2	—	—
Scoresby Sund		68.2	342	i 11 5	+ 1	20 10	+ 6	13 27	PP
Aberdeen		68.3	325	i 20 6	S	(i 20 6)	0	i 24 31	SS 32.9
Besançon		68.5	312	e 11 5	- 1	e 20 13	+ 5	e 27 46	SSS e 33.5
College		69.0	25	i 11 5	- 4	e 20 15	+ 1	e 13 23	PP e 28.0
Durham		69.2	322	i 18 8	?	(i 20 26)	+ 10	—	—
Paris		69.8	316	i 11 13	- 1	i 20 28	+ 5	i 11 46	P <sub>c</sub> P 33.5
Kew		70.2	319	i 11 16	- 1	i 20 31	+ 3	i 11 42?	P <sub>c</sub> P e 34.0
Clermont-Ferrand		70.9	312	i 11 21	0	i 20 41 <sup>a</sup>	+ 5	i 25 6	SS 33.0
Tananarive		71.9	232	e 11 28	+ 1	e 20 47	- 1	14 9	PP 29.7
Jersey		72.3	319	e 11 33	+ 4	e 20 52	0	—	—
Barcelona		73.7	309	e 11 35	- 3	21 18	+ 10	14 23	PP e 34.9
Tortosa		75.0	309	i 11 46	+ 1	i 21 15	- 8	12 5	P <sub>c</sub> P e 34.5
Algiers		75.4	304	i 11 52	+ 5	i 21 38	+ 11	27 28	SS 34.5
Alicante		77.0	307	i 11 53	- 3	21 50	+ 5	12 15	pP e 35.0
Sitka		78.3	27	i 12 6	+ 3	i 22 7	+ 8	—	— i 33.3
Brisbane	N.	79.1	133	i 12 4	- 4	—	—	—	—
Almería		79.1	307	i 12 3	- 5	i 22 0	- 7	15 5	PP 40.0
Granada		79.7	308	i 12 10	- 1	i 22 16	+ 3	i 12 27	pP i 40.1
Malaga	N.	80.5	308	12 9	- 6	22 27	+ 5	40 19	Q 44.0
Ivigtut		82.0	344	12 19	- 4	22 45	+ 8	—	—
Lisbon		82.4	312	12 26 <sup>k</sup>	+ 1	22 46	+ 5	27 58	SS 36.4
Riverview		82.7	139	i 12 27 <sup>a</sup>	0	i 22 53	+ 9	e 28 32	SS e 37.6
Honolulu		88.4	65	—	—	e 23 38	- 2	e 29 45	SS e 36.7
Johannesburg		90.1	238	—	—	24 28?	+ 33	—	— 38.5
Saskatoon		91.7	16	13 5	- 5	24 17	+ 7	23 39	SKS 37.5
Grand Coulee		91.9	25	i 13 12	+ 1	e 24 23	+ 12	—	—
Butte		95.7	22	e 17 28	PP	i 25 0	+ 16	e 26 13	PS e 41.4
Bozeman		96.5	21	e 17 28	PP	e 24 28	(- 1)	e 25 8	S e 39.5
Shasta Dam		96.7	30	e 13 32	- 1	—	—	—	—
Berkeley		99.1	33	i 16 49	?	i 25 17	+ 4	i 24 54	SKS e 47.5
San Francisco		99.1	33	—	—	e 27 41	PPS	—	— e 54.2
Seven Falls		99.3	353	13 47	+ 2	25 30	+ 16	18 1	PP 43.5

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Santa Clara	99.6	33	e 17 53	PP	e 29 11	?	—	—
Lick	99.8	33	i 17 53	PP	i 27 32	PPS	—	e 46.5
Logan	99.8	23	e 17 52	PP	e 24 32	[+ 6]	e 25 36	e 39.5
Shawinigan Falls	100.0	355	13 49	+ 1	—	—	17 46	PP
Rapid City	100.1	16	i 13 52	+ 3	e 25 28	+ 7	e 17 59	PP
Arapuni	100.3	129	—	—	e 27 28	PS	31 34	SS
Salt Lake City	100.6	24	e 15 28	?	e 25 30	+ 5	e 17 56	PP
Halifax	100.7	348	—	—	e 28 28?	PPS	—	—
Ottawa	101.4	357	13 58	+ 3	25 44	+12	17 58	PP
Tinemaha	101.4	30	e 13 54	- 1	i 38 15	P'P'	i 18 2	PP
Christchurch	101.6	135	—	—	26 18	PS	27 19	PPS
Haiwee	102.4	30	e 18 7	PP	—	—	—	—
Santa Barbara	103.0	33	e 18 16	PP	—	—	—	—
Overton	103.5	28	e 14 5	+ 1	—	—	e 18 15	PP
Boulder City	103.8	29	e 14 7	+ 2	e 32 35	SS	e 18 23	PP
Harvard	103.9	353	i 18 21	PP	e 27 45	PS	e 20 14	PPP
Weston	104.0	353	—	—	e 24 56	[+10]	i 33 28	SS
Pierce Ferry	104.0	28	e 14 5	- 1	e 25 35	-19	e 18 23	PP
Mount Wilson	104.0	32	i 14 8	+ 2	i 38 12	P'P'	e 18 22	PP
Pasadena	104.0	32	e 14 7	+ 1	e 33 19	SS	i 18 20	PP
Riverside	104.5	32	e 14 14	+ 6	e 38 8	P'P'	e 18 27	PP
Lincoln	104.5	13	—	—	e 28 55	PPS	e 39 6	P'P'
Chicago	104.8	7	—	—	e 24 52	[+ 2]	e 26 3	S
Palomar	105.2	31	e 14 12	+ 1	e 38 8	P'P'	i 18 33	PP
La Jolla	105.5	32	e 18 36	PP	—	—	—	—
Fordham	105.8	355	—	—	e 24 52	[- 2]	e 27 52	PS
New Kensington	106.3	359	—	—	e 26 0	-13	e 28 14	PS
Philadelphia	106.7	355	e 18 46	PP	e 24 45	[-13]	e 27 59	PS
St. Louis	107.7	8	e 17 55	?	i 25 13	[+11]	e 18 52	PP
Tucson	108.6	27	e 14 33	P	e 25 14	[+ 8]	i 18 59	PP
Bermuda	112.8	344	e 19 28	PP	e 25 14	[-10]	e 28 33	PS
Columbia	112.9	1	e 28 48	PS	e 35 1	SS	e 30 16	PPS
San Juan	126.6	343	e 20 58	PP	e 26 6	[- 5]	e 22 14	PKS
Bogota	z. 141.6	350	e 19 27	[- 6]	e 22 34	PKS	e 19 32	PKP <sub>2</sub>
Huancayo	158.1	347	i 20 2	[+ 3]	e 43 56	SS	e 27 13	PPP <sub>2</sub>
La Paz	159.7	323	i 20 2	[+ 2]	31 7	{- 3}	24 21	PP
La Plata	161.3	260	23 52	PP	44 34	SS	70 13	Q

Additional readings :—

Nanking iSE = 8m.14s., SS = 8m.44s.  
 New Delhi SSE = 8m.26s.  
 Bombay iSE = 10m.41s.  
 Tokyo PPP = 7m.56s., SS? = 13m.48s., SSS? = 16m.25s.  
 Mori i = 14m.18s.  
 Helsinki eSS = 20m.3s.  
 Helwan PPP = 13m.24s., i = 16m.1s. and 16m.33s.  
 Warsaw iZ = 10m.19s., iPPE = 11m.59s., PPPZ = 13m.4s., IPPPE = 13m.20s., iP<sub>c</sub>S?E = 14m.19s., iP<sub>c</sub>SZ = 14m.58s., iZ = 16m.1s., S<sub>c</sub>SZ = 19m.38s., S<sub>c</sub>SE = 19m.48s., S<sub>c</sub>SN = 19m.57s., iE = 20m.58s., SSZ = 21m.33s., SSN = 21m.38s., SSE = 21m.42s., iE = 22m.38s., iZ = 22m.46s., iE = 23m.9s., SSSN = 23m.43s., SSSSE = 24m.5s.  
 Upsala iPE = 10m.0s. and 10m.10s., iPPP = 13m.14s., SE = 18m.2s., S<sub>c</sub>SN = 19m.44s., eSSE = 22m.2s., eSSS?N = 24m.4s., eSSS?E = 24m.21s., eN = 25m.22s.  
 Belgrade ePPP = 13m.16s., SS? = 22m.16s., eSSS? = 24m.25s.  
 Budapest iN = 20m.18s., eN = 24m.44s., SKKSE = 24m.47s., SSSE = 25m.2s.  
 Kalossa ePE = 10m.17s.  
 Copenhagen e = 10m.21s., 10m.51s., and 24m.28s., i = 25m.30s.  
 Prague eSSS = 25m.28s.  
 Zagreb eSSS = 25m.59s.  
 Cheb e = 16m.36s., i = 21m.3s. and 29m.46s.  
 Bergen eSE = 19m.13s., S<sub>c</sub>S = 20m.21s., SSEN = 23m.28s.?, eN = 24m.28s.?  
 Jena eN = 26m.9s., eE = 26m.12s.  
 Trieste i = 10m.43s., ePPP = 14m.15s., eSS = 24m.1s.  
 Stuttgart iPPP = 15m.9s., iS<sub>c</sub>S = 20m.28s., iSS = 24m.16s., iSSS = 26m.44s.  
 Florence iPS = 20m.17s., iSSS = 27m.37s.  
 De Bilt eSS = 24m.18s.  
 Strasbourg ePPP? = 14m.28s., iS = 19m.52s. and 19m.56s., iS<sub>c</sub>S? = 21m.6s., iSS = 24m.7s., iSSS = 27m.5s.  
 Perth i = 24m.36s. and 30m.26s.  
 Rome iPPZ = 13m.25s., iSN = 19m.55s., iSSN = 24m.5s.

Continued on next page.

