The International Seismological Summary.

1939 October, November, December.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

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

This final quarter for 1939 contains 92 determined epicentres, of which 48 are repetitions from origins determined since the introduction of the use of geocentric co-ordinates.

Cases of abnormal focal depth are noticed as below :—

Oct.	5d.	4h.	22°·6S.	68°·8W.	0·015
	17d.	6h.	14·7S.	167·3E.	0·010
	17d.	8h.	14·7S.	167·3E.	0·010
	24d.	14h.	42·2N.	133·8E.	0·060
	30d.	13h.	16·6S.	174·0W.	0·015
Nov.	9d.	16h.	12·5N.	143·0E.	0·010
	17d.	18h.	20·5S.	179·0W.	0·060
	21d.	11h.	36·3N.	71·0E.	0·025
	28d.	2h.	8·7N.	78·5W.	0·030
Dec.	4d.	16h.	18·3N.	145·2E.	0·080
	12d.	2h.	15·5N.	91·7W.	0·020
	16d.	10h.	43·7N.	147·6E.	0·005
	17d.	7h.	9·2S.	123·0E.	0·010
	19d.	0h.	36·3N.	71·0E.	0·025
	21d.	21h.	0·1N.	122·7E.	0·010
	26d.	11h.	13·3N.	88·7W.	Suggested Deep.

Thanks are also due to the Director of the Meteorological Office and the Superintendent of Kew Observatory for hospitality extended to the staff.

December, 1950.

KEW OBSERVATORY,
RICHMOND,
SURREY.

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1939 OCTOBER, NOVEMBER, DECEMBER.

October 1d. 10h. Undetermined shock.
La Plata P = 58m.41s., S = 59m.54s., L = 60·3m.
La Paz PZ = 60m.19s., SZ = 62m.15s., LZ = 63·0m.
Huancayo eP = 61m.29s., eS = 65m.5s., S = 65m.24s.
Tucson P = 68m.24s.k.
La Jolla ePEZ = 68m.47s.
Riverside iP = 68m.51s.
Mount Wilson iPNZ = 68m.54s.
Pasadena ePEN = 68m.55s.
Haiwee iP = 68m.58s.
Tinemaha iP = 69m.6s.

October 1d. Readings also at 0h. (Tucson (2)), 1h. (Huancayo, La Paz, and Tucson (3)), 4h. (Manila), 6h. (Agra, Kodaikanal, Hyderabad, Samarkand, Calcutta, Sverdlovsk, Bombay, and Tucson (3)), 7h. (Tucson and near Manila), 8h. (Ottawa and near Tuai), 9h. (Palomar, Tinemaha, Haiwee, Pasadena, Tucson, Mount Wilson, and Riverside), 10h. (Tucson (2)), 12h. (Sverdlovsk, Baku, and Ksara), 13h. (near Sarajevo), 15h. (Andijan), 16h. (Andijan and near Mizusawa), 19h. (Almata, Frunse, and Andijan), 20h. (near Lick), 21h. (near Osaka and near Mizusawa (2)), 23h. (Bucharest, Tucson (2), and Ksara).

Oct. 2d. 21h 38m. 32s. Epicentre 43°·0N. 3°·5W.
Intensity V at Villaracajo (Burgos).
Epicentre Monto Cantabriques, 43°·0N. 3°·5W. (Strasbourg).
See Annales de l'Institut de Physique du Globe de Strasbourg, Vol. IV, 2 eme partie, p.75.

$A = +\cdot7322$, $B = -\cdot0448$, $C = +\cdot6795$; $\delta = -16$; $h = -3$;
$D = -\cdot061$, $E = -\cdot998$; $G = +\cdot678$, $H = -\cdot041$, $K = -\cdot734$.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Toledo	3·1	188	e 0 54	+ 3	i 1 38	S*	i 0 58	P*	—
Clermont-Ferrand	5·5	57	e 1 16	− 9	e 2 28	− 2	1 33	P*	—
Granada	5·8	184	1 55	P_g	i 3 7	S_g	—	—	—
Almeria	6·2	171	e 3 2	S*	—	—	3 23	S_g	—
Paris	7·1	33	—	—	e 3 15	+ 5	—	—	e 4·4
Neuchatel	8·4	58	e 1 58	− 8	e 3 34	− 9	—	—	—
Basle	9·0	56	e 2 12	− 1	e 4 44	S_g	—	—	—
Zurich	9·6	58	e 2 16	− 5	—	—	—	—	—
Stuttgart	10·5	53	—	—	e 4 15	−20	i 5 54	S_g	—
Jena	13·0	47	e 1 28	?	—	—	—	—	e 6·5

Additional readings :—
Toledo i = +1m.7s. and +1m.45s.
Clermont-Ferrand P_g = +1m.44s., S_g = +2m.56s., e = +3m.9s.
Granada i = +3m.21s.
Almeria iS_g = +3m.15s., S_g = +3m.19s., P_gS_g = +3m.28s., P_g = +3m.32s., P_gS_g = +3m.36s., S_g = +3m.46s. and +4m.7s.
Paris e = +2m.55s.
Stuttgart eNE = +5m.56s.
Long waves were also recorded at Rome.

Oct. 2d. Readings also at 1h. (Zurich and near Mizusawa), 2h. (Tucson), 4h. (Andijan and near Mizusawa), 5h. (Tucson), 6h. (La Paz, Tucson, and Perth), 7h. (Tacubaya), 10h. (Tucson and near Andijan), 11h. (Samarkand), 14h. (near Wellington), 15h. (near Tuai), 16h. (Fordham and Williamstown), 19h. (near Branner, Grozny, Ksara, Baku, Sverdlovsk, and Huancayo), 20h. (Tucson), 21h. (La Paz, Huancayo (2) and Zurich), 22h. (Oaxaca and Tacubaya).

Oct. 3d. Readings at 0h. (Sitka), 1h. (Tucson (3)), 7h. (Tucson and near Mizusawa), 9h. (Calcutta, Baku, Semipalatinsk, Almata, Grozny, near Samarkand, Frunse, Andijan, Tucson, Sverdlovsk, Ksara, Pasadena, Mount Wilson, Riverside, and Tinemaha), 11h. (Moscow, Sverdlovsk, Tucson, Huancayo, Kobe, Tokyo, Kumamoto, Manila, and La Paz), 12h. (Hong Kong, Akita, Misima, Mori, Sverdlovsk, Manila, Kumamoto, Tokyo, Kobe, and Ksara), 13h. (La Jolla, Santa Barbara, Christchurch, Riverview, Apia, Brisbane, Haiwee, Ksara, Tucson, La Paz, Tinemaha, Riverside, Mount Wilson, and Pasadena), 14h. (Vladivostok, Helwan, Huancayo, and Sverdlovsk), 15h. (Merida), 16h. (Tucson), 17h. (Mizusawa, Huancayo, near Karenko, Taihoku, and Sintiku), 18h. (Tucson), 20h. (Butte and Bozeman (2)), 22h. (near Ferndale),

Oct. 4d. 22h. 23m. 51s. Epicentre 29°·0N. 114°·0W. (as on 1939, May 2d.).

$A = -\cdot3563$, $B = -\cdot8003$, $C = +\cdot4823$; $\delta = +4$; $h = +2$;
$D = -\cdot914$, $E = +\cdot407$; $G = -\cdot196$, $H = -\cdot441$, $K = -\cdot876$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tucson		4·2	40	·0 59k	− 8	—	—	i 1 13	P*	i 2·0
La Jolla	Z.	4·8	325	i 1 24	P*	—	—	—	—	—
Riverside		5·7	332	e 1 44	P*	e 2 48	S*	—	—	—
Pasadena		6·2	327	e 1 37	+ 2	i 3 8	S*	i 1 54	P*	—
Mount Wilson		6·3	327	i 1 34	− 2	e 3 6	S*	—	—	—
Salt Lake City		11·9	8	—	—	e 4 13	−56	—	—	e 5·2
Ukiah		12·6	326	e 3 3	0	e 5 27	+ 1	—	—	e 6·2
Bozeman		16·8	7	e 3 57	− 1	—	—	—	—	e 7·4
Butte		17·0	4	e 3 50	−11	e 7 21	+11	—	—	e 9·0
Lincoln		18·4	45	e 4 17	− 1	—	—	—	—	e 8·6
Victoria		20·7	343	—	—	e 8 57	SS	—	—	11·1
Florissant		21·9	57	e 4 56	− 1	e 8 51	− 3	—	—	e 11·4
St. Louis		21·9	57	e 4 58	+ 1	e 8 54	0	—	—	e 11·2
Cape Girardeau	E.	22·1	62	e 4 58	− 1	e 9 48	SS	—	—	e 11·7
Chicago		24·9	51	e 5 30	+ 4	—	—	—	—	e 12·4
Philadelphia		33·6	60	—	—	e 17 12	S_cS	—	—	e 16·0

Additional readings:—
Salt Lake City eS = +4m.43s.
Bozeman ePPP = +4m.1s.
Florissant eSN = +8m.55s.
St. Louis iPE = +5m.2s.
Long waves were also recorded at Columbia, Santa Clara, Fordham, and East Machias.

Oct. 4d. Readings also at 0h. (near Mizusawa), 1h. (Apia), 2h. (Samarkand and Bermuda), 6h. (Tananarive), 10h. (Berkeley), 12h. (Tucson), 13h. (Ottawa and Melbourne), 16h. (near Fordham), 19h. (Berkeley), 23h. (near Andijan).

Oct. 5d. 4h. 55m. 47s. Epicentre 22°·6S. 68°·8W. (as on 1939, Jan. 18d.).

$A = +\cdot3342$, $B = -\cdot8616$, $C = -\cdot3821$; $\delta = +4$; $h = +4$;
$D = -\cdot932$, $E = -\cdot361$; $G = -\cdot138$, $H = +\cdot356$, $K = -\cdot924$.

Tables for depth of focus 0·015 have been used.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
La Paz		6·1	5	i 1 28a	− 1	i 2 21	−17	—	—	i 2·5
Huancayo		12·2	328	e 2 57	+ 6	e 5 19	SS	3 2	pP	—
La Plata		15·5	145	3 31	− 2	6 15	− 6	—	—	7·6
Tucson		67·7	322	i 10 45k	− 1	e 19 44	+13	11 10	pP	—
La Jolla	Z.	72·0	319	i 11 12	0	—	—	—	—	—
Riverside	N.	72·8	319	e 11 16	0	—	—	—	—	—
Mount Wilson		73·4	319	i 11 21k	+ 1	—	—	e 12 16	pP	—
Pasadena		73·4	319	i 11 20k	0	—	—	i 12 20	pP	—
Santa Barbara	Z.	74·6	318	i 11 26	− 1	—	—	—	—	—
Tinemaha		75·5	321	i 11 31	− 1	—	—	—	—	—

Additional readings:—
Huancayo iS = +5m.34s.
Tucson ePP = +13m.22s., ePPP = +15m.2s.
Long waves were also recorded at Little Rock.

Oct. 5d. Readings also at 1h. (Tucson), 3h. (Balboa Heights), 4h. (Tucson (2)), 5h. (Andijan), 8h. (Balboa Heights, Tucson, and Huancayo), 10h. (near Sarajevo), 13h. (near Fordham), 15h. (Harvard, Manila, Andijan, and Tucson), 17h. (Ksara, Colombo, and Kodaikanal), 19h. (Tucson and near Samarkand), 20h. (La Paz), 21h. (near Osaka and near Mizusawa).

Oct. 6d. Readings at 2h. (Tucson, Ksara, Fordham, and Helwan), 4h. (near Lick, Berkeley, Branner, and Fresno), 5h. (San Juan), 7h. (near Sofia, Bucharest, and Tucson), 8h. (Tucson and Andijan), 13h. (Bozeman), 15h. (Mizusawa, Colombo, Kodaikanal, and Bombay), 17h. (Ksara), 18h. (Andijan), 20h. (Triest, near Andijan, and Tchimkent), 21h. (Ksara), 23h. (Samarkand and Andijan).

Oct. 7d. 20h. 43m. 0s. Epicentre 6°·5S. 128°·5E. (as on 1938 February 22d.).

$A = -\cdot6186$, $B = +\cdot7777$, $C = -\cdot1125$; $\delta = +14$; $h = +7$;
$D = +\cdot783$, $E = +\cdot623$; $G = +\cdot070$, $H = -\cdot088$, $K = -\cdot994$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Palau		15·0	24	3 37	+ 2	6 43	SS	—	—	—
Perth		27·9	203	5 55	+ 1	10 28	− 9	i 6 37	PP	15·0
Adelaide		29·8	164	e 6 11	0	e 10 28	−39	i 12 41	SS	i 15·5
Hong Kong		31·9	334	6 30k	+ 1	11 50	+10	7 28	PP	—
Riverview		34·3	146	e 6 52	+ 2	e 12 7	−10	e 8 15	PP	e 17·4
Sydney		34·3	146	e 6 48	− 2	e 12 0	−17	—	—	—
Phu-Lien		34·6	323	e 6 56	+ 3	12 35	+13	—	—	—
Melbourne		34·6	157	i 7 43?	+50	i 12 4?	−18	i 14 37	SS	17·0
Zi-ka-wei	Z.	38·1	351	e 7 21	− 1	i 13 27	+11	i 8 22	PP	i 20·1
Koti		40·1	7	7 40	+ 1	12 22	?	—	—	—
Hamada		41·3	4	7 49	0	14 52	+48	—	—	—
Kobe		41·5	8	7 49	− 1	14 14	+ 7	—	—	—
Kameyama		41·8	9	7 54	+ 1	—	—	—	—	—
Tokyo, Cen. Met. Ob.		43·3	13	8 6	+ 1	—	—	—	—	—
Zinsen		43·8	357	8 15	+ 6	14 40	0	—	—	—
Nagano		43·9	11	8 9	− 1	14 44	+ 2	—	—	—
Wazima		44·4	9	8 13	− 1	—	—	—	—	—
Sendai		46·0	13	8 27	0	—	—	—	—	—
Mizusawa		46·9	13	e 8 33	− 1	15 33	+ 8	—	—	—
Akita		47·2	12	8 44	+ 8	—	—	—	—	—
Calcutta	N.	48·8	308	e 8 49	0	i 15 57	+ 5	e 9 10	pP	—
Vladivostok		49·5	4	8 53	− 1	e 16 11	+ 9	—	—	24·6
Colombo	E.	50·3	285	8 59	− 1	16 17	+ 4	—	—	25·4
Sapporo		50·7	11	9 1	− 2	—	—	—	—	—
Christchurch		53·4	141	i 9 18	− 6	e 15 55	−60	—	—	—
Kodaikanal	E.	53·5	288	i 9 23a	− 1	e 17 0	+ 3	—	—	i 28·1
Wellington		53·7	137	—	—	e 19 26	SS	—	—	26·5
Hyderabad		54·9	297	e 9 35	0	17 15	− 1	—	—	25·5
Agra	E.	59·2	307	10 0	− 5	19 1	PPS	12 18	PP	—
Bombay		60·4	296	i 10 9a	− 4	i 18 25	− 3	i 12 24	PP	35·2
Almata		68·0	322	e 11 6	+ 3	—	—	—	—	e 33·7
Andijan		69·7	318	e 11 13	− 1	20 28	+ 6	—	—	—
Semipalatinsk		70·3	330	e 11 18	+ 1	—	—	—	—	—
Tchimkent		72·2	318	11 31	+ 2	i 20 56	+ 5	—	—	—
Honolulu		77·3	66	e 12 2	+ 4	e 21 53	+ 5	e 16 12	PPP	—
Sverdlovsk		83·6	329	i 12 29	− 3	i 22 50	− 3	15 46	PP	41·0
Baku		85·6	311	12 41	0	e 23 27	+14	—	—	46·0
Grozny		89·2	313	12 31	−28	23 37	−10	—	—	—
Erevan		89·6	310	13 9	+ 8	—	—	—	—	—
College		93·2	25	e 19 24	PPP	e 25 32	PS	e 25 52	PPS	—
Ksara		95·7	303	i 13 30k	+ 1	e 24 58	+14	e 17 15	PP	47·3
Moscow		95·9	325	e 13 27	− 3	24 17	[+11]	17 21	PP	—
Sitka		98·8	33	—	—	e 24 40	[+19]	e 26 19	PS	—
Helwan		99·4	299	e 13 45	− 1	25 24	+ 9	e 17 51	PP	—
Pulkovo		99·7	330	17 53	PP	24 33	[+ 7]	26 47	PS	e 51·5
Cape Town	E.	102·8	233	e 22 22	PKS	e 26 25	PS	—	—	49·1
Upsala		106·0	331	e 23 0?	PKS	e 28 17	PS	—	—	e 47·0
Victoria		106·9	40	e 18 42	PP	—	—	—	—	38·0
Triest		111·8	317	e 19 23	PP	e 28 52	PS	e 35 25	SSP	—
Hamburg	E.	111·9	326	e 24 0?	?	—	—	—	—	—
Haiwee	Z.	112·3	54	e 18 36	[− 2]	—	—	—	—	—
Pasadena	Z.	113·0	56	e 18 36	[− 3]	—	—	—	—	—
Rome		113·6	313	e 19 36	PP	i 29 9	PS	e 35 6	SS	e 50·9
Stuttgart	N.E.	114·0	322	e 19 41	PP	—	—	—	—	—
De Bilt		115·2	326	e 19 59	PP	—	—	—	—	e 58·0
Bozeman		115·7	42	—	—	e 25 40	[+ 6]	e 39 19	SSS	—
Uccle		116·2	325	e 21 12	?	e 29 50	PS	e 35 12	SS	e 55·0
Salt Lake City		116·5	47	—	—	e 30 4	PS	—	—	—
Paris		118·1	323	20 8	PP	—	—	—	—	e 70·0
Kew		118·5	327	e 20 10	PP	e 32 0?	?	—	—	e 67·0

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tucson		119·3	56	e 18 47	[− 4]	e 36 5	SS	e 20 9	PP	—
Toledo		126·1	316	e 20 59	PP	—	—	—	—	—
Granada		126·9	312	e 21 20	PP	e 27 58	{− 1}	—	—	—
Florissant		132·4	41	e 19 18	[+ 2]	i 22 43	PKS	—	—	—
Cape Girardeau	N.	133·8	43	e 22 42	PKS	—	—	—	—	—
Ottawa		135·9	24	i 19 8	[−15]	—	—	e 23 0	PKS	34·0
Seven Falls		135·9	18	—	—	e 35 0?	PPS	—	—	61·0
Williamstown		139·2	23	e 19 27	[− 2]	—	—	—	—	—
East Machias		139·4	16	e 19 27	[− 2]	e 40 12	SS	e 22 47	PP	—
Harvard		140·0	22	e 19 20	[−11]	—	—	—	—	e 70·0
Fordham		140·4	26	e 19 23	[− 8]	e 29 36	{+13}	e 23 2	PP	—
Huancayo		150·0	128	e 19 50	[+ 3]	e 27 3	[+ 9]	23 5	PP	e 58·3
Bermuda		151·5	23	e 19 50	[+ 1]	e 27 50	[+54]	e 44 30	SSP	—
La Paz	z.	151·8	144	19 58	[+ 8]	—	—	—	—	—
Balboa Heights		152·1	84	e 20 0?	[+10]	—	—	—	—	—