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Uccle ePPPEN = 15m.5s., eSSN = 24m.28s., eSSSN = 27m.40s., iSSSE = 27m.44s.  
 Scoresby Sund 24m.40s.  
 Aberdeen iE = 19m.16s., iN = 19m.30s., iSE = 27m.38s.  
 College iS = 20m.18s., eSS = 24m.32s.  
 Durham iSE = 26m.11s., iN = 27m.55s., true S is given as iPPN.  
 Paris ePP = 13m.48s., i = 14m.12s., iPPP = 15m.36s., eSKS? = 21m.22s., e = 22m.2s.?,  
 iSS = 24m.55s., eSS = 25m.8s., e = 26m.30s., i = 27m.4s., iSSS = 27m.54s. and 28m.5s.,  
 eQ = 31.5m.  
 Kew ePPPEZ = 15m.33s., iZ = 18m.49s., iPSEZ = 20m.51s., ePPSEN = 21m.17s.,  
 iN = 21m.51s., eN = 22m.17s., eE = 22m.45s., eSSN = 24m.52s., eSSEZ = 25m.22s.?,  
 eSSSNZ = 27m.58s.?, eSSSE = 28m.17s., eQEZ = 30.5m.  
 Clermont-Ferrand iSSS = 28m.39s.  
 Tananarive PS = 21m.21s., SS = 25m.16s., SSS = 28m.19s.  
 Barcelona SS = 25m.56s.  
 Tortosa PPN = 14m.20s., PPPE = 16m.22s., S<sub>c</sub>SEN = 21m.30s., PSN = 21m.40s., SSN =  
 26m.10s., SSSN = 29m.56s., eQN = 31m.43s.  
 Algiers SSS = 30m.0s.  
 Alicante P<sub>c</sub>P = 12m.2s., PP = 14m.50s., PPP = 16m.31s., PS = 22m.23s., PPS = 22m.58s.,  
 SS = 26m.16s., SSS = 29m.40s., Q = 31m.22s.  
 Almeria PPP = 16m.59s., S<sub>c</sub>S = 22m.18s., SS = 27m.15s., SSS = 30m.48s., Q = 33m.23s.  
 Granada iPP = 15m.40s., PS = 22m.46s., eSS = 28m.13s., iSSS = 31m.49s.  
 Malaga iN = 33m.35s.  
 Lisbon iPEN = 12m.31s., SN = 22m.55s.  
 Riverview iZ = 12m.31s., iSKSN = 23m.8s., iE = 28m.23s., eSSN = 28m.46s., eQ?E =  
 34m.10s.  
 Saskatoon SS = 30m.16s.  
 Grand Coulee e = 24m.27s.  
 Butte ePPP? = 20m.25s., eSS? = 31m.23s.  
 Bozeman ePS = 26m.24s., e = 28m.0s., eSS = 31m.28s., eSSS = 35m.28s.  
 Berkeley iZ = 27m.22s., iSZ = 27m.56s., iN = 36m.9s., iE = 39m.30s., iN = 39m.53s.,  
 iEN = 41m.58s.  
 San Francisco eN = 27m.48s.  
 Seven Falls PS = 26m.58s., SS = 32m.2s., SSS = 37m.4s.  
 Lick iSEN = 28m.16s.  
 Logan i = 17m.56s. and 20m.42s., e = 21m.32s., ePS = 26m.52s., e = 27m.26s., eSS =  
 32m.22s.  
 Shawinigan Falls PPP = 19m.59s.  
 Rapid City e = 21m.32s., eSKS = 24m.30s., ePS = 26m.57s., eSS = 32m.12s.  
 Arapuni e = 43m.46s. and 56m.10s.  
 Salt Lake City e = 20m.14s., eSKS = 24m.35s., ePS = 27m.18s., ePPS = 27m.54s., e =  
 30m.10s., eSS = 32m.2s., eSSS = 36m.13s.  
 Ottawa SKS = 24m.34s., SKKS = 25m.18s., PS = 26m.50s., PPS = 27m.46s., SS =  
 32m.28s., SSS = 36m.16s., e = 38m.58s.  
 Tinemaha ePKPZ = 17m.38s.  
 Christchurch SSEN = 32m.43s., SSSE = 36m.38s., SSSSEN = 39m.28s., QEN = 43m.13s.  
 Overton e = 17m.52s.  
 Boulder City e = 17m.18s.  
 Harvard ePPS?Z = 30m.20s., PKKSZ = 32m.45s., eSSZ = 34m.58s., eZ = 44m.11s.  
 Weston e = 27m.38s., iPPS = 28m.33s., iSPS = 33m.50s., iSSS = 37m.11s.  
 Pierce Ferry ePKP = 17m.48s.  
 Mount Wilson iPKPZ = 17m.43s., ePKKPZ = 29m.54s.  
 Pasadena ePKPZ = 17m.44s., ePPPZ = 20m.18s., ePKKPZ = 29m.54s., ePKP,PKPZ =  
 38m.11s.  
 Riverside ePKPZ = 17m.50s., ePKKPZ = 29m.52s.  
 Chicago eS? = 26m.54s., eSS = 33m.0s., eSSS = 37m.28s.  
 Palomar iPKPNZ = 18m.17s.  
 Fordham eSSS = 37m.33s.  
 New Kensington eSS? = 35m.33s.  
 Philadelphia e = 24m.6s. and 27m.32s., eSS = 33m.49s., eSSS = 39m.22s.  
 St. Louis iZ = 20m.58s., iPPPZ = 21m.13s., iSE = 26m.37s., iPSE = 28m.7s., iN =  
 28m.23s., iPPSN = 29m.7s., iE = 29m.38s., iPPPSE = 30m.0s., iE = 31m.41s.,  
 32m.31s. and 33m.25s., iSSE = 34m.3s., iE = 34m.51s.  
 Tucson ePKP? = 18m.42s., i = 19m.52s., ePPP = 21m.0s., eS? = 26m.3s., e = 27m.42s.,  
 ePS = 28m.39s., iPS = 28m.43s., ePPS = 29m.38s., e = 30m.18s., eSS = 33m.48s.,  
 e = 37m.24s.  
 Bermuda e = 20m.36s., eS? = 26m.39s., ePPS = 30m.17s., eSS = 35m.20s., eSSS = 39m.8s.  
 Columbia e = 36m.28s. and 43m.8s.  
 San Juan e = 28m.37s., ePPS = 31m.32s., eSS = 37m.28s., eSSS = 41m.44s.  
 Huancayo e = 22m.11s., 24m.12s., and 24m.56s., ePPP = 30m.11s., ePPS = 40m.20s.,  
 e = 49m.58s., eSSS = 53m.48s., e = 55m.0s., 59m.11s., and 63m.12s.  
 La Paz iZ = 20m.40s. and 26m.11s., PSKSZ = 35m.6s., iSSE = 44m.35s., iSSSE = 49m.47s.  
 La Plata Z = 30m.22s., N = 45m.16s., E = 47m.28s., N = 57m.34s., E = 58m.52s., N =  
 58m.58s. and 67m.16s.  
 Long waves were also recorded at Seattle, Ferndale, Pennsylvania, Fort de France,  
 Punta Arenas, Santa Lucia, Auckland, and Wellington.

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March 17d. 16h. 2m. 27s. Epicentre 34°·9N. 134°·6E.

Intensity VI at Yashiro, Tawara, Takasago, Yamazaki, and Fukura (Hyogo Pref.); V at Katada (Shiga Pref.), Tomitabayashi (Osaka Pref.); IV at Kobe, Toyooka, Sumoto, Kyoto, and Osaka; II-III at Tu, Tottori, Kashiwara, Tokushima, Yonago, Matsue, and Nagoya. Epicentre as adopted. Shallow. Macroseismic radius 200-300km. Seismo. Bull. Cent. Met. Obs., Japan, 1947, Tokyo, 1950, pp. 17, 18, with macroseismic chart.

A = -·5771, B = +·5853, C = +·5696;  $\delta = +6$ ;  $h = 0$ ;  
D = +·712, E = +·702; G = -·400, H = +·406, K = -·822.

	$\Delta$	Az.	P.	O - C.	S.	O - C.
	°	°	m. s.	s.	m. s.	s.
Kobe	0·5	114	0 11 <sub>a</sub>	- 3	0 17	- 6
Sumoto	0·6	157	0 15 <sub>a</sub>	0	0 24	- 2
Toyooka	0·6	16	0 14	- 1	0 22	- 4
Osaka	0·8	108	0 17 <sub>a</sub>	- 1	0 28	- 3
Kyoto	0·9	83	0 17	- 3	0 25	- 9
Hikone	1·4	75	0 27 <sub>k</sub>	0	0 41	- 5
Kameyama	1·5	92	0 28	0	0 46	- 3
Koti	1·6	213	-0 17	?	—	—
Owase	1·6	122	0 31	+ 1	0 51	0
Siomisaki	1·7	146	0 34	+ 3	0 59	+ 5
Hirosima	1·8	253	0 26 <sub>k</sub>	- 6	0 52	- 4
Gihu	1·8	74	0 35	+ 3	0 58	+ 2
Nagoya	2·0	82	0 35	0	0 58	- 4
Hamada	2·1	270	0 43	P <sub>r</sub>	1 10	S <sub>r</sub>
Toyama	2·8	50	0 52 <sub>a</sub>	P <sub>r</sub>	1 31	S <sub>r</sub>
Omaesaki	3·0	96	0 57	P <sub>r</sub>	1 33	S <sub>r</sub>
Wazima	3·1	37	0 57	P <sub>r</sub>	1 40	S <sub>r</sub>
Shizuoka	3·1	89	0 56	P <sub>r</sub>	1 34	S <sub>r</sub>
Isuka	3·4	250	1 11	P <sub>r</sub>	—	—
Nagano	3·4	58	1 7	P <sub>r</sub>	1 46	S <sub>r</sub>
Hunatu	3·5	79	1 0	+ 3	1 47	S <sub>r</sub>
Misima	3·6	86	1 55	S <sub>r</sub>	2 48	S <sub>r</sub>
Hukuoka	3·7	250	0 59	- 1	1 54	S <sub>r</sub>
Kumamoto	3·8	239	1 8	P <sub>r</sub>	2 10	S <sub>r</sub>
Maebasi	3·9	66	1 13	P <sub>r</sub>	2 5	S <sub>r</sub>
Miyazaki	4·0	222	1 35	P <sub>r</sub>	2 23	S <sub>r</sub>
Osima	4·0	91	1 17	P <sub>r</sub>	2 13	S <sub>r</sub>
Kumagaya	4·1	71	1 21	P <sub>r</sub>	2 10	S <sub>r</sub>
Yokohama	4·2	81	1 21	P <sub>r</sub>	2 13	S <sub>r</sub>
Mera	4·3	88	1 25	P <sub>r</sub>	2 15	S <sub>r</sub>
Tokyo	4·3	78	1 23	P <sub>r</sub>	2 14	S <sub>r</sub>
Utunomiya	4·6	67	1 30	P <sub>r</sub>	2 43	S <sub>r</sub>
Kakioka	4·7	72	1 18	+ 4	—	—
Kagosima	4·8	227	1 46	P <sub>r</sub>	2 40	S <sub>r</sub>
Mito	5·0	71	1 35	P <sub>r</sub>	2 36	S <sub>r</sub>
Sendai	6·1	55	2 1	P <sub>r</sub>	—	—

March 17d. Readings also at 0h. (Tchikent, Andijan, and Tashkent), 5h. (Andijan, Samarkand, near Obi-garm, and Stalinabad), 6h. (Tananarive and near Malaga), 8h. (near Ferndale and Mineral), 11h. (Apia, Brisbane, Mount Wilson, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, Pierce Ferry, and near Mizusawa), 13h. (College, Shasta Dam, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, and Pierce Ferry), 14h. (Tinemaha, Tucson, Pierce Ferry, and Nanking), 15h. (Tucson (2)), 16h. (St. Louis, and Tucson (3)), 18h. (Shasta Dam (2)), 19h. (Andijan, near Obi-garm, Samarkand, and Stalinabad), 22h. (St. Louis), 23h. (near Mineral).