Additional readings :—
Perth i = +6m.25s., +6m.48s., and +6m.56s., P_cP = +8m.20s., i = +11m.15s.
Adelaide i = +7m.0s., +7m.26s., +8m.42s., +11m.56s., and +14m.7s.
Hong Kong SS = +14m.4s.
Riverview eZ = +7m.37s.
Melbourne i = +11m.25s.?
Zi-ka-wei iZ = +11m.31s.
Calcutta esSN = +16m.37s.
Christchurch i = +13m.28s.
Agra PPPE = +14m.0s., iE = +19m.53s., SSE = +23m.30s.
Bombay iEN = +10m.24s., iE = +18m.18s., iN = +18m.50s., iE = +20m.5s.
Honolulu ePS = +22m.17s., eSS = +26m.48s.
Sverdlovsk PS = +23m.49s., SS = +28m.18s.
Baku e = +37m.0s.
Ksara PPS = +26m.39s.
Moscow SS = +31m.30s.
Helwan PPEZ = +18m.22s., PSE = +28m.2s., PPSE = +29m.2s.
Pulkovo eS = +25m.26s., SS = +32m.18s.
Rome e = +20m.24s. and +22m.21s., ePP = +23m.23s., i = +27m.53s., eSKS = +30m.11s., i = +38m.53s., e = +40m.57s. and +44m.16s.
Uccle eE = +36m.54s.
Paris e = +24m.0s.?
Cape Girardeau eN = +22m.53s.
East Machias ePKS = +23m.5s., eSKSP = +32m.37s., ePSPS = +41m.36s.
Fordham eN = +42m.0s.?
Huancayo PKP = +19m.58s., eSKKS = +29m.21s., eSS = +42m.50s., eSSS = +48m.3s.
Long waves were also recorded at Prague, Bidston, and La Plata.

Oct. 7d. 21h. 4m. 32s. Epicentre 36°·9N. 141°·3E.

Intensity III at Shirakawa ; II at Onahama, Mito, Utunomiya, Hukusima, Kakioka, Tukubasan, Sendai, and Miyako ; I at Aidu, Tokyo, Mizusawa, Morioka, and Titibu.

Epicentre 36°·9N. 141°·3E. Shallow.

See Seismological Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo, 1949, p. 25.

A = −·6256, B = +·5012, C = +·5978 ; δ = −6 ; h = −1 ;
D = +·625, E = +·780 ; G = −·467, H = +·374, K = −·802.

	Δ	Az.	P.	O−C.	S.	O−C.
	°	°	m. s.	s.	m. s.	s.
Onahama	0·3	276	0 15k	+ 4	0 24	+ 6
Mito	0·8	232	0 21a	+ 3	0 33	+ 2
Hukusima	1·1	322	0 24k	+ 2	0 38	− 1
Kakioka	1·1	233	0 24a	+ 2	0 39	0
Tukubasan	1·2	235	0 24a	0	0 40	− 1
Tyosi	1·2	197	0 34	+10	0 46	+ 5
Utunomiya	1·2	253	0 23a	− 1	0 37	− 4
Sendai	1·4	347	0 27	0	0 44	− 2
Tokyo Cen. Met. Ob.	1·7	225	0 33a	+ 2	0 56	+ 2
Maebasi	1·8	254	0 28	− 4	1 0	+ 4

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.
	°	°	m. s.	s.	m. s.	s.
Yokohama	2·0	222	0 38	+ 3	1 3	+ 1
Mizusawa	2·2	357	0 37	− 1	i 1 3	− 3
Hunatu	2·5	236	0 44	+ 1	1 11	− 3
Nagano	2·5	265	0 44	+ 1	1 21	S_g
Miyako	2·8	11	0 44	− 3	1 15	− 7
Akita	3·0	342	0 50	0	1 24	− 3
Osima	3·2	216	0 44	− 8	1 16	−16
Wazima	3·5	281	1 6	P*	—	—
Hatinohe	3·7	3	0 53a	− 7	1 35	−10
Aomori	3·9	354	1 2	0	1 48	− 2
Nagoya	3·9	244	1 8	P*	1 58	S*
Osaka	5·2	247	e 1 18	− 3	2 26	+ 4
Sapporo	6·2	0	2 34	S	(2 34)	−14
Nemuro	7·2	26	1 45	− 4	2 58	−15

Oct. 7d. Readings also at 0h. (Bermuda), 4h. (Tchimkent, Andijan, and Samarkand), 7h. (Rome), 8h. (Ksara, Baku, Bombay, Sverdlovsk, Agra, Kodaikanal (2), Colombo, and Perth), 9h. (near Mizusawa), 10h. (Istanbul), 11h. (near Balboa Heights), 15h. (Sitka), 16h. (Rome, Andijan, and Almata), 17h. (Algiers and Rome), 20h. (Andijan, Almata (2), and Philadelphia), 21h. (Almata and Samarkand), 22h. (Kew and Uccle), 23h. (La Plata, near La Paz, and Huancayo).

Oct. 8d. Readings at 0h. (Harvard, Toledo, Granada, Williamstown, Tucson, Florissant, Cape Girardeau, Tinemaha, La Jolla, Pasadena, Ksara, and Almata), 1h. (near Mizusawa), 5h. (Mount Wilson, Santa Barbara, Pasadena, La Jolla, Tinemaha, and Tucson), 6h. (Perth), 8h. (La Paz and Huancayo), 9h. (Sverdlovsk, Baku, Erevan, Helwan, and Ksara), 15h. (Merida and Balboa Heights), 16h. (Brisbane, Rome, and Tucson), 20h. (near Triest, Grozny, near Samarkand, Tchimkent, Andijan, Almata, and near Mizusawa), 21h. (near Fordham, La Paz, and Huancayo), 22h. (Riverside, La Paz, Tucson, and Pasadena), 23h. (Wellington and Tuai).

Oct. 9d. 2h. 17m. 56s. Epicentre 19°·0S. 169°·5E.

$A = -·9304$, $B = +·1724$, $C = -·3236$; $\delta = +8$; $h = +5$;
$D = +·182$, $E = +·983$; $G = +·318$, $H = -·059$, $K = -·946$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Brisbane	N.	17·3	238	i 3 58	− 6	i 7 16	0	—	—	i 8·4
Apia		18·5	78	i 4 22	+ 3	e 7 59	SS	—	—	—
Arapuni		19·7	167	—	—	8 4	− 6	—	—	11·1
Riverview		22·0	225	e 4 58	0	i 8 54	− 2	5 25	PP	e 10·9
Sydney		22·0	225	e 5 4	+ 6	e 9 10	+14	—	—	e 11·1
Wellington		22·7	171	5 4	0	i 8 58	−11	5 39	PP	11·1
Christchurch		24·6	175	5 21a	− 2	9 40	− 2	10 16	L_q	12·2
Melbourne		28·5	224	i 6 12	+13	i 10 47	+ 1	i 6 44	PP	12·1
Adelaide		31·6	233	i 3 9	?	i 10 27	−68	—	—	—
Perth		49·7	244	i 11 7	PP	i 16 4	0	i 19 9	SS	i 24·6
Honolulu		51·3	40	e 10 11	P_cP	e 16 5	−21	e 17 38	S_cS	e 20·5
Zi-ka-wei	Z.	68·0	317	e 11 39	+36	—	—	—	—	i 38·8
Vladivostok		70·8	333	e 11 35	+15	i 21 34	PPS	—	—	28·8
Santa Clara		85·4	48	e 12 52	+12	e 24 32	PPS	—	—	e 39·7
Berkeley		85·4	48	—	—	e 23 28	+17	—	—	e 39·7
Ukiah		85·4	46	e 12 47	+ 7	e 23 20	+ 9	e 24 21	PPS	e 35·3
Pasadena	Z.	86·7	53	e 12 46	− 1	—	—	—	—	e 39·8
Mount Wilson		86·8	53	i 12 47	0	—	—	—	—	—
Riverside	Z.	87·2	53	i 12 49	0	—	—	—	—	—
Haiwee		87·7	51	e 12 51	− 1	—	—	—	—	—
Sitka		88·6	27	—	—	e 23 36	− 6	e 24 11	PS	e 35·7
Calcutta	N.	89·4	294	e 20 6	?	e 23 59	+10	—	—	—
Tucson		91·6	57	e 13 10	0	e 23 49	[+ 6]	e 17 14	PP	e 41·8
Colombo	E.	91·9	276	16 21	PP	—	—	—	—	—
Salt Lake City		94·0	49	—	—	e 30 7	SS	—	—	e 41·0