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March 18d. 15h. 23m. 37s. Epicentre  $16^{\circ}5'N$ ,  $110^{\circ}0'W$ . (approximate).

$$A = -.3281, B = -.9014, C = +.2823; \quad \delta = -14; \quad h = +5;$$

$$D = -.940, E = +.342; \quad G = -.097, H = -.265, K = -.959.$$

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Tucson		15.7	357	i 4 34	+50	c 6 45	+ 6	—	c 7.2
Palomar	z.	17.9	341	e 4 10	- 2	—	—	—	—
Riverside	z.	18.7	340	e 4 20	- 2	—	—	—	—
Pasadena	z.	19.0	340	i 4 25	- 1	—	—	—	c 9.1
Mount Wilson	z.	19.1	340	i 4 28	+ 1	—	—	—	—
Santa Barbara	z.	19.8	336	i 4 28	- 7	—	—	—	—
Boulder City		19.9	349	i 4 32	- 4	—	—	i 4 41	PP c 12.6
Pierce Ferry		19.9	351	i 4 31	- 5	c 8 4	-11	—	c 10.7
Overton		20.3	350	e 4 35	- 5	—	—	c 4 58	PP
Haiwee	n.	20.8	342	e 4 47	+ 2	—	—	—	—
Tinemaha		21.8	342	i 4 57	+ 1	—	—	—	—
Berkeley		23.9	336	i 5 24	+ 8	i 9 23	- 7	i 9 44	S c 13.2
Salt Lake City		24.2	356	e 5 23	+ 4	—	—	c 6 30	PPP c 11.8
Shasta Dam		26.4	338	e 5 43	+ 3	—	—	—	—
Lincoln		26.9	22	e 10 23	?	—	—	—	c 12.9
St. Louis		28.0	33	i 5 49	- 6	i 10 48	+10	i 6 21	PP i 13.7
Rapid City		28.1	12	e 5 59	+ 4	—	—	c 6 50	PP c 10.4
Chicago		31.7	33	e 11 55	S	(e 11 55)	+18	c 15 11	Q c 15.4

Additional readings :—

Tucson e = 5m.20s., i = 5m.23s.

St. Louis iPZ = 6m.4s., iSE = 10m.26s., iSSE = 11m.5s.

Long waves were also recorded at Philadelphia, Bozeman, and Weston.

March 18d. Readings also at 5h. (Helwan, Huancayo, La Paz, Overton, Tinemaha, Tucson, and near Pierce Ferry), 6h. (Stuttgart), 9h. (Copenhagen), 10h. (Edinburgh, Andijan, and near Obi-garm, Stalinabad, and Samarkand), 19h. (near Ottawa), 20h. (Samarkand and near Obi-garm, Stalinabad, and Andijan), 21h. (near Grozny), 22h. (near Granada and Malaga), 23h. (near Pierce Ferry and Overton).

March 19d. Readings at 0h. (near Granada), 1h. (Nanking), 2h. (near Granada), 4h. (Shasta Dam), 5h. (Shasta Dam, Tinemaha (2), Mount Wilson, Overton, Pierce Ferry, Palomar, Tucson (2), and St. Louis), 6h. (Stuttgart and near Mizusawa), 9h. (Tucson), 11h. (Andijan, and near Obi-garm, Stalinabad, and Samarkand), 12h. (Santa Lucia), 19h. (Tucson, near Mineral, and near Mizusawa), 20h. (near Bogota).

March 20d. Readings at 2h. (Tucson), 3h. (Tucson, Overton, Tinemaha, Riverside, Mount Wilson, Pasadena, Shasta Dam, Pierce Ferry, Samarkand, and near Stalinabad, Tashkent, Tchikent, and Andijan), 6h. (Tucson, Overton, Tinemaha, Riverside, Mount Wilson, Palomar, and Pierce Ferry (2)), 9h. (Tucson, Tinemaha, Mount Wilson, and near Honolulu), 10h. (Tucson (2), Tinemaha (2), Palomar, Riverside, Pasadena, Mount Wilson, and St. Louis), 11h. (Shasta Dam), 15h. (Tucson), 18h. (near Mizusawa), 23h. (near Stalinabad and Obi-garm).

March 21d. 16h. 26m. 19s. Epicentre  $32^{\circ}5'S$ ,  $70^{\circ}0'W$ . Depth of focus 0.020. (as on 1944, December 5d.).

Intensity VII between latitudes  $32^{\circ}S$ . and  $33^{\circ}S$ . Macroseismic radius more than 300km.

F. Greve.

Lista de sismos sensibles al hombre obtenidos por el servicio de postales informativas, año 1947. Instituto sismológico de la Universidad de Chile, p. 4.

$$A = +.2890, B = -.7940, C = -.5347; \quad \delta = -14; \quad h = +1;$$

$$D = -.940, E = -.342; \quad G = -.183, H = +.502, K = -.845.$$

		$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Santa Lucia	e.	1.1	213	0 16	-11	—	—	—	0.6
La Plata		10.3	106	i 2 30	+ 6	4 29	+11	2 41	PPP 5.1
La Paz		16.0	6	c 3 59	PP	7 1	SS	—	9.4
St. Louis	z.	73.2	344	i 11 13	- 2	—	—	i 11 31	PcP
Tucson		75.1	326	e 11 24	- 2	—	—	i 11 43	PcP

Continued on next page.

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		$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.	
		<sup>c</sup>	<sup>c</sup>	m. s.	s.	m. s.	s.	m. s.	m.	
Palomar	z.	79.0	322	i 11 48	0	—	—	i 12 5	P <sub>c</sub> P	—
Pierce Ferry		79.7	325	i 11 51	0	—	—	i 12 9	P <sub>c</sub> P	—
Riverside	z.	79.8	322	e 11 52	0	—	—	i 12 9	P <sub>c</sub> P	—
Boulder City		80.0	324	i 12 11	P <sub>c</sub> P	—	—	—	—	—
Overton		80.3	325	e 11 55	+ 1	—	—	i 12 12	P <sub>c</sub> P	—
Pasadena	z.	80.3	322	i 12 13	PS	—	—	—	—	—
Tinemaha	z.	82.6	323	i 12 6k	0	—	—	e 12 12	P <sub>c</sub> P	—
Shasta Dam		87.4	323	i 12 29	- 1	—	—	—	—	—

Additional readings :—

La Plata Z = 3m.22s.  
 St. Louis iZ = 11m.40s.  
 Palomar iZ = 12m.13s.  
 Pierce Ferry i = 11m.57s.  
 Riverside iZ = 12m.17s.  
 Tinemaha iZ = 12m.24s. and 12m.33s.

March 21d. 23h. 0m. 0s. Epicentre 35°·1N. 23°·4E. (as on 1946, May 18d.).

A = +.7525, B = +.3257, C = +.5724 ;  $\delta = -2$  ;  $h = 0$  ;  
 D = +.397, E = -.918 ; G = +.525, H = +.227, K = -.820.

		$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
		<sup>c</sup>	<sup>c</sup>	m. s.	s.	m. s.	s.	m. s.	m.
Istanbul		7.4	35	1 56	+ 4	3 30	+12	—	—
Helwan		8.5	125	2 2	- 5	3 33	-12	2 42	P <sub>s</sub>
Bucharest	N.	9.5	12	c 2 16	- 4	—	—	—	—
Belgrade		10.0	348	c 2 24	- 3	e 5 51	?	e 3 10	PPP
Ksara		10.4	93	e 2 32	- 2	e 4 46	SS	—	—
Rome		10.9	312	e 3 3	+23	e 5 27	SS	—	i 6.1
Kalossa		11.9	346	e 3 16	PPP	—	—	—	e 8.2
Zagreb		12.1	335	e 2 53	- 4	e 5 31?	SS	e 4 33?	?
Yalta		12.5	38	e 3 10	+ 8	—	—	—	—
Budapest		12.8	347	3 24	PPP	—	—	—	e 8.6
Simferopol		12.8	37	c 3 7	+ 1	—	—	—	—
Triest		12.8	328	c 3 14	+ 8	e 5 28	- 2	—	—
Chur		15.7	323	c 3 45	+ 1	e 6 37	- 2	—	—
Prague		16.3	339	e 4 19	PPP	e 7 24	SSS	—	e 8.5
Zürich		16.5	322	e 3 54 <sub>a</sub>	0	e 7 1	+ 3	—	—
Algiers		16.6	283	i 3 59	+ 3	6 45	-15	—	—
Leninakan		16.9	65	e 4 4	+ 5	—	—	—	—
Cheb		17.0	335	e 5 0?	+59	e 8 0?	+50	—	e 10.5
Neuchatel		17.1	319	e 4 1	- 1	—	—	—	—
Basle		17.2	323	e 4 2	- 1	—	—	—	—
Stuttgart		17.2	327	e 4 3k	0	e 7 40	SS	e 4 16	PP
Warsaw		17.2	355	e 4 8	+ 5	e 7 35	SS	e 4 16	PP
Erevan		17.5	67	e 4 20?	PP	—	—	—	e 9.5
Strasbourg		17.8	326	e 4 9	- 2	e 7 48	SS	e 4 49	PPP
Jena		18.0	337	e 4 13	0	—	—	—	e 10.0 e 11.3
Clermont-Ferrand		18.7	311	e 4 20	- 2	—	—	—	—
Tortosa		18.9	295	e 4 31	+ 7	7 53	0	4 50	PPP
Grozny		19.1	59	4 29	+ 2	e 8 15?	SS	—	—
Alicante		19.4	288	e 5 41	+71	—	—	—	—
Paris		20.6	318	i 4 43k	0	—	—	i 5 10	PP
Uccle		20.9	325	e 4 46	0	—	—	—	e 12.0
Almeria		21.0	282	e 4 47	0	e 8 39	+ 2	4 59	pP
Baku		21.6	68	e 4 53	- 1	—	—	—	12.0
Copenhagen		21.9	344	e 4 55	- 2	i 9 25	SS	5 27	PPP
Granada		21.9	284	i 4 54	- 3	i 9 0	+ 6	5 2	pP
Malaga	z.	22.6	283	e 4 55	- 8	—	—	(5 37)	PPP
Moscow		22.9	21	5 6	0	e 9 28	+15	—	—
Helsinki		25.1	1	e 5 26	- 2	e 10 4	+13	—	e 15.0
Upsala	N.	25.1	353	i 5 24	- 4	i 9 54	+ 3	e 10 54	SS
Sverdlovsk		33.2	37	e 6 39	- 1	—	—	—	—

Continued on next page.

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	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Tashkent	36.3	66	e 7 5?	- 2	—	—	—	—
Andijan	38.6	66	e 7 27	+ 1	—	—	—	—
Frunse	40.0	63	e 7 40	+ 2	—	—	—	—
Weston	70.5	309	i 11 18	0	—	—	—	—
St. Louis	84.3	313	i 12 37	+ 2	—	—	—	e 38.3
Tucson	100.4	322	—	—	e 28 4	PPS	—	—

Additional readings :—

Belgrade eSS = 6m.54s.

Kalossa ePE = 3m.35s., eE = 7m.4s., iE = 7m.39s.

Budapest PE = 3m.29s., eN = 7m.24s., eE = 7m.45s., iE = 8m.12s.

Stuttgart e = 4m.31s. and 5m.4s.

Warsaw PPZ = 4m.30s., PPPE = 4m.38s., eSE = 7m.42s., SZ = 7m.50s., SSN = 7m.58s., SSE = 8m.6s., SSZ = 8m.9s.

Strasbourg e = 5m.37s. and 8m.18s.

Jena eN = 4m.16s.

Tortosa PPP?E = 4m.59s., SSN = 8m.23s.

Almeria PP = 5m.11s., PcP = 8m.57s., PPS = 9m.37s.

Granada iPP = 5m.25s., PPP = 5m.42s., SS = 9m.38s.

Malaga PZ = 5m.4s., SSZ = 5m.53s., S<sub>z</sub>Z = 6m.1s., trace interpreted as for close shock.

Upsala P?E = 5m.36s.

Tucson e = 28m.30s., i = 30m.2s. and 30m.50s., e = 31m.20s.

Long waves were also recorded at Florence, De Bilt, Kew, and Bergen.

March 21d. Readings also at 3h. (Balboa Heights), 4h. (Tucson and Palomar), 5h. (Huancayo, La Plata, Santa Lucia, Tucson, Pasadena, Palomar, Riverside, and Tinemaha), 10h. (Tucson), 15h. (Riverview), 16h. (near Mizusawa), 17h. (Grand Coulee), 18h. (near Stalinabad), 19h. (near Boulder City, Pierce Ferry (2), Overton, and Tucson), 21h. (Bucharest and near Stalinabad, Andijan, Obi-garm, and Samarkand), 22h. (near Apia), 23h. (Pasadena, Mount Wilson, Palomar, Shasta Dam, Tinemaha, Pierce Ferry, Overton, and Tucson).

March 22d. 9h. 41m. 41s. Epicentre 23°·3S. 66°·4W. Depth of focus 0·025.  
(as on 1946 Oct. 13d.)

A = +·3681, B = -·8425, C = -·3933;  $\delta = -1$ ;  $h = +4$ ;  
D = -·916, E = -·400; G = -·157, H = +·360, K = -·919.

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.	
	°	°	m. s.	s.	m. s.	s.	m. s.	m.	
Montezuma	2.3	288	e 0 41	- 1	i 1 11	- 3	—	e 1.5	
La Paz	6.9	346	i 1 43	+ 3	i 3 1	+ 4	—	3.6	
Santa Lucia	E. 10.8	200	2 44	PP	4 40	SS	—	5.9	
La Plata	E. 13.7	150	i 3 10	+ 3	5 31	- 4	15 6	6.5	
	N. 13.7	150	i 3 7	0	5 25	-10	—	6.2	
	Z. 13.7	150	3 9	+ 2	5 37	+ 2	—	—	
Huancayo	14.1	321	e 3 14	+ 2	i 4 47	-57	e 3 33	PP	i 5.1
Bogota	N. 28.7	343	i 5 42	+ 1	e 10 13	- 2	e 9 4	PcP	—
Fort de France	38.1	9	i 7 3	+ 1	i 12 39	- 1	—	—	—
San Juan	41.4	0	e 7 27	- 2	e 13 17	-12	—	—	e 16.5
St. Louis	65.5	339	i 10 28	+ 3	i 18 53	0	i 10 59	PcP	—
Weston	65.5	357	i 10 24	- 1	—	—	—	—	—
Harvard	65.6	357	i 10 26	+ 1	—	—	—	—	—
Florissant	E. 65.7	339	e 10 25	- 1	i 18 51	- 4	—	—	—
Tucson	69.7	320	i 10 50 <sup>k</sup>	- 1	—	—	i 11 9	pP	—
Palomar	74.1	318	i 11 18	+ 1	e 20 51	+19	i 11 31	PcP	—
Pierce Ferry	74.3	322	i 11 18	0	e 20 35	0	i 11 32	pP	—
Boulder City	74.6	321	i 11 21	+ 1	e 21 14	sS	i 11 28	PcP	—
Overton	74.8	321	i 11 22	+ 1	e 20 43	+ 3	—	—	—
Riverside	74.8	318	i 11 21	0	—	—	—	—	—
Rapid City	75.0	334	i 11 25	+ 3	i 20 41	- 1	i 12 21	pP	—
Mount Wilson	75.4	318	i 11 25 <sup>k</sup>	+ 1	—	—	—	—	—
Pasadena	75.4	318	i 11 24 <sup>k</sup>	0	—	—	i 11 37	PcP	—
Haiwee	76.6	320	e 11 32	+ 1	—	—	—	—	—
Santa Barbara	76.6	317	i 11 31	0	—	—	—	—	—
Tinemaha	77.4	320	i 11 36 <sup>k</sup>	+ 1	e 21 11	+ 3	—	—	—

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		$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Fresno	N.	78.1	319	i 11 39	0	—	—	c 18 12	?
Shasta Dam		82.2	320	i 11 59	- 2	—	—	—	c 41.7
Grand Coulee		85.2	328	i 12 15	- 1	—	—	—	—
Stuttgart	Z.	98.3	41	c 13 18	+ 1	—	—	—	—

Additional readings :—

Huancayo i = 3m.18s., e = 4m.18s.

Bogota ePPN = 6m.19s., ePPP = 6m.28s., eSSN = 11m.19s., eSSSN = 11m.41s.,

eScSIN = 17m.7s.

St. Louis iZ = 10m.39s., iPcPZ = 11m.23s., iSIZ = 19m.6s., iN = 19m.56s., eE = 20m.3s.

Tucson i = 11m.57s.

Palomar iZ = 11m.42s.

Pierce Ferry e = 20m.7s.

Tinemaha ePKP, PKP?Z = 38m.5s.

March 22d. Readings also at 1h. (near Stalinabad), 6h. (Helwan), 9h. (near Stalinabad), 15h. (near Granada), 16h. (near Obi-garm), 23h. (Belgrade, Zagreb, Triest, and Stuttgart).

March 23d. 1h. Undetermined shock.

Balboa Heights eP? = 20m.4s.

San Juan eP? = 22m.43s., e = 23m.48s., eS? = 27m.32s., eL = 29m.22s.

St. Louis iPZ = 22m.56s., ipPZ = 23m.12s., eZ = 23m.32s., ePPZ = 23m.42s., iSIN = 27m.2s., iSSE = 28m.10s., isSSE = 28m.50s., iE = 31m.0s., iN = 31m.10s.

Tucson eP = 23m.21s., i = 24m.24s., e = 30m.12s.

Huancayo eP? = 23m.32s., e = 23m.39s.

Palomar iP = 24m.5s. a, iPcPZ = 26m.50s., i = 30m.30s.

Riverside iPZ = 24m.10s., iZ = 24m.25s., 26m.51s., and 30m.32s.

Mount Wilson iPZ = 24m.15s., iZ = 24m.32s., eScPZ = 30m.32s.

Pasadena iPZ = 24m.15s., iZ = 24m.37s., ePcPZ = 26m.53s., eZ = 27m.10s.

Tinemaha iPZ = 24m.30s., eZ = 24m.45s., iPcPZ = 26m.58s., iZ = 27m.15s., and 30m.38s.

Shasta Dam e = 27m.11s. and 30m.55s.

March 23d. Readings also at 0h. (Wellington, Arapuni, near Stalinabad, Samarkand, Almata, Frunse, Tashkent, Andijan (2), and Obi-garm), 1h. (Brisbane and River-view), 3h. (Bogota and Ksara), 4h. (Tucson, Palomar, Mount Wilson, Stuttgart, Helwan, and near Istanbul), 5h. (Andijan (2), near Obi-garm (2), Tashkent, Samarkand, and Stalinabad (2)), 9h. (Lick), 10h. (St. Louis), 11h. (Stuttgart, Tucson, Riverside, Palomar, Mount Wilson, Pasadena, Tinemaha, Shasta Dam, near Berkeley, and Lick), 14h. (near Santa Lucia), 16h. (near Mineral), 19h. (Shasta Dam), 22h. (Tucson and Santa Lucia).

March 24d. 16h. Undetermined shock.

Shasta Dam iP = 47m.53s.

Tinemaha iP = 48m.35s., iZ = 48m.59s., 49m.27s., and 50m.31s.

Haiwee ePEN = 48m.41s.

Mount Wilson iPZ = 48m.49s. a.

Pasadena iPEZ = 48m.49s.

Riverside iPZ = 48m.53s. a.

Boulder City iP = 48m.56s.

Pierce Ferry iP = 48m.59s.

Palomar iP = 49m.0s. a, eZ = 49m.20s., i = 49m.42s.

Tucson iP = 49m.34s. a, i = 49m.47s., 50m.17s., and 50m.58s.

Florissant iPEN = 50m.28s.

St. Louis iPZ = 50m.31s.

Copenhagen P = 52m.10s.

Stuttgart eZ = 52m.51s.

March 24d. Readings also at 2h. (Bogota), 4h. (near Obi-garm), 5h. (Shasta Dam, Tinemaha, Riverside, and Tucson), 6h. (Tucson), 9h. (near Tashkent and near Almeria), 10h. (Tucson, Almata, and near Andijan), 13h. (Samarkand, near Obi-garm and Stalinabad), 15h. (Helwan), 16h. (Alicante, Mount Wilson, Tinemaha, Riverside, and Tucson), 17h. (Brisbane), 18h. (Santa Lucia).



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March 25d. 19h. 44m. 8s. Epicentre  $36^{\circ}3'N.$ ,  $141^{\circ}5'E.$  (as on 1943, May 2d.).