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Butte		95·4	43	—	—	e 24 23	−19	e 26 11	PPS	e 40·1
Bozeman		96·3	44	—	—	e 23 53	[−15]	e 26 17	PS	e 40·1
Agra	E.	99·7	295	—	—	i 24 23	[− 2]	—	—	—
Bombay	E.	102·0	286	e 18 6	PP	—	—	—	—	—
Lincoln		105·0	51	—	—	26 40	+38	—	—	e 48·6
Huancayo		109·1	111	e 14 5	P	e 26 18	{+19}	e 19 13	PP	e 44·8
Chicago		111·9	51	e 18 19	[−18]	e 34 14	SS	e 29 7	PPS	e 46·3
La Paz	Z.	113·2	119	13 6	?	—	—	—	—	73·1
Sverdlovsk		116·0	325	e 19 50	PP	e 27 42	{+55}	e 36 0	SS	47·1
Columbia		116·2	60	—	—	e 26 12	{−36}	e 35 59	SS	e 51·2
Cape Town	E.	120·5	208	—	—	e 31 36	PPS	e 38 9	SSP	49·7
Philadelphia		121·2	55	—	—	e 25 54	[0]	—	—	e 61·1
Fordham	N.	122·2	54	—	—	e 37 22	SS	—	—	e 56·4
East Machias		126·6	48	—	—	e 44 50	?	—	—	—
San Juan		127·5	81	e 21 11	PP	e 25 47	[−26]	e 23 49	PPP	e 55·9
Moscow		128·6	327	e 19 25	[+16]	e 39 14	SSP	e 21 36	PP	e 67·5
Bermuda		129·7	64	e 13 36	P	—	—	—	—	—
Pulkovo		129·9	334	e 22 32	PP	e 28 10	{−10}	e 38 26	SS	64·6
Upsala		134·5	341	e 24 4?	PPP	—	—	—	—	e 67·1
Ksara		136·3	298	e 19 48	[+24]	—	—	e 22 15	PP	—
Istanbul		139·8	312	e 22 40	PP	—	—	—	—	—
Helwan		140·6	294	i 23 44	?	e 26 14	[−26]	e 33 34	PS	—
Uccle		146·2	344	e 19 41	[0]	e 47 58	SSS	—	—	e 64·1
Chur		147·7	335	e 19 45	[+ 2]	—	—	—	—	—
Zurich		147·7	336	e 19 35	[− 8]	—	—	—	—	—
Basle		147·9	337	e 19 48	[+ 4]	—	—	—	—	—
Paris		148·5	343	e 20 16	[+31]	—	—	e 22 38	PP	e 78·1
Neuchatel		148·6	337	e 19 52	[+ 7]	—	—	—	—	—
Rome		150·0	324	e 19 56	[+ 9]	i 49 11	SSS	i 43 47	SSP	e 67·2

Additional readings :—
Riverview iE = +5m.11s. and +9m.1s., iN = +9m.5s., SSN = +9m.21s.
Melbourne e = +10m.32s.
Adelaide e = +12m.9s., i = +14m.44s.
Perth i = +16m.54s., +21m.26s., +22m.4s., +22m.32s., and +23m.31s.
Honolulu eSS = +19m.49s.
Zi-ka-wei iZ = +32m.4s.
Vladivistok i = +12m.31s. and +26m.19s.
Berkeley eE = +23m.37s., eN = +35m.44s.
Ukiah eSS = +28m.46s.
Sitka eSS = +29m.7s.
Tucson ePPS = +25m.11s.
Butte eSS = +30m.40s.
Bozeman eS = +24m.35s., ePPS = +27m.16s.
Huancayo P = +14m.51s., ePS = +28m.23s., eSSS = +37m.33s.
Chicago eSSS = +39m.29s.
La Paz iZ = +14m.9s.
Columbia eSSS = +39m.35s.
Moscow e = +22m.24s., +34m.20s., and +36m.35s.
Pulkovo e = +22m.39s., +23m.37s., and +29m.44s.
Ksara PPS = +34m.15s.
Rome e = +20m.57s., iPPP = +24m.49s., e = +39m.20s., eSSS = +44m.19s., e = +46m.6s., +53m.0s., +60m.0s., and +64m.0s.
Long waves were also recorded at Harvard, Scoresby Sund, Clermont-Ferrand, De Bilt, San Fernando, and Toledo.

Oct. 9d. Readings also at 3h. (Palomar, Haiwee, Riverside, Mount Wilson, Pasadena, and Tucson), 8h. (Mizusawa), 14h. (Andijan, Tchimkent, Triest, Helwan, and Ksara), 17h. (Tucson), 18h. (Tuai and Wellington), 19h. (Williamstown), 20h. (Samarkand (2)), 21h. (Stuttgart), 22h. (near Wellington, Tacubaya, and Oaxaca).

Oct. 10d. 13h. 54m. 50s. Epicentre 37°·6N. 141°·7E. (as on 1939, August 17d.).

Intensity III at Onahama, Hukusima, Shirakawa; II at Sendai, Mito, Kakioka, Utunomiya, Tukubasan, and Miyako; I at Yamagata, Mizusawa, Morioka, Tokyo, Yokohama, Titibu, Akita, and Kumagaya.

Epicentre 37°·5N. 141°·6E. Shallow.

See Seismological Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo 1949, p. 26.

$A = -·6233$, $B = +·4923$, $C = +·6076$; $\delta = +4$; $h = -1$;
$D = +·620$, $E = +·785$; $G = -·477$, $H = +·377$; $K = -·794$.

	△	Az.	P.	O−C.	S.	O−C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Onahama	0·9	224	0 19k	− 1	0 28	− 6	—
Sendai	0·9	317	0 24k	+ 4	0 36	+ 2	—
Hukusima	1·0	279	0 20k	− 1	0 33	− 3	—
Mito	1·5	219	0 28a	0	0 42	− 7	—
Mizusawa	1·6	344	0 32	+ 2	i 0 50	− 1	—
Kakioka	1·8	222	0 30k	− 2	0 48	− 8	—
Utunomiya	1·8	234	0 32k	0	0 52	− 4	—
Tukubasan	1·9	223	0 32	− 2	0 52	− 7	—
Tyosi	2·0	200	0 36	+ 1	0 54	− 8	—
Miyako	2·1	6	0 41	P_g	1 5	+ 1	—
Kumagaya	2·4	232	0 40	− 1	1 7	− 5	—
Maebasi	2·4	240	0 41	0	1 11	− 1	—
Akita	2·5	329	0 46	+ 3	1 23	S_g	—
Tokyo, Cen. Met. Ob.	2·5	219	0 41k	− 2	1 25	S_g	—
Yokohama	2·7	217	0 44	− 1	1 12	− 7	—
Hatinohe	3·0	357	0 51a	+ 1	1 28	+ 1	—
Nagano	3·0	252	0 48	− 2	1 28	+ 1	—
Hunatu	3·1	228	0 52	+ 1	1 25	− 4	—
Aomori	3·3	344	0 57	+ 4	1 42	S*	—
Osima	3·4	214	0 55	0	1 29	− 8	—
Wazima	3·8	269	1 1	0	—	—	—
Hamamatu	4·3	229	1 13a	P*	2 20	S_g	—
Mori	4·5	349	1 16	+ 5	2 49	?	—
Gihu	4·5	243	1 11	0	2 1	− 4	—
Nagoya	4·5	239	1 13k	+ 2	2 6	+ 1	—
Sapporo	5·5	357	1 34	P*	2 49	S*	—
Osaka	5·8	242	1 28	− 1	2 38	0	—
Kobe	6·0	244	1 32a	0	2 34	− 9	—
Nemuro	6·4	26	1 42	+ 4	2 48	− 5	—
Andijan	52·5	296	e 9 7	−10	—	—	—
Sverdlovsk	54·9	320	i 9 31	− 4	17 28	+12	26·2
Haiwee z.	76·0	55	e 11 51	0	—	—	—
Mount Wilson z.	77·1	57	e 12 11	+14	—	—	—
Pasadena z.	77·1	57	e 12 10	+13	—	—	—
Ksara	81·0	306	e 11 59	−19	e 21 45	−42	44·2
Tucson	83·1	55	e 12 28	− 1	—	—	—

Long waves were also recorded at Rome and Baku.

Oct. 10d. 18h. 31m. 55s. Epicentre 38°·6N. 143°·1E. (as on 1938 December 20d.).

Intensity III at Miyako, Mizusawa, Morioka, Sendai, Yamagata, Hukusima, and Shirakawa; II at Hatinohe, Onahama, Akita, Sakata, Mito, Aomori, Aidu, Kakioka; I at Utunomiya, Tukubasan, Tokyo, Takada, Iida, and Kumagaya.

Epicentre 38°·4N. 143°·0E. Shallow.

See Seismological Bulletin of the Central Met. Ob., Japan, for the year 1939, Tokyo 1940, p. 27.

$A = -·6266$, $B = +·4704$, $C = +·6213$; $\delta = -8$; $h = -1$;
$D = +·600$, $E = +·800$; $G = -·497$, $H = +·373$, $K = -·784$.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Miyako	1·4	320	0 24	− 3	0 45	− 1	—	—	—
Mizusawa	1·6	289	i 0 27	− 3	—	—	—	—	—
Sendai	1·8	259	0 36	+ 4	0 56	0	—	—	—
Hatinohe	2·3	328	0 38a	− 2	1 7	− 2	—	—	—
Hukusima	2·3	248	0 39a	− 1	1 2	− 7	—	—	—
Akita	2·5	296	0 44a	+ 1	1 19	+ 5	—	—	—
Onahama	2·5	226	0 41a	− 2	1 6	− 8	—	—	—
Aomori	2·8	321	0 48	+ 1	1 29	S*	—	—	—
Mito	3·0	223	0 48a	− 2	1 15	−12	—	—	—
Kakioka	3·3	224	0 52a	− 1	1 35	0	—	—	—
Tyosi	3·4	214	0 56	+ 1	1 35	− 2	—	—	—
Maebasi	3·9	237	1 2a	0	1 47	− 3	—	—	—
Tokyo, Cen. Met. Ob.	3·9	225	1 4a	+ 2	1 55	+ 5	—	—	—
Mori	4·1	332	1 4a	− 1	2 3	S*	—	—	—
Yokohama	4·2	223	1 7a	0	2 4	+ 7	—	—	—
Nagano	4·3	246	1 10a	+ 2	2 1	+ 1	—	—	—
Mera	4·4	217	1 13	+ 3	2 5	+ 3	—	—	—
Hunatu	4·7	230	1 13a	− 1	2 9	− 1	—	—	—
Sapporo	4·7	343	1 14	0	2 19	S*	—	—	—
Misima	4·8	226	1 14a	− 1	2 17	+ 5	—	—	—
Toyama	5·0	250	1 19	+ 1	2 24	+ 6	—	—	—
Nemuro	5·1	21	1 19a	− 1	2 11	− 9	—	—	—
Hamamatu	5·8	230	1 31k	+ 2	2 49	+11	—	—	—
Gihu	6·0	240	1 31a	− 1	2 42	− 1	—	—	—
Nagoya	6·0	237	1 33a	+ 1	2 46	+ 3	—	—	—
Hikone	6·4	241	1 36a	− 2	2 47	− 6	—	—	—
Kameyama	6·5	237	1 40	+ 1	3 8	+13	—	—	—
Kyoto	6·9	241	1 44a	− 1	3 24	S*	—	—	—
Osaka	7·3	240	i 1 49	− 1	3 37	S*	—	—	—
Kobe	7·5	241	1 52	− 1	2 57	−23	—	—	—
Muroto	9·0	237	2 22	+ 9	3 59	+ 1	—	—	—
Hamada	9·6	251	2 22	+ 1	4 9	− 3	—	—	—
Hirosima	9·6	248	2 23	+ 2	4 14	+ 2	—	—	—
Simidu	10·1	238	2 26	− 2	4 20	− 5	—	—	—
Izuka	11·2	248	2 38	− 6	5 7	SS	—	—	—
Hukuoka	11·4	248	2 52	+ 5	5 23	SSS	—	—	—
Titizima	11·5	184	2 49	+ 1	—	—	—	—	—
Nagasaki	12·2	246	2 56	− 2	5 44	SSS	—	—	—
Keizyo	12·8	271	3 6	0	5 30	0	—	—	—
Dairen	16·7	278	3 50	− 7	6 41	−22	—	—	—
Zi-ka-wei	19·2	256	i 4 23k	− 5	8 1	+ 2	i 8 25	SS	i 10·7
Miyakozima	20·4	235	4 43	+ 2	9 34	?	—	—	—
Hong Kong	29·6	247	6 7	− 2	11 2	− 2	7 9	PP	14·4
Irkutsk	30·1	311	6 11	− 2	11 12	0	—	—	16·1
Manila	30·9	225	e 6 19a	− 1	i 11 26	+ 2	—	—	17·4
Palau	32·1	197	6 15	−16	12 9	+26	—	—	—
Phu-Lien	36·0	251	e 7 5	0	12 46	+ 2	—	—	18·0
Semipalatinsk	45·1	308	8 17	− 3	14 53	− 6	—	—	—
College	47·1	33	e 8 36	+ 1	e 15 21	− 7	e 10 42	PP	—
Almata	49·0	300	8 49	− 1	15 57	+ 2	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Calcutta		49·1	268	i 8 51a	0	i 15 55	− 1	e 10 20	PcP	i 23·9
Frunse		50·8	299	9 5	+ 1	16 16	− 4	—	—	27·8
Andijan		53·1	296	9 20	− 1	17 5	+14	—	—	27·8
Honolulu		53·1	90	e 9 36	+15	e 16 44	− 7	e 11 32	PP	e 21·8
Dehra Dun	N.	53·3	282	e 9 19?	− 3	e 16 51	− 3	e 20 9	SS	e 27·8
Sitka		54·3	41	e 9 50	+20	i 17 10	+ 3	i 11 58	PP	—
Tchimkent		54·4	300	9 29	− 2	e 17 2	− 7	—	—	28·1
Agra		54·8	279	i 9 32a	− 2	17 10	− 4	11 29	PP	—
Sverdlovsk		54·9	319	i 9 33	− 2	17 13	− 3	26 41	L_q	30·5
Samarkand		57·3	297	9 52	0	17 48	+ 1	—	—	36·2
Hyderabad		59·7	268	10 5	− 4	18 13	− 6	12 17	PP	28·0
Bombay		63·2	274	i 10 28k	− 4	i 18 58	− 5	i 11 11	PcP	—
Victoria		64·5	47	e 10 29	−12	e 19 11	− 8	e 23 5?	SS	e 29·1
Kodaikanal	E.	64·7	263	i 10 42a	0	i 19 17	− 5	—	—	i 34·2
Colombo	E.	65·0	258	10 35	− 9	19 25	− 1	—	—	31·5
Seattle		65·5	48	—	—	e 20 5?	+33	—	—	—
Brisbane		66·4	170	e 10 53	0	i 19 41	− 2	e 23 47	SS	e 30·1
Moscow		66·8	324	10 53	− 3	19 44	− 4	—	—	35·6
Pulkovo		67·5	330	i 10 58	− 2	i 19 52	− 4	—	—	e 33·4
Baku		68·4	306	i 11 5	− 1	i 20 18	+11	25 27	SS	34·3
Ukiah		69·4	55	e 11 23	+11	20 20	+ 2	e 11 52	pP	—
San Francisco		70·7	57	e 12 5?	+45	—	—	—	—	—
Scoresby Sund		70·7	355	e 11 25	+ 5	e 20 18	−16	i 14 9	PP	e 29·5
Berkeley		70·8	57	i 11 26k	+ 6	e 20 35	0	—	—	—
Branner		71·1	57	e 11 35	+13	e 20 40	+ 2	—	—	—
Santa Clara		71·2	57	e 12 34	?	i 20 44	+ 4	—	—	—
Butte		71·9	44	e 11 34	+ 7	e 20 47	− 1	21 30	PS	—
Erevan		72·0	306	12 14	+46	e 21 42	PS	—	—	35·3
Upsala		72·1	335	11 25	− 3	i 20 44	− 6	i 21 1	PS	e 34·1
Riverview		72·5	173	e 11 35	+ 5	i 20 53	− 1	—	—	e 32·6
Sydney		72·5	173	e 10 41	−49	e 20 50	− 4	—	—	—
Bozeman		73·0	45	e 11 36	+ 3	i 20 58	− 2	e 14 30	PP	—
Adelaide		73·3	184	e 11 38	+ 3	i 21 45	PS	i 16 16	PPP	e 34·0
Tinemaha	Z.	73·8	56	i 11 44	+ 6	—	—	—	—	—
Santa Barbara	Z.	74·4	59	i 11 55	+13	—	—	—	—	—
Haiwee		74·6	56	e 11 48	+ 5	—	—	—	—	—
Perth		74·6	204	11 21	−22	21 15	− 3	14 55	PP	46·3
Bergen		75·5	340	i 11 48	0	e 21 26	− 2	—	—	e 35·1
Salt Lake City		75·5	49	e 12 14	PcP	e 25 31	SS	e 29 17	SSS	e 31·3
Mount Wilson		75·6	58	e 11 51	+ 3	—	—	—	—	—
Pasadena		75·6	58	e 11 51	+ 3	i 21 29	0	—	—	—
Melbourne		76·1	178	—	—	i 21 30	− 5	e 26 23	SS	—
Riverside	Z.	76·2	58	e 11 53	+ 1	—	—	—	—	—
La Jolla		77·0	58	e 12 2	+ 6	—	—	—	—	—
Cernauti	E.	77·1	323	e 12 0	+ 3	22 5?	+19	—	—	41·1
Copenhagen		77·1	335	11 56a	− 1	21 42	− 4	—	—	34·1
Bucharest		79·7	320	e 12 13a	+ 2	22 14	+ 1	12 27	pP	41·1
Heligoland		79·9	336	e 12 11	− 1	e 22 8	− 8	e 27 29	SS	e 38·3
Ivigtut		80·1	6	12 12	− 1	22 16	− 2	—	—	—
Istanbul		80·5	316	12 19	+ 4	33 20	SSS	15 15	PP	e 45·1
Prague		80·5	330	12 15a	0	22 21	− 1	e 15 24	PP	e 40·1
Budapest		80·8	326	e 12 5?	−12	e 22 35	+10	—	—	e 44·1
Jena		81·2	332	e 12 17	− 2	e 22 25	− 4	—	—	e 38·1
Ksara		81·3	306	i 12 19a	− 1	e 22 32	+ 2	e 15 26	PP	39·1
Edinburgh		81·6	342	12 11	−10	22 7	−26	23 5	PS	—
Tucson		81·6	55	e 12 21	0	i 22 37	+ 4	e 12 45	pP	—
Arapuni		82·0	155	—	—	22 47	+10	—	—	—
Belgrade		82·2	321	e 12 23k	− 1	i 22 37	− 2	e 15 33	PP	e 38·5
Sofia		82·4	320	e 12 25	0	e 22 40	− 1	—	—	39·1
De Bilt		82·5	336	i 12 26a	0	22 38	− 4	e 15 30	PP	29·1
Stonyhurst		83·3	340	—	—	i 22 50	0	28 13	SS	43·1
Bidston		83·7	341	—	—	i 22 51	− 3	i 23 19	PS	e 43·1
Stuttgart		83·9	332	e 12 32a	− 1	e 22 53	− 3	e 15 40	PP	e 42·4
Uccle		83·9	336	i 12 30a	− 3	i 22 58	+ 2	i 15 42	PP	40·1
Lincoln		84·0	41	e 12 44	+11	e 22 53	− 4	e 23 50	PS	—