Intensity V at Namie (Hukusima Pref.); IV at Onahama, Mito, Kakioka, and Hukusima; II-III at Tokyo, Titibu, Maebasi, and Sendai. Macroseismic radius 200-300km. Epicentre  $36^{\circ}3'N.$   $141^{\circ}3'E.$  Focal depth 60km.

The Seismological Bulletin of the Central Meteorological Observatory, Japan, for the year 1947, Tokyo 1950, pp. 18-19, macroseismic chart p. 18.

$$A = -0.6322, B = +0.5029, C = +0.5894; \quad \delta = -2; \quad h = 0; \\ D = +0.623, E = +0.783; \quad G = -0.461, H = +0.367, K = -0.808.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	
Onahama	0.8	323	0 15k	- 3	0 23	$S_{\kappa}$	—	—
Mito	0.9	276	0 16	- 4	0 25	$S_{\kappa}$	—	—
Kakioka	1.1	266	0 19	- 3	0 30	$S_{\kappa}$	—	—
Tukubasan	1.1	266	0 23	+ 1	0 32	$S_{\kappa}$	—	—
Tokyo	1.5	247	0 27	- 1	0 44	- 5	—	—
Hukusima	1.7	330	0 30k	- 1	0 48	- 6	—	—
Kumagaya	1.7	265	0 32	+ 1	0 49	- 5	—	—
Yokohama	1.7	240	0 33	+ 2	0 51	- 3	—	—
Mera	1.9	224	0 39	$P_{\kappa}$	1 18	+19	—	—
Maebasi	2.0	273	0 33	- 2	0 54	- 8	—	—
Sendai	2.0	346	0 36a	+ 1	0 47	-15	—	—
Osima	2.3	228	0 42	+ 2	1 12	+ 3	—	—
Hunatu	2.4	250	0 40a	- 1	1 6	- 6	—	—
Misima	2.4	240	0 43	+ 2	1 17	+ 5	—	—
Nagano	2.7	278	0 45	0	1 14	- 5	—	—
Mizusawa	E. 2.8	354	0 48	+ 1	1 18	- 4	—	—
Shizuoka	2.8	242	0 48	+ 1	1 27	+ 5	—	—
Omaesaki	3.2	238	0 26	-26	0 51	-41	—	—
Miyako	3.4	6	0 56	+ 1	1 31	- 6	—	—
Morioka	3.4	356	0 55	0	1 32	- 5	—	—
Toyama	3.5	279	0 56	- 1	1 38	- 2	—	—
Akita	3.6	343	0 59	+ 1	3 2	?	—	—
Nagoya	3.8	254	1 5	+ 4	1 51	+ 4	—	—
Gihu	3.9	258	1 1	- 1	1 40	-10	—	—
Hatinohe	4.2	0	0 58	- 9	1 42	-15	—	—
Hikone	4.4	258	1 10	0	1 39	-23	—	—
Mori	5.9	351	1 30	- 1	2 51	$S^*$	—	—
Sapporo	6.8	359	2 53	+69	—	—	—	—
Stuttgart	z. 85.3	331	c 12 37	- 3	—	—	c 12 49	$P_eP$

March 25d. 20h. 32m. 33s. Epicentre  $38^{\circ}4'S.$   $176^{\circ}5'E.$  Depth of focus 0.020. (as on Feb. 17d.).

Intensity IV in the district of Gisborne and north of Hawkes Bay. Two tidal waves, reported to be 30ft. high; houses were wrecked and roads and farmlands damaged. Epicentre  $38^{\circ}8'S.$   $178^{\circ}5'E.$  Normal depth (New Zealand).

R. C. Hayes.

Earthquakes in New Zealand during the year 1947 (Extract from the New Zealand Journal of Science and Technology, vol. 30, No. 2 (sec. B.), pp. 102-105, Isoseismic chart p. 105.

Anon: Seismological Notes, Bulletin of the Seismological Society of America, Vol. 37, No. 1, 1947, p. 161.

$$A = -0.7842, B = +0.0480, C = -0.6186; \quad \delta = -6; \quad h = +1; \\ D = +0.061, E = +0.998; \quad G = +0.617, H = -0.038, K = -0.786.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m. s.	m.
Tuai	0.6	128	0 27	+ 4	0 40?	- 1	—	—
Arapuni	0.7	295	0 27	+ 3	0 51	+ 9	—	—
Auckland	2.0	318	0 41	+ 5	1 26	SSS	—	—
Bunynthorpe	2.0	200	0 37?	+ 1	1 12?	SSS	—	—
New Plymouth	2.0	251	0 31	- 5	1 9	+ 5	—	—

Continued on next page.

The scanned images of the 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 collected by SGA Storia Geofisica Ambiente (Bologna) on behalf of the Istituto Nazionale di Geofisica e Vulcanologia (Rome), in the frame of the EUROSEISMOS project.

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	$\Delta$	Az.	P.		O-C.	S.		O-C.	Supp.		L.
	°	°	m.	s.	s.	m.	s.	s.	m.	s.	m.
Wellington	3.2	205	0	36	-15	1	18	-12	—	—	—
Kaimata	5.6	221	1	26?	+4	2	33	+7	—	—	—
Riverview	21.0	275	i 4	45 <sub>a</sub>	+13	8	58	SS	i 5	12	e 10.7
Brisbane	22.5	293	i 4	56	+10	—	—	—	i 5	22	—
Perth	49.2	258	9	7	pP	16	25	+59	i 22	17	Q 23.8
Honolulu	64.1	27	e 13	12	PP	e 18	59	+18	e 22	54	SS e 25.7
La Plata	91.3	138	10	3	?	23	9	[+5]	24	51	PS 41.6
Pasadena	94.2	49	e 12	57	-5	e 23	53	-3	e 23	34	SKS e 38.1
Santa Clara	94.3	44	e 13	28	+26	e 24	29	[+69]	—	—	e 38.7
Berkeley	94.5	44	i 13	1	-2	i 24	0	+2	—	—	e 38.1
Palomar	94.5	50	e 12	54	-9	e 23	41	-17	i 13	6	PcP —
Riverside	94.6	49	e 12	58	-6	—	—	—	—	—	—
Santa Lucia	94.9	129	22	35	?	—	—	—	—	—	—
Tinemaha	96.2	47	e 13	8	-3	—	—	—	—	—	—
Huancayo	96.4	110	e 13	9	-3	e 23	42	[+10]	e 25	34	SP e 44.0
Shasta Dam	96.5	42	e 13	14	+2	—	—	—	—	—	—
Boulder City	97.5	50	e 13	19	+2	—	—	—	e 17	4	PP —
Tucson	97.5	54	e 13	16	-1	e 23	54	[+17]	i 17	26	PP e 39.5
Pierce Ferry	98.1	50	e 13	9	-10	—	—	—	—	—	—
La Paz	98.5	118	e 13	27	+6	23	46	[+4]	i 17	17	PP 45.0
Colombo	99.4	271	17	20	PP	24	15	-25	—	—	51.2
Victoria	101.6	36	—	—	—	25	14	+16	32	18	SS 49.5
Calcutta	102.3	289	e 9	59	?	e 20	27	?	(e 20	27)	PPP —
Salt Lake City	102.4	47	e 18	15	PP	e 24	28	[+27]	e 32	34	SSP e 40.1
Kodaikanal	103.3	273	(e 18	13)	PP	(e 24	43)	+31	(27	28)	PS —
Sitka	103.8	24	e 18	16	PP	e 25	57	+41	e 32	27	SS e 41.2
Tananarive	105.6	230	e 18	31	PP	25	1	-30	27	55	PPS e 44.5
Bozeman	106.0	44	e 27	38	PS	e 23	55	[-23]	e 25	0	S e 43.4
College	106.7	14	e 18	33	PP	e 24	52	[+31]	e 33	20	SS e 44.0
Hyderabad	106.8	279	e 14	25	P	24	44	[+23]	18	39	PP 46.0
Rapid City	109.5	49	e 25	12	?	e 34	45	SSP	e 30	46	?
Irkutsk	109.9	322	e 19	10	PP	25	18	[+44]	28	38	PPS —
Bombay	112.0	277	e 19	6	PP	e 25	10	[+27]	35	51	SS 47.4
Saskatoon	112.2	40	19	27	PP	27	57	PS	34	39	SS 49.5
New Delhi	114.0	289	e 19	18	PP	e 25	11	[+20]	i 29	27	PPS —
Florissant	114.8	59	e 19	4	PP	e 27	8	S	e 35	16	SS —
St. Louis	114.8	59	e 19	11	PP	i 25	11	[+17]	i 35	9	SS —
Almata	121.2	303	19	9	[+35]	—	—	—	—	—	—
San Juan	122.5	91	e 20	22	PP	e 25	28	[+7]	e 36	59	SS e 49.6
Andijan	123.2	298	18	46	[+8]	e 30	55	PS	—	—	—
Obi-garm	124.7	296	18	51	[+10]	—	—	—	20	42	PP —
Stalinabad	124.9	295	18	50	[+9]	i 27	54	SKKS	i 21	12	PP —
Tashkent	125.6	298	e 18	46	[+4]	25	56	[+26]	20	44	PP —
Tehimkent	125.7	299	18	56	[+14]	—	—	—	—	—	—
Philadelphia	125.8	64	e 20	31	PP	e 26	22	[+51]	e 37	7	SS e 51.6
Samarkand	126.6	295	18	53	[+9]	—	—	—	—	—	—
Fordham	127.1	63	e 20	37	PP	e 32	49	PPS	e 42	37	SSS 52.3
Ottawa	127.5	58	18	49	[+3]	27	27	SKKS	e 21	27	PP 55.5
Harvard	129.3	63	e 20	55	PP	e 22	45	PKS	—	—	—
Weston	129.4	63	e 21	2	PP	e 42	45	SSS	e 52	41	Q e 54.6
Bermuda	130.6	77	e 19	32	[+40]	e 26	5	[+21]	e 21	27	PP e 54.0
Seven Falls	131.2	57	21	15	PP	26	40	SKKS	31	33	PS 56.5
Sverdlovsk	134.8	316	19	4	[+4]	26	41	[+48]	i 21	43	PP —
Baku	139.2	290	22	50	PP	—	—	—	—	—	—
Grozny	142.9	294	19	24	[+9]	22	58	PP	(22	58)	PP —
Erevan	143.2	289	e 19	26	[+11]	—	—	—	—	—	—
Leninakan	143.8	289	19	28	[+12]	—	—	—	e 20	8	pPKP —
Ivigtut	144.3	36	19	20	[+3]	41	9	SS	—	—	69.5
Platigorsk	144.9	295	e 20	19	[+61]	—	—	—	—	—	—
Scoresby Sund	146.4	12	19	25	[+4]	33	21	PS	41	55	SSP —

Continued on next page.

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	Δ	Az.	P.		O - C.	S.		O - C.	Supp.		L.
			m.	s.		m.	s.		m.	s.	
Sotchi	147.3	294	19	42	[+20]	—	—	—	—	—	—
Moscow	147.6	316	19	27	[+4]	29	53	SKKS	23	0	PP
Ksara	148.0	274	e 19	36?	[+13]	36	1	PPS	—	—	—
Helwan	150.1	264	19	36	[+10]	30	7	SKKS	—	—	—
Simferopol	151.3	296	e 19	32	[+4]	—	—	—	—	—	—
Yalta	151.3	294	e 19	38	[+10]	—	—	—	—	—	—
Helsinki	151.8	332	e 19	53	[+24]	e 27	18	[+59]	e 43	12	SSP
Upsala	154.7	336	20	21	pPKP	e 25	59	[-23]	e 43	57	SSP
Istanbul	154.9	287	e 19	35	[+2]	e 32	7	PS	—	—	—
Bucharest	N. 157.1	296	17	57	?	—	—	—	(40 27)	?	40.5
Bergen	157.3	350	e 25	3	?	—	—	—	—	—	62.5
Warsaw	158.0	317	e 19	43	[+6]	e 43	34	SS	24	21	PP
Copenhagen	159.7	333	e 19	47	[+8]	37	45	PPS	i 20	31	pPKP
Belgrade	161.0	297	e 28	16	PPP	e 45	43	SSP	—	—	e 67.5
Aberdeen	161.2	359	e 31	12	?	—	—	—	e 76	42	Q
Prague	162.7	318	e 24	3	SKP	e 45	21	SSP	e 24	47	PP
Durham	F. 163.6	356	i 38	49	PPS	—	—	—	—	—	i 58.3
Cheb	163.7	323	e 20	28	PKP <sub>2</sub>	e 31	7	SKKS	e 25	1	PP
De Bilt	165.0	339	e 20	0?	[+15]	e 31	27	SKKS	e 24	52	PP
Triest	165.3	305	e 25	7	PP	e 31	26	SKKS	i 51	22	SSS
Stuttgart	166.2	323	e 19	57	[+12]	e 31	27	SKKS	e 24	47	PP
Uccle	166.4	339	e 21	20	?	e 31	46	SKKS	e 24	53	PP
Kew	166.7	351	i 20	20	[+34]	e 31	52	SKKS	i 25	3	PP
Strasbourg	167.0	325	e 20	4	[+18]	e 38	45	PPS	e 24	47	PP
Chur	167.2	316	e 24	53	PP	—	—	—	—	—	e 84.0
Rome	167.3	291	e 20	3	[+17]	i 31	43	SKKS	e 24	48	PP
Florence	167.6	300	i 20	34	pPKP	i 46	7	SS	i 25	7	PP
Basle	167.8	322	e 3	27	?	—	—	—	(e 37 27)	?	e 37.5
Neuchatel	168.5	322	—	—	—	e 26	23	[-10]	—	—	—
Paris	168.7	339	e 20	7	[+20]	e 45	27	SS	i 24	59	PP
Clermont-Ferrand	171.2	329	i 25	37	PP	i 46	52	SS	—	—	72.5
Barcelona	174.7	307	—	—	—	32	31	SKKS	46	9	SS
Lisbon	175.6	84	20	13?	[+23]	32	20	SKKS	26	7	PP
Tortosa	176.1	309	25	43	PP	32	12	SKKS	47	1	SS
Alicante	177.6	—	20	10	[+19]	27	0	[+24]	22	0	pPKP
Almeria	178.2	—	i 20	7	[+16]	27	3	[+27]	25	59	PP
Malaga	178.2	—	19	54	[+3]	26	36	[0]	25	38	PP
Granada	z. 178.8	—	20	18	[+27]	27	15	[+39]	21	32	pSKS

Additional readings and notes:—

Riverview iEN = 5m.2s., iPPZ = 5m.22s., iEN = 5m.26s., iE = 5m.45s., iN = 5m.50s., iZ = 5m.55s., iE = 7m.41s., iN = 9m.10s., iE = 9m.16s., iSSZ = 9m.21s., iSSN = 9m.25s., iSSE = 9m.30s., iSSSEN = 9m.38s., iSSSZ = 9m.41s.

Perth i = 12m.30s.

La Plata E = 14m.3s., N = 29m.57s.

Pasadena iZ = 13m.11s., iSEN = 24m.29s., eSSZ = 30m.57s.

Berkeley ePPE = 17m.32s., iSKKSN = 24m.30s., iSSE = 32m.11s.

Palomar iNZ = 13m.22s.

Huancayo e = 16m.27s., 16m.55s., and 21m.7s., eSS = 30m.17s.

Tucson e = 21m.34s., ePS = 26m.9s., eSS = 30m.29s., eSSS? = 36m.2s.

La Paz SKKSZ = 24m.35s., PS = 26m.29s., iZ = 28m.41s., SSZ = 31m.53s., SSSN = 35m.49s.

Victoria e = 37m.51s and 41m.27s.

Calcutta PPSN = 24m.27s., SSN = 29m.26s. Readings wrongly identified.

Salt Lake City eS = 25m.24s.

Kodaikanal readings increased by 2m.

Sitka iPP = 18m.22s., e = 26m.2s., and 38m.4s.

Tananarive eSEN = 26m.22s., SS = 33m.37s., SSS = 37m.43s.

Bozeman eSS? = 30m.55s.

College eS = 26m.5s., eSSS = 37m.22s., e = 38m.30s.

Hyderabad SSN = 32m.20s.

Bombay ePSN = 29m.16s.

New Delhi iSKKSN = 26m.47s., PPSN = 31m.13s., SSN = 36m.30s., PKP,PKPN = 37m.18s., SSN = 40m.50s.

Florissant eE = 25m.28s. and 28m.30s., iPPSZ = 29m.46s.

St. Louis iE = 22m.40s. and 25m.32s., iSKKSE = 26m.13s., iSN = 27m.6s., iPSN = 28m.43s., iPPSE = 29m.45s., iE = 32m.36s. and 33m.40s.

San Juan ePS = 30m.11s.

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Tashkent ePKS = 22m.7s., SKKS = 28m.0s.  
 Philadelphia eSKKS? = 27m.45s., ePPS = 32m.18s., eSSS = 41m.33s.  
 Fordham eSS = 36m.53s.  
 Ottawa SS = 38m.3s., SSS = 42m.39s.  
 Weston iPPS = 38m.33s.  
 Bermuda eS? = 29m.11s., iPS = 31m.57s., eSS = 38m.42s., iSS = 38m.48s.  
 Seven Falls PPP = 22m.38s., SSS = 41m.26s.  
 Sverdlovsk PKS = 22m.45s., PS = 32m.2s., SS = 40m.17s.  
 Scoresby Sund 19m.40s. and 19m.59s.  
 Moscow PPP = 26m.19s., PS = 33m.23s.  
 Helwan PKKPZ = 19m.50s., iZ = 19m.57s., eZ = 22m.53s., PPZ = 23m.20s., PSKSZ = 33m.45s., PPSZ = 36m.51s.  
 Helsinki ePKS = 22m.54s., ePP = 24m.14s., ePS = 30m.38s., eSKSP = 34m.17s., ePPS = 36m.34s., eScS,PKP = 38m.38s., e = 41m.32s., eSS = 53m.22s., e = 58m.34s.  
 Upsala PKSN = 23m.5s., eSKSN = 30m.39s., SKKSE = 30m.51s., eN = 33m.27s., eSKSPE = 34m.27s., PPSE = 37m.6s., eN = 38m.27s., eSSSE = 50m.27s., eN = 52m.57s., eE = 58m.27s.  
 Bergen PPE = 26m.19s., eN = 31m.55s. and 33m.51s., SKKSN = 37m.44s., SSN = 45m.6s., eN = 50m.39s.  
 Warsaw ePE = 20m.0s., PKP<sub>2</sub>?Z = 20m.14s., eSKP?Z = 23m.33s., PPE = 24m.29s., ePPPE = 27m.38s., PKKPZ = 28m.17s., ePKKPE = 28m.37s., iSKKSZ = 30m.44s., iSKKS?E = 30m.56s., iZ = 35m.37s., PPSZ = 37m.31s., PPSE = 37m.38s., eE = 40m.20s., iZ = 41m.46s., eSSE = 43m.53s., iZ = 45m.25s. and 47m.36s., eE = 47m.53s., eSSS?Z = 49m.45s.  
 Copenhagen 24m.45s., 29m.5s., 31m.22s., 34m.15s., 34m.45s., and 45m.15s.  
 Belgrade ePKS? = 30m.44s., ePPS? = 39m.47s.  
 Aberdeen iEN = 34m.45s. and 48m.37s., iE = 57m.40s.  
 Prague ePP = 28m.15s., ePPP( $\Delta > 180^\circ$ ) = 31m.27s., eSKSP = 35m.3s., e = 37m.48s., eE = 40m.57s., e = 47m.50s., eSSS = 51m.51s., eSSS = 56m.27s.  
 Cheb eSKSP = 35m.3s., e = 37m.48s., eSS = 45m.29s., eSSS = 51m.38s.  
 De Bilt ePKP = 20m.21s., ePSKS = 35m.13s.  
 Trieste iPSKS = 35m.55s.  
 Stuttgart ePKPZ = 20m.25s. and 20m.53s., ePPP = 28m.35s. and 29m.14s., ePSKS = 35m.37s., ePPS = 39m.7s., eSS = 45m.43s., eSSS = 51m.3s., eQ? = 74m.27s.  
 Uccle eN = 28m.29s., ePSKN = 35m.24s., eSSE = 45m.27s., eSSSN = 51m.13s.  
 Kew iPKP<sub>2</sub> = 21m.28s.?, iPKS<sub>2</sub> = 23m.56s., iZ = 27m.26s., ePPPEN = 28m.58s.?, eE = 32m.38s.?, iN = 33m.23s., iSKKSN = 33m.48s., eN = 35m.23s., ePPSE = 39m.0s.?, eE = 42m.38s.?, eSSSN = 54m.7s.?, eE = 57m.37s.?  
 Strasbourg ePKP<sub>2</sub> = 21m.5s., iPKP<sub>2</sub> = 21m.17s., iPP = 25m.0s., ePP = 25m.5s., ePPP = 28m.26s., 28m.59s., and 29m.2s., e = 29m.24s., ePPP( $\Delta > 180^\circ$ ) = 31m.52s., i = 35m.28s., ePPS = 39m.0s., e = 43m.35s., iSS = 45m.55s.  
 Rome iPKP<sub>2</sub>Z = 21m.7s., iPSKSZ = 35m.48s., iSSE = 45m.51s.?  
 Florence iPPP = 29m.7s., iPPSZ = 35m.41s., iSSS = 50m.39s.  
 Paris iPKP = 20m.27s., ePKP<sub>2</sub> = 21m.11s., iPKP<sub>2</sub> = 21m.33s., iPPP( $\Delta > 180^\circ$ ) = 32m.18s., e = 37m.27s., eQ = 77m.27s.  
 Clermont-Ferrand e = 33m.36s. and 36m.12s.  
 Lisbon PPE = 26m.11s., PPZ = 26m.39s., PPPE = 29m.31s., PPPZ = 29m.39s., PPPEN( $\Delta > 180^\circ$ ) = 30m.45s., EZ( $\Delta > 180^\circ$ ) = 31m.11s., EN( $\Delta > 180^\circ$ ) = 32m.59s., SSEN = 46m.21s., SSEN( $\Delta > 180^\circ$ ) = 48m.37s., 54m.27s., Q = 72m.3s.  
 Tortosa PPPE = 29m.47s. and 30m.45s., SKKSE = 32m.55s., SKSPEN = 36m.4s., SSPN = 48m.9s., SSSE = 53m.2s.  
 Alicante PKP<sub>2</sub> = 22m.6s., PKS = 23m.42s., PP = 26m.8s., PPP = 30m.37s., SKKS = 32m.34s., SKKKS = 34m.16s., PSKS = 36m.34s., PPS = 40m.42s., SS = 47m.8s., SSP = 49m.36s., SSS = 55m.8s., Q = 71m.42s.  
 Almeria iPKP<sub>2</sub> = 22m.7s., PKS = 23m.36s., PPP = 30m.19s., SKKS = 32m.31s., SKSP = 36m.25s., PPS = 40m.20s., SS = 47m.33s., SSP = 48m.51s., SSS = 54m.51s.  
 Malaga PKP<sub>2</sub>Z = 21m.52s., P<sub>c</sub>P,PKPZ = 28m.58s., PPPZ = 29m.52s., SKSPZ = 36m.26s., PPSZ = 39m.56s., SSZ = 47m.38s., QZ = 75m.36s.  
 Granada PKP<sub>2</sub> = 22m.6s., PP = 26m.9s., pSKS = 28m.16s., PPP = 30m.0s., SKKS = 32m.24s., SKSP = 36m.36s., PPS? = 40m.54s., iSS = 47m.33s., SSS = 54m.42s.  
 Long waves were also recorded at Johannesburg, Potadam, Besançon, Budapest, and at other American stations.