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Oxford	84·6	339	12 48	+12	i 23 1	− 2	e 28 45	SS	e 33·1
Triest	84·6	327	12 36	0	i 22 56	− 7	15 49	PP	e 40·6
Wellington	84·6	157	12 23	−13	22 59	− 4	28 43	SS	43·1
Kew	84·8	338	i 12 36a	− 1	i 23 2	− 3	i 12 57	pP	e 43·1
Chur	85·3	330	e 12 39	− 1	e 23 1	[− 2]	—	—	—
Zurich	85·3	332	e 12 39a	− 1	e 23 0	[− 3]	e 16 2	PP	—
Basle	85·5	332	e 12 39	− 2	e 23 4	[0]	—	—	—
Christchurch	86·0	159	12 51	+ 8	23 12	[+ 4]	28 45	SS	40·3
Neuchatel	86·2	331	e 12 43	− 1	e 23 16	− 3	—	—	—
Paris	86·2	336	i 12 44a	0	e 23 8	[− 1]	16 7	PP	e 38·1
Helwan	86·8	306	i 12 45k	− 2	23 10	[− 3]	12 54	P_cP	—
Jersey	87·3	339	e 13 5?	+15	e 23 25	− 4	—	—	e 40·1
Chicago	87·5	36	—	—	23 8	[− 9]	29 27	SS	e 40·8
Moncalieri	87·6	331	e 12 41	−10	23 16	[− 1]	i 13 6	?	35·1
Rome	88·1	326	i 12 52a	− 2	i 23 4	[−17]	i 16 21	PP	43·9
Clermont-Ferrand	88·7	333	e 12 36	−21	i 23 43	− 1	—	—	e 43·3
Florissant	88·7	39	e 13 5	+ 8	i 23 24	[− 1]	—	—	—
St. Louis N.	88·9	39	e 13 6	+ 8	e 23 25	[− 1]	—	—	—
Shawinigan Falls	89·3	23	e 13 5	+ 6	i 23 27	[− 2]	—	—	59·1
Ottawa	89·4	26	i 12 58	− 2	e 23 35	[+ 6]	e 29 47	SS	—
Seven Falls	89·4	23	e 12 17	−43	i 23 16	[−13]	29 20	SS	42·1
Toronto	89·5	29	—	—	e 21 47	?	—	—	42·1
Cape Girardeau E.	89·9	40	e 13 11	+ 9	e 23 29	[− 3]	—	—	—
Vermont	91·0	25	—	—	e 23 59	− 4	e 25 28	PS	e 37·6
Cincinnati	91·2	35	i 13 8	0	i 23 37	[− 3]	—	—	e 48·6
Bagnères	92·0	334	—	—	e 23 5?	[−39]	—	—	—
Pittsburgh	92·0	31	e 14 31	?	i 24 10	− 2	e 17 5	PP	—
East Machias	92·6	21	e 13 24	+ 9	e 23 26	[−22]	e 17 2	PP	e 46·7
Williamstown	92·6	25	e 13 25	+10	—	—	—	—	—
Harvard	93·3	24	i 13 18	0	i 24 18	− 6	i 16 48	PP	e 47·1
Weston	93·5	24	e 13 20	+ 1	e 24 23	− 2	e 34 48	SSS	—
Halifax	93·7	18	e 16 5?	?	e 24 41	+14	—	—	46·1
Fordham	94·0	26	e 13 21	0	e 23 54	[− 2]	—	—	e 44·1
Philadelphia	94·3	28	—	—	e 23 53	[− 4]	i 24 26	S	e 48·0
Georgetown	94·5	30	e 13 23	0	e 23 55	[− 3]	i 17 28	PP	40·1
Toledo	96·3	335	e 13 40	+ 8	e 24 36	−13	e 17 24	PP	45·0
Algiers	96·4	329	e 13 43	+11	24 31	[+22]	e 17 34	PP	48·1
Columbia	97·0	35	e 17 30	PP	e 24 11	[− 1]	e 31 52	SS	—
Almeria	98·5	333	17 39	PP	28 55	PPS	35 26	SSS	49·6
Granada	98·6	334	e 15 49	?	e 30 44	SS	e 19 59	PPP	42·8
San Fernando	100·1	336	e 17 31	PP	e 24 30	[+ 3]	e 27 15	PPS	48·1
Bermuda	104·8	24	e 20 12	PPP	26 59	+59	e 38 26	?	e 52·5
Tananarive	105·8	259	e 18 38	PP	e 24 46	[− 8]	—	—	—
San Juan	117·0	31	—	—	e 27 41	{+47}	—	—	36·0
Cape Town E.	135·7	259	e 22 1	PP	i 26 39	[+ 8]	i 25 4	PPP	67·5
Huancayo	136·8	63	e 17 8	pP	e 26 49	[+15]	e 22 24	PP	—
La Paz	144·9	60	e 19 34	[− 5]	44 38	SS	23 44	SKP	70·1
Rio de Janeiro	163·4	21	e 24 5	PP	(i 45 5)	SS	—	—	i 45·1

Additional readings :—
Zi-ka-wei iZ = +4m.37s.
Hong Kong P_cP? = +9m.16s., SS = +12m.27s., S_cS = +16m.33s.
College iS = +15m.26s., i = +15m.35s., eS_cS = +18m.26s., eSS = +19m.4s., sSS = +19m.13s.
Calcutta eS_cSN = +18m.45s., eSSN = +19m.17s.
Honolulu esP = +10m.4s., ePPP = +12m.32s., iS = +16m.57s., eSS = +20m.37s., esSS = +21m.15s.
Sitka eP_cP = +10m.48s., epPP = +12m.7s.
Agra eN = +9m.35s., S?EN = +17m.30s., SSE = +20m.46s., SSN = +20m.54s.
Hyderabad P_cPE = +11m.2s., PSE = +18m.31s., SSE = +21m.56s.
Bombay iN = +19m.6s., iS_cSE = +20m.17s., iSSEN = +22m.58s.
Victoria SSS = +26m.5s.?
Baku SSS = +27m.59s.
Ukiah epPP = +14m.24s., ePS = +21m.14s., eSS = +25m.3s., esSS = +25m.28s., eSSS = +27m.49s.
Scoresby Sund iS = +20m.31s., pS = +20m.48s., esS = +21m.5s., isPS = +21m.38s., i = +23m.13s., sSS = +25m.45s., eSSS = +28m.33s., iSSS = +28m.46s., i = +28m.57s. and +29m.11s.

Continued on next page.

Berkeley ePE = +11m.32s., iZ = +13m.2s., eN = +29m.59s., eE = +30m.8s.
Branner eE = +12m.33s., eN = +17m.39s.
Butte eSSS = +28m.4s.
Upsala iE = +21m.26s., iN = +21m.31s. and +21m.54s., eSSN = +25m.35s., iSSE = +25m.46s., eSSSN = +29m.39s.
Bozeman eSS = +25m.1s., eSSS = +28m.55s.
Adelaide e = +20m.58s., i = +29m.25s.
Perth P = +6m.0s., i = +8m.27s., PPS = +22m.38s., SS = +27m.28s., SSS = +33m.10s.
Salt Lake City esP = +12m.34s., esPP = +15m.27s., i = +20m.28s. and +20m.38s.
Mount Wilson iZ = +12m.0s.
Pasadena iNZ = +12m.1s.
Riverside i = +12m.2s.
Bucharest PPN = +15m.13s., pSE = +22m.31s., SSN = +27m.22s., SSE = +27m.25s., SSSE = +30m.38s.
Heligoland eSSSE = +30m.53s.
Jena eSN = +22m.33s.
Ksara PS = +23m.8s.
Edinburgh S_cS = +22m.24s., PPS = +23m.27s., SS = +27m.22s.
Tucson eP_cP = +12m.31s., i = +15m.22s., ePP = +15m.32s., ePPP = +17m.29s., i = +22m.30s., epS = +23m.8s., iPS = +23m.33s., eSS = +27m.40s.
Belgrade eZ = +17m.22s.
De Bilt iZ = +14m.16s.
Stonyhurst iS = +23m.2s., L_q = +39·1m.
Bidston eS = +13m.7s., iSS = +23m.35s.
Stuttgart eSSE = +28m.31s.
Uccle ePPPN = +17m.48s., ePPPPN = +19m.15s., eN = +22m.4s., iPSN = +23m.50s., eSSN = +28m.34s.
Lincoln eSS = +27m.55s., eSSS = +33m.25s.
Triest PPP = +17m.32s., i = +23m.18s., SS = +28m.33s., SSS = +31m.57s.
Wellington iZ = +12m.52s., S? = +23m.41s., i? = +24m.8s., L_q = +39·1m.
Kew iP_cPZ = +12m.47s., isPZ = +13m.4s., iPPZ = +15m.58s., iPPPZ = +17m.50s., ipPPPZ = +18m.2s., eS = +23m.10s., epSKSEZ = +23m.22s., ipSEN = +23m.30s., isSEN = +23m.42s., eSSE = +28m.44s., eSSSE = +32m.6s., eL_qE = +38m.35s.
Zurich e = +23m.26s.
Christchurch L_qE = +34m.39s.
Paris PPP = +18m.8s., PS = +23m.44s., SS = +28m.56s.
Helwan eZ = +13m.20s. and +14m.8s., PP = +16m.10s., PPPZ = +18m.0s., SE = +23m.25s., PSN = +24m.10s., SSE = +29m.15s.
Chicago iS = +23m.27s.
Rome iZ = +12m.58s. and +13m.6s., iZ = +18m.4s., iPPPZ = +18m.9s., iZ = +19m.29s., i = +19m.53s., iSKSE = +23m.13s., iSKKSE = +23m.20s.?, iSEN = +23m.39s., iPSEN = +24m.48s., iSSE = +29m.37s., iSSN = +29m.47s., i = +30m.44s., iSSS = +32m.34s., iSSSN = +33m.8s.
Florissant iSE = +23m.43s.
St. Louis iPN = +13m.19s., eSN = +23m.42s.
Seven Falls SSS = +32m.41s., i = +35m.58s.
Toronto e = +27m.47s.
Cape Girardeau eN = +13m.14s., +13m.45s., and +15m.15s., eSE = +23m.52s.
Vermont iS = +24m.18s., eSS = +29m.47s., eSSS = +33m.49s.
Cincinnati i = +13m.18s.
Pittsburg isS = +24m.30s., eSS = +30m.6s.
East Machias S = +24m.13s., eSS = +30m.25s.
Weston iPPS = +25m.46s.
Fordham iSE = +24m.29s., iN = +38m.12s.
Georgetown iS = +24m.33s.
Toledo eSS = +31m.13s.
Algiers eN = +18m.46s., eE = +19m.17s., PS = +25m.22s., e = +26m.27s., SS = +30m.25s.
Columbia esS = +26m.2s., eSSS = +38m.15s.
Almeria PP = +21m.58s., PPP = +23m.50s., PPS = +30m.30s.
San Fernando eSSN = +32m.59s.
San Juan esS = +28m.17s.
Cape Town iSKPN = +22m.58s., ePSKS?E = +31m.47s., eSSN = +40m.1s., eSSE = +40m.13s.
Huancayo PKS = +23m.14s., i = +27m.2s., eSKKS = +28m.49s., eSKSP = +32m.4s., esSP = +33m.44s.
La Paz iPKPZ = +19m.46s.
Long waves were also recorded at Marseilles, La Plata, and Piatigorsk.