March 25d. Readings also at 2h. (Riverview, La Paz, Huancayo, Tucson, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Boulder City, Pierce Ferry, and Shasta Dam), 3h. (Huancayo and near Balboa Heights), 4h. (La Paz (2), Tucson, Palomar, Riverside, Mount Wilson, Pasadena, Pierce Ferry, Boulder City, and Tinemaha), 5h. (near Tashkent, Frunse, Andijan, Obi-garm, Stalinabad, Tchimkent, and Samarkand), 9h. (Obi-garm, Stalinabad, Tinemaha, Boulder City, Pierce Ferry, Pasadena, Mount Wilson, Tucson, and near Barcelona), 11h. (near Mizusawa), 12h. (near Andijan, Tchimkent, Frunse, Tashkent, and near Mineral), 16h. (Tucson, Pierce Ferry, Boulder City, Tinemaha, Palomar, and Stuttgart), 18h. (Mount Wilson, Riverside, and Riverview), 22h. (Lick and near Algiers).

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March 26d. 16h. 23m. 10s. Epicentre 39°·0N. 98°·0E.

$$A = -.1084, B = +.7716, C = +.6268; \quad \delta = 0; \quad h = -1;$$

$$D = +.990, E = +.139; \quad G = -.087, H = +.621, K = -.779.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Irkutsk	14·0	16	e 3 23	+ 1	e 6 1	+ 2	—
Almata	16·4	292	e 3 53	0	—	—	—
Frunse	18·1	290	e 4 16	+ 2	—	—	—
Andijan	19·7	283	e 4 40	+ 6	—	—	—
New Delhi	N. 20·1	245	—	—	e 8 11	- 8	i 11·3
Tchimkent	21·8	288	4 53	- 3	—	—	—
Tashkent	22·0	285	4 54	- 4	e 8 47	- 9	—
Obi-garm	22·0	278	4 49	- 9	—	—	—
Stalinabad	22·8	278	e 5 5	0	—	—	—
Samarkand	23·9	281	5 20	+ 4	—	—	—

Long waves were also recorded at Copenhagen.

March 26d. 20h. 48m. 32s. Epicentre 25°·0N. 102°·0E. (as on 1938, Oct. 26d.).

$$A = -.1887, B = +.8876, C = +.4203; \quad \delta = +9; \quad h = +3;$$

$$D = +.978, E = +.208; \quad G = -.087, H = +.411, K = -.907.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
New Delhi	N. 22·4	285	—	—	i 8 52	-12	i 12·1
Hyderabad	E. 23·2	256	—	—	9 24	+ 6	—
Irkutsk	27·3	3	e 5 48	0	e 10 22	- 5	—
Almata	27·4	319	e 5 49	0	—	—	—
Bombay	27·7	264	—	—	e 8 57	?	—
Andijan	29·2	310	e 6 11	+ 6	—	—	—
Obi-garm	30·5	305	e 6 13	- 4	—	—	—
Samarkand	32·8	305	e 6 34	- 3	—	—	—
Sverdlovsk	43·5	328	e 8 3	- 4	e 14 32	- 4	—
Stuttgart	z. 73·4	317	e 11 33?	- 3	—	—	—

Long waves were also recorded at Strasbourg.

March 26d. Readings also at 0h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, and Shasta Dam), 3h. (Shasta Dam), 4h. (Tucson), 6h. (Stuttgart and near Triest), 8h. (Haiwee, Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Overton, Pierce Ferry, Shasta Dam, Florissant, St. Louis, and College), 9h. (Brisbane and Riverview), 15h. and 16h. (Strasbourg), 18h. (near Ottawa), 19h. (Palomar, Riverside, Tinemaha, Tucson, Boulder City, Pierce Ferry, and Shasta Dam), 20h. (near Seven Falls), 21h. (Palomar, Riverside, Tinemaha, Shasta Dam, and near Almata), 22h. (Palomar, Riverside, Tinemaha, Tucson, and Shasta Dam), 23h. (near Ottawa).

March 27d. 18h. 25m. 29s. Epicentre 38°·4S. 176°·5E. (as on 25d.).

Intensity V in the epicentral region. Epicentre 39°·2S. 178°·2E.

R. C. Hayes.  
Earthquakes in New Zealand during the year 1947. New Zealand Journal of Science and Technology, Vol. 30, No. 2 (Section B), 1948, p. 102. Chart of epicentres, p. 105.

$$A = -.7842, B = +.0480, C = -.6186; \quad \delta = -6; \quad h = +1.$$

	$\Delta$	Az.	P.	O-C.	S.	O-C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Havelock North	1·3	167	0 31	+ 6	0 45	+ 1	—	—
Auckland	2·0	318	0 31?	- 4	1 17	SS	—	—
Bunnythorpe	2·0	200	0 42	P <sub>r</sub>	1 16?	SS	—	—
New Plymouth	2·0	251	0 40	P <sub>r</sub>	1 19	SSS	—	—
Wellington	3·2	205	0 41	-11	1 22	-10	—	—
Kaimata	5·6	221	1 49?	P <sub>r</sub>	2 30	- 3	—	—
Riverview	21·0	275	i 4 48k	+ 1	e 9 12	SS	e 9 34	SSS e 11·3
Santa Lucia	E. 94·9	129	—	—	30 59	SS	—	—
Huancayo	96·4	110	e 22 41	?	—	—	—	—
La Paz	z. 98·5	118	(18 31)	PP	—	—	—	18·5

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March 27d. 19h. Undetermined shock.

Auckland P = 23m.0s., P<sub>c</sub>P = 26m.16s., S = 27m.7s., sS = 27m.56s., Q? = 29m.0s.  
 Riverview ePP?E = 25m.23s., iS?E = 29m.28s., eLE = 33.1m.  
 Wellington i = 26m.10s., e = 26m.50s?, S? = 29m.26s., L = 32m.  
 Arapuni e = 27m.30s.  
 Tinemaha ePZ = 28m.43s., iZ = 29m.6s.  
 Pasadena ePZ = 28m.56s., eLZ = 51m.28s.  
 Mount Wilson ePZ = 28m.57s.  
 Shasta Dam eP = 28m.58s.  
 Riverside ePZ = 28m.58s.  
 Palomar iPZ = 28m.59s.  
 Pierce Ferry eP = 29m.15s.  
 Tucson eP? = 29m.22s., eL = 53m.30s.  
 Brisbane ePN = 30m.22s., eS?EN = 34m.55s.  
 Stuttgart eP?Z = 36m.57s.  
 Paris ePKP = 37m.5s., e = 37m.30s.  
 Helwan eZ = 37m.24s. and 39m.29s.  
 Istanbul eP = 38m.  
 Warsaw eE = 70m.0s., eLZ = 91m.0s.  
 Long waves were also recorded at Apia, Bozeman, Malaga, Kew, and Copenhagen.

March 27d. Readings also at 1h. (near Andijan), 4h. (Riverview), 5h. (Stuttgart, Tucson, Riverside, Palomar, Tinemaha, and Shasta Dam), 6h. (Pasadena, Pierce Ferry, Tinemaha, Tucson, and Shasta Dam), 7h. (Stuttgart, Ksara, Almata, Samarkand, near Andijan, Stalinabad, and Copenhagen), 9h. (Boulder City, Pierce Ferry, Shasta Dam, Tucson, Berkeley, San Francisco, near Fresno, Lick, Samarkand, Almata, and near Stalinabad, Obi-garm, Tchimkent, Tashkent, Frunse, and Andijan), 12h. (Ksara), 15h. (near Andijan, Tchimkent, Tashkent, Frunse, and Obi-garm), 17h. (Nanking, Irkutsk, Andijan, Obi-garm, Tchimkent, Calcutta, Hyderabad, New Delhi, Strasbourg, Cheb, Copenhagen, Uccle, Kew, Warsaw, De Bilt, Helsinki, Stuttgart (2), and Shasta Dam), 20h. (Granada, Alicante, and Brisbane), 21h. (Cheb, Warsaw, Stuttgart, Copenhagen, near Rome, Florence, and Grand Coulee).

March 28d. 3h. 40m. 32s. Epicentre 33°·8N. 25°·3E. (as on 1946, July 16d.).

A = +·7528, B = +·3559, C = +·5537;  $\delta = -4$ ;  $h = +1$ ;  
 D = +·427, E = -·904; G = +·501, H = +·237, K = -·833.

	$\Delta$	Az.	P.	O - C.	S.	O - C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Helwan	6·5	126	1 37 <sub>a</sub>	- 2	2 48	- 7	2 7	—
Istanbul	7·8	21	e 2 1	+ 3	—	—	—	—
Ksara	8·8	87	e 2 18	+ 7	e 3 40	- 13	—	e 4·5
Bucharest	10·6	3	—	—	4 28	- 9	—	—
Triest	14·8	327	—	—	e 6 30	+ 12	—	—
Chur	17·7	322	e 4 12 <sub>k</sub>	+ 2	e 7 36	+ 10	—	—
Prague	18·1	337	e 5 58	?	—	—	—	—
Zürich	18·5	322	e 4 19	0	e 7 54	+ 10	—	—
Warsaw	18·7	353	e 4 15	- 7	e 7 53	+ 5	e 9 29	Q
Cheb	18·8	334	e 6 28	?	—	—	—	e 11·0 e 9·5
Basle	19·2	322	e 4 28	0	e 8 15	+ 16	—	—
Stuttgart	19·2	326	e 4 29	+ 1	e 8 10	+ 11	—	—
Jena	19·8	334	e 4 33	- 2	—	—	—	e 11·0
Strasbourg	19·8	325	e 4 36	+ 1	e 8 19	+ 6	—	—
Paris	22·7	319	i 5 7	+ 3	—	—	—	e 11·5
Uccle	22·9	325	e 2 42	?	—	—	—	—
De Bilt	23·4	329	—	—	e 9 38	+ 17	—	e 13·5

Additional readings:—

Jena eN = 4m.43s.  
 Strasbourg eP = 4m.46s.  
 Paris iP = 5m.21s.

Long waves were also recorded at Belgrade, Zagreb, Florence, Copenhagen, and Kew.

March 28d. Readings also at 3h. (Ksara), 8h. (La Paz, Bogota, and near Huancayo), 13h. (near Mizusawa), 15h. (Brisbane), 18h. (Samarkand, near Andijan, Obi-garm, Stalinabad, Tashkent, and Tchimkent), 19h. (near Granada), 21h. (near Ottawa).

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March 29d. 3h. 58m. 44s. Epicentre 46°·0N. 6°·2E.

Intensity IV-V North East of Annecy. Macroseismic area 450 sq. km. Epicentre 45°·57'N. 6°10'E.

Annales de l'Institut de Physique du Globe de Strasbourg, 2e partie, Séismologie, Nouvelle Série, Tome XII, 1947, Strasbourg, 1952, p. 10.

$$A = +.6930, B = +.0753, C = +.7170; \quad \delta = +1; \quad h = -4.$$

	$\Delta$ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	Supp. m. s.
Neuchatel	1.1	27	c 0 21	- 1	c 0 38	- 1	—
Besançon	1.3	353	—	—	i 0 41	- 3	—
Basle	1.8	32	c 0 33	+ 1	c 0 59	+ 3	c 0 36 P <sub>g</sub>
Zürich	2.1	50	c 0 36	- 1	c 1 7	+ 3	c 0 41 P <sub>g</sub>
Chur	2.5	70	c 0 47	+ 4	c 1 17	+ 3	—
Strasbourg	2.8	22	c 0 57	P <sub>g</sub>	e 1 33	S <sub>g</sub>	—
Stuttgart	3.4	35	e 1 11	P <sub>g</sub>	e 1 45	+ 8	c 1 53 S <sub>g</sub>
Paris	3.8	320	e 1 19	P <sub>g</sub>	e 2 3	S <sub>g</sub>	—

Additional readings:—

Strasbourg e = 1m.36s. and 1m.39s., i = 1m.44s. and 2m.5s.

Stuttgart eS<sub>g</sub>? = 2m.1s.

Paris e = 2m.7s. and 2m.16s.

March 29d. 7h. 50m. 28s. Epicentre 64°·0N. 20°·0W.

Intensity VI near Mount Hecla in Iceland. Earthquake recorded as far as Rome and Florence is associated with the beginning of a Volcanic Eruption.

S. Thorarinson.

"The Eruption of Mount Hecla, 1947-1948." U.G.G.I. publication N. 11 (General Assembly, Oslo, 1948), p.p. 150-152. Epicentre adopted.

$$A = +.4142, B = -.1508, C = +.8976; \quad \delta = -1; \quad h = -10; \\ D = -.342, E = -.940; \quad G = +.843, H = -.307, K = -.441.$$

	$\Delta$ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.
Reykjavik	0.9	279	i 0 17	- 3	i 0 31	- 3	i 0.5
Scoresby Sund	6.5	354	1 49	+10	3 7	+12	—
Paris	19.5	130	i 4 29	- 2	—	—	e 8.5
Strasbourg	21.4	122	c 4 55	+ 4	—	—	c 12.0
Stuttgart	21.9	119	c 4 56	- 1	c 9 8	+14	c 12.0
Cheb	22.1	112	c 7 32	?	—	—	—
Prague	23.0	110	—	—	c 9 50	+36	c 15.1
Tinemaha z.	60.8	295	c 10 17	+ 1	—	—	—
Tucson	61.9	286	e 10 23	- 1	—	—	—
Riverside z.	63.1	293	e 10 34	+ 2	—	—	—
Mount Wilson z.	63.2	293	i 10 27	- 5	—	—	—
Palomar z.	63.4	291	e 10 34	0	—	—	—

Additional readings —

Stuttgart e = 5m.6s.

Prague e = 10m.57s.

Long waves were also recorded at Ivigtut and other European stations.

March 29d. Readings also at 1h. (near Algiers), 6h. (Riverside, Tinemaha, and Tucson), 7h. (near Reykjavik), 8h. (Rome), 9h. (Frunse, near Andijan and Tchikent), 12h. (Uccle, Harvard and near Ottawa, Seven Falls, and Shawinigan Falls), 13h. (Riverview), 14h. (Harvard), 16h. (Brisbane), 17h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Boulder City, Pierce Ferry, Shasta Dam, St. Louis and Stuttgart), 18h. (Mount Wilson (2), Pasadena, Palomar (2), Riverside (2), Tucson (2), Boulder City (2), Pierce Ferry (2), Shasta Dam, Florissant, St. Louis (2) and Stuttgart), 19h. (Strasbourg), 21h. (near Granada), 23h. (Samarkand, near Obi-garm and Stalinabad).

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March 30d. 7h. 43m. 28s. Epicentre  $40^{\circ}8'N$ .  $124^{\circ}6'W$ . (as on 1945, Oct. 22d.).

Felt near the South West boundary of Humboldt County over an area of about 2000 sq. miles. Intensity VI recorded at Upper Mattole; V at Bridgeville, Eureka, Fortuna, and Holmes; IV at Arcata, Blue Lake, Cap. Mendocino, Carlotta, and Petrolia.

L. M. Murphy.

United States Earthquakes, 1947, Serial No. 730, Washington, 1950, p. 16. Epicentre near that adopted.

$$A = -.4324, B = -.6268, C = +.6482; \quad \delta = +1; \quad h = -2;$$

$$D = -.823, E = +.568; \quad G = -.368, H = -.534, K = -.762.$$

		$\Delta$	Az.	P.		O-C.		S.		O-C.		Supp.		L. m.
				m.	s.	s.	m.	s.	m.	s.				
Ferndale		0.2	98	i 0	13	+ 3	i 0	18	+ 2	—	—	—	—	
Mineral	E.	2.3	96	i 0	39	- 1	i 1	13	S*	i 0	51	P <sub>v</sub>	—	
Berkeley		3.3	145	i 0	53	0	i 1	28	- 7	i 1	10	P <sub>v</sub>	—	
San Francisco		3.3	147	e 0	56	+ 3	—	—	—	i 1	3	P <sub>v</sub>	—	
Lick		4.0	143	e 1	2	- 2	i 1	44	- 8	—	—	—	—	
Fresno	N.	5.4	134	e 1	24	0	i 2	30	+ 2	—	—	—	—	
Tinemaha		6.0	125	i 1	36	+ 4	i 3	16	S <sub>v</sub>	—	—	—	—	
Haiwee	E.	6.9	128	e 1	47	+ 2	e 3	37	S <sub>v</sub>	—	—	—	—	
Mount Wilson	Z.	8.2	138	i 2	1	- 2	—	—	—	—	—	—	—	
Pasadena	Z.	8.2	138	i 2	1	- 2	i 3	33	- 5	—	—	—	—	
Riverside	Z.	8.7	136	i 2	8	- 2	—	—	—	—	—	—	—	
Boulder City		9.0	118	e 2	14	+ 1	—	—	—	—	—	—	—	
Pierce Ferry		9.4	115	i 2	19	+ 1	e 4	46	S*	—	—	—	—	
Palomar	Z.	9.5	137	i 2	20	0	—	—	—	—	—	—	—	
Tucson		13.9	123	e 3	21	0	—	—	—	—	—	—	e 7.3	

Additional readings :—

Mineral iE = 42s.

Berkeley iN = 58s., iEN = 1m.56s.

San Francisco iE = 1m.0s., iEN = 1m.15s.

Fresno iN = 4m.53s.

March 30d. Readings also at 0h. (Riverview), 3h. (Riverview, Mount Wilson, Palomar, Riverside, Tinemaha, Tucson, Pierce Ferry, and St. Louis), 6h. (near Andijan, Obi-garm, and Stalinabad), 7h. (Mount Wilson, Pasadena, Palomar, Riverside, Tinemaha, Tucson, Pierce Ferry, Bozeman, Shasta Dam, Bogota, and near La Paz), 8h. (near Ferndale), 9h. (near La Paz), 11h. (Santa Lucia), 15h. (Mount Wilson, Pasadena, Palomar, Tinemaha, and Tucson), 16h. (near Andijan, Obi-garm, Samarkand, Stalinabad, Tashkent, and Tchinkent), 17h. (Strasbourg and La Paz), 19h. (La Paz, Andijan, Tchinkent, near Obi-garm, and Stalinabad).

March 31d. Readings at 1h. (Stuttgart), 2h. (near Andijan, Obi-garm, Samarkand, and Stalinabad), 4h. (Santa Lucia), 5h. (Mount Wilson, Palomar, Riverside, Tinemaha, Tucson, Boulder City, and Shasta Dam), 6h. (near Leninakan and near Balboa Heights), 7h. (Almata, near Andijan, Obi-garm, Samarkand, Stalinabad, Tashkent, and Tchinkent), 9h. (near Irkutsk), 14h. (Nanking and Tinemaha).



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A digital hypocenter file of the ISS (Villaseñor and Engdahl, 2005) can be obtained from the USGS web site: <http://earthquake.usgs.gov/scitech/iss/>

These data are considered public domain and may be freely distributed or copied for non-profit purposes provided the previous references are quoted.

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