Oct. 10d. 18h. 50m. 49s. Epicenter 38°·6N. 143°·1E. (as at 18h. 31m.).

Intensity III at Miyako; II at Yamagata, Mizusawa, Hukusima, Morioka, Aidu, and Sendai; I at Hatinohe, Mito, Onahama, and Sakata.

Epicentre 38°·3N. 143°·0E. Shallow.

See Seismological Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo, 1940, p. 27.

$A = -\cdot6266$, $B = +\cdot4704$, $C = +\cdot6213$; $\delta = -8$; $h = -1$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Miyako		1·4	320	0 27k	0	0 49	+ 3	—	—	—
Mizusawa		1·6	289	i 0 27	− 3	0 49	− 2	—	—	—
Hukusima		2·3	248	0 29	−11	0 53	−16	—	—	—
Hatinohe		2·3	328	0 37a	− 3	1 15	+ 6	—	—	—
Akita		2·5	296	0 43	0	1 14	0	—	—	—
Aomori		2·8	321	0 45a	− 2	1 25	+ 3	—	—	—
Mito		3·0	223	0 47a	− 3	1 11	−16	—	—	—
Kakioka		3·3	224	0 50a	− 3	1 31	− 4	—	—	—
Utunomiya		3·3	231	0 51k	− 2	1 43	+ 8	—	—	—
Kumagaya		3·8	232	1 2	+ 1	1 51	+ 4	—	—	—
Tokyo Cen. Met. Ob.		3·9	225	1 4	+ 2	—	—	—	—	—
Mori		4·1	332	1 6	+ 1	2 11	+16	—	—	—
Yokohama		4·2	223	1 3	− 4	2 0	+ 3	—	—	—
Nagano		4·3	246	1 7a	− 1	1 58	− 2	—	—	—
Mera		4·4	217	1 14	+ 4	2 3	+ 1	—	—	—
Hunatu		4·7	230	1 12	− 2	2 7	− 3	—	—	—
Sapporo		4·7	343	1 17	+ 3	2 17	+ 7	—	—	—
Nemuro		5·1	21	1 19k	− 1	2 14	− 6	—	—	—
Wazima		5·1	258	1 15	− 5	2 13	− 7	—	—	—
Hamamatu		5·8	230	1 28a	− 1	2 36	− 2	—	—	—
Nagoya		6·0	237	1 33k	+ 1	2 53	+10	—	—	—
Osaka		7·3	240	1 49	− 1	3 31	+16	—	—	—
Toyooka		7·3	248	1 49	− 1	3 31	+16	—	—	—
Siomisaki		7·9	232	1 58	− 1	4 4	S*	—	—	—
Koti		9·2	240	2 14	− 2	3 51	−12	—	—	—
Hirosima		9·6	248	2 24	+ 3	4 16	+ 4	—	—	—
Matuyama		9·6	244	2 22	+ 1	4 55	S*	—	—	—
Hukuoka		11·4	248	e 2 58	+11	5 54	+58	—	—	—
Husan		11·8	257	2 51	− 2	5 26	SSS	—	—	—
Honolulu		53·1	90	—	—	e 16 45	− 6	19 40	S_eS	23·4
Ferndale		68·0	54	—	—	e 16 11	?	—	—	—
Berkeley		70·8	57	i 11 21	+ 1	—	—	—	—	—
Santa Clara	Z.	71·2	57	e 11 33	+10	—	—	—	—	—
Butte		71·9	44	e 11 22	− 5	e 20 28	−20	e 14 24	PP	—
Bozeman		73·0	45	e 11 43	+10	—	—	—	—	—
Tinemaha		73·8	56	e 11 50	+12	—	—	—	—	—
Santa Barbara	Z.	74·4	59	i 11 54	+12	—	—	—	—	—
Haiwee		74·6	56	e 11 43	0	—	—	—	—	—
Salt Lake City		75·5	49	—	—	i 20 29	−59	i 29 49	SSS	—
Mount Wilson		75·6	58	i 11 49	+ 1	—	—	—	—	—
Pasadena	Z.	75·6	58	e 11 48	0	—	—	—	—	—
Riverside	Z.	76·2	58	e 11 51	− 1	—	—	—	—	—
La Jolla		77·0	58	e 11 57	+ 1	—	—	—	—	—
Ksara		81·3	306	i 12 18k	− 2	e 22 34	+ 4	—	—	—
Tucson		81·6	55	i 12 23	+ 2	22 23	−10	e 15 17	PP	e 33·1
Stuttgart	N.E.	83·9	332	e 12 33	0	—	—	—	—	—
Basle		85·5	332	e 12 39	− 2	—	—	—	—	—
Florissant		88·7	39	e 13 6	+ 9	i 23 42	− 1	—	—	—
St. Louis	N.	88·9	39	e 13 7	+ 9	e 23 43	− 1	—	—	—
Cincinnati		91·2	35	i 13 9	+ 1	i 23 37	[− 3]	—	—	—
East Machias		92·6	21	e 13 31	+16	e 24 1	−17	e 16 38	PP	—
Columbia		97·0	35	—	—	e 23 55	[−17]	25 24	PS	—
San Juan		117·0	31	e 18 26	[−21]	e 25 23	[−16]	e 22 23	PPP	e 46·9
Huancayo		136·8	63	e 19 12	[−12]	26 32	[− 2]	39 37	SS	—
La Paz	Z.	144·9	60	19 45a	[+ 6]	—	—	—	—	—

For Notes see next page.

NOTES TO OCT. 10d. 18h. 50m. 49s.

Additional readings :—
Honolulu S = +16m.58s.
Berkeley iZ = +11m.31s.
Butte eSS = +25m.25s., eSSS = +28m.30s.
Haiwee iZ = +11m.54s.
Salt Lake City i = +30m.51s.
Mount Wilson iNZ = +12m.0s.
Pasadena iNZ = +11m.59s.
Riverside iZ = +12m.2s.
La Jolla iZ = +12m.7s.
Tucson iP = +12m.33s., ePPP = +17m.10s., ePS = +23m.22s.
St. Louis iPN = +13m.10s., eN = +23m.24s.
East Machias eS = +24m.19s., eSS = +29m.43s.
Columbia eSS = +30m.50s.
San Juan eS = +27m.43s., ePS = +30m.24s., eSS = +36m.1s.
Huancayo SSS = +44m.50s., iSSS = +45m.52s., i = +46m.30s.

Oct. 10d. 20h. 42m. 39s. Epicentre 37°·2N. 69°·3E. (as on 1937 June 29d.).

A = +·2822, B = +·7469, C = +·6020 ; δ = −10 ; h = −1 ;
D = +·935, E = −·353 ; G = +·213, H = +·563, K = −·798.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Samarkand		3·1	324	0 50	− 1	1 46	S_g	i 1 4	P_g	—
Andijan		4·3	33	i 1 11	+ 3	i 2 11	S*	i 1 35	P_g	—
Tchimkent		5·1	2	1 22	+ 2	i 2 29	S*	i 1 51	P_g	—
Frunse		7·0	34	1 48	+ 2	i 3 21	+13	—	—	—
Almata		8·4	42	e 2 7	+ 1	e 3 51	+ 8	—	—	—
Dehra Dun	N.	10·0	131	—	—	e 3 38?	?	—	—	e 4·8
Agra	N.	12·4	141	e 3 11	+10	e 4 56	−25	—	—	—
Semipalatinsk		15·4	27	e 3 37	− 3	—	—	—	—	—
Bombay		18·5	169	e 3 55	−24	e 7 34	−10	—	—	—
Erevan		19·6	286	e 4 43	+11	e 8 49	SS	—	—	—
Sverdlovsk		20·5	346	4 37	− 5	8 28	+ 1	11 33	L_q	12·8
Hyderabad		21·3	155	e 4 39	−11	8 25	−18	—	—	10·4
Calcutta	N.	22·0	126	e 4 55	− 3	e 8 38	−18	e 9 2	SS	10·5
Kodaikanal	E.	27·8	162	—	—	i 10 9	−24	—	—	—
Moscow		28·3	321	5 46	−11	e 11 16	+33	—	—	—
Colombo	E.	31·7	160	—	—	e 12 19	+42	—	—	i 17·1
Pulkovo		33·6	325	e 6 33	−11	e 11 57	− 9	e 8 30	PP	15·8

Additional readings :—
Samarkand i = +55s., i = +1m.13s. and +1m.30s., S_g = +1m.49s.
Andijan i = +1m.16s., e = +1m.19s., i = +1m.51s., +2m.22s., and +2m.39s., iS_g = +2m.45s., i = +3m.11s.
Tchimkent i = +2m.2s., iS_g = +3m.15s.
Frunse i = +1m.57s., +2m.8s., +2m.51s., +3m.3s., +3m.9s., and +3m.15s.
Almata e = +2m.51s. and +4m.49s.
Bombay eE = +4m.28s. and +8m.51s.
Calcutta eP_cPN = +9m.9s., eS_cSN = +16m.31s.
Pulkovo e = +6m.36s. and +11m.28s.
Long waves were also recorded at Irkutsk.

Oct. 10d. Readings also at 2h. (Stuttgart, near Basle, Chur, Zurich, and Neuchatel), 6h. (near Ferndale, Berkeley, Tinemaha, Andijan, Riverside, Pasadena, Mount Wilson, Haiwee, and Samarkand), 9h. (Irkutsk, near Triest, near Manila, Andijan, Baku, Ksara, and Helwan), 10h. (Andijan, Tucson, and Sverdlovsk), 11h. (Ksara and Helwan), 14h. (Tchimkent, Frunse, Andijan, Tucson, Samarkand, and near Mizusawa), 15h. (Sverdlovsk, Ksara, Helwan, and Baku), 17h. (near Harvard), 18h. (Adelaide), 19h. (Santa Barbara, Christchurch, Brisbane, Riverview, Sydney, Monowai, New Plymouth, Tuai, Arapuni, Wellington, Samarkand, Haiwee, Mount Wilson, Riverside, and Pasadena), 21h. (Wellington, Williamstown, near Fordham (2), near Balboa Heights, near Harvard (2), and near Mizusawa), 23h. (Mizusawa).

Oct. 11d. Readings at 1h. (Andijan), 2h. (De Bilt, Paris, Uccle, Rome, Ksara, and Sverdlovsk), 4h. (near Hukuoka), 5h. (Mount Wilson, Pasadena, Riverside, Tucson (2), and Sitka), 9h. (Riverview), 10h. (near Mizusawa), 16h. (Christchurch, Tuai, New Plymouth, and near Wellington), 17h. (near Ebingen, Basle, Zurich, and Stuttgart), 18h. (Moncalieri, near Samarkand, near Harvard, and near Williamstown), 20h. (near Branner), 22h. (Kodaikanal), 23h. (near Manila).

Oct. 12d. Readings at 0h. (Stuttgart, near Ebingen, and near Mizusawa), 2h. (Stuttgart and near Ebingen), 3h. (La Jolla, Mount Wilson, Pasadena, Riverside, and Tucson), 5h. (Pulkovo and near Mizusawa), 6h. (Tucson), 8h. (Huancayo, La Paz, La Plata, Rio de Janeiro, Mount Wilson, Pasadena, Riverside, Tucson, Christchurch, New Plymouth, near Hastings, Tuai, and Wellington), 9h. (Ksara, Rome, Huancayo, La Paz, and Tucson), 12h. (Baku, Sverdlovsk, Helwan, and Ksara), 13h. (La Paz and Tucson), 14h. (near Sofia), 17h. (near Mizusawa), 21h. (Kodaikanal), 22h. (Haiwee, La Jolla, Mount Wilson, Pasadena, Riverside, Santa Barbara, Tinemaha, and Tucson), 23h. (Ksara, Sverdlovsk, Bombay, Almata, near Andijan, Frunse, Samarkand, and Tchimkent).

Oct. 13d. Readings at 2h. (Haiwee, Mount Wilson, Pasadena, Riverside, Tucson, La Paz, and La Plata), 4h. (Tucson, San Francisco, near Berkeley, Branner, Hukuoka, and near Osaka), 7h. (Paris), 10h. (Ukiah (4), Tucson (5), and near Mizusawa), 11h. (Rome (2)), 15h. (Haiwee, Mount Wilson, Pasadena, Riverside, Tinemaha, Tucson, and near Balboa Heights), 17h. (San Francisco, near Berkeley, and Branner), 20h. (Erevan, Baku, Sverdlovsk, Helwan, and Ksara).

Oct. 14d. 6h. 2m. 22s. Epicentre 10°·7N. 63°·8W.

$A = +\cdot4339$, $B = -\cdot8818$, $C = +\cdot1845$; $\delta = -12$; $h = +6$;
$D = -\cdot897$, $E = -\cdot442$; $G = +\cdot081$, $H = -\cdot166$, $K = -\cdot983$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
San Juan		7·9	344	e 1 52	− 7	—	—	—	—	4·2
Huancayo		25·3	207	e 5 29	− 1	e 9 50	− 4	e 6 25	PPP	e 11·9
La Paz		27·4	188	5 48	− 1	10 22	− 6	—	—	12·4
Tucson		48·3	305	e 8 44	− 1	e 15 47	+ 2	e 10 44	PP	e 20·1
La Jolla	z.	53·7	304	e 9 29	+ 3	—	—	—	—	—
Riverside	z.	54·0	305	e 9 29	+ 1	—	—	—	—	—
Mount Wilson		54·6	305	e 9 33	+ 1	—	—	—	—	—
Pasadena		54·7	305	i 9 32	− 1	—	—	—	—	—
Haiwee		55·0	307	i 9 37	+ 2	—	—	—	—	—
Tinemaha		55·4	308	e 9 40	+ 2	—	—	—	—	—

Additional readings :—
Huancayo $eP_cP = +8$m.30s.
Tucson ePPP = +11m.44s.
Long waves were also recorded at La Plata and Bermuda.

Oct. 14d. Readings also at 0h. (Bombay and Calcutta), 3h. (near Tananarive and near Mizusawa), 9h. (La Paz), 10h. (near Mizusawa, Samarkand, Andijan, Almata, Frunse, Tchimkent, and Semipalatinsk), 12h. (La Paz, Samarkand, and near Mizusawa), 13h. (La Paz and near Balboa Heights), 20h. (Piatigorsk and Grozny), 21h. (Istanbul and La Paz), 22h. (Riverview), 23h. (Tucson).

Oct. 15d. 4h. Readings for a shock, probably in Mediterranean, for which no determination is made.
Istanbul P = 44m.2s., S_g = 45m.5s.
Prague eP? = 44m.12s., eS? = 47m.0s.
Sofia eEN = 44m.45s., eSEN = 46m.7s.
Bucharest ePN = 44m.57s., eEN = 45m.18s. and 45m.32s., iEN = 46m.36s., iLE = 46m.46s.
Ksara e = 45m.25s. and 48m.10s.
Helwan ePZ = 46m.13s., eZ = 47m.41s., eE = 48m.40s.
Belgrade eZ = 47m.5s. and 47m.33s., iNW = 47m.44s. and 47m.58s.
Pulkovo eP = 47m.51s., eS = 52m.1s., L = 54m.30s.
Szeged ePN = 48m.21s., e = 48m.44s., eN = 49m.2s., eL = 49m.16s.
Baku e = 49m.3s., 50m.59s., and 51m.19s., eL = 53m.12s.
Triest e = 49m.28s. and 50m.11s., sSS = 50m.59s., i = 51m.32s.
Rome eL_gN = 49m.43s., eZ = 50m.17s.
Sverdlovsk e = 50m.41s., 54m.6s., and 54m.24s.
Moscow e = 51m.35s.
Granada e = 53m.26s.k, L = 60m.54s.
Long waves were also recorded at Scoresby Sund and other European stations.

Oct. 15d. 14h. 5m. 24s. Epicentre 44°·2N. 10°·2E.

Intensity VII at Fivizzano; VI-VII at Castelnuovo, Garfagnana, Piazza al Serchio, Carrara, and Camaiore; radius of macroseismic area 100km. approx.

Ezio Rosini.

Il terremoto della Garfagnana del 15 Octobre, 1939, XVII.

Estratto de "La Ricercha Scientifica," Anno. XI-N, 7-8 (Luglio-Agosto, 1940, XVIII), p. 496. Also "Publication dell Instituto Nazionale di Geofisica de Roma," No. 44.

Epicentre 44°14′·0N. 10°12·2′E.; *depth* =26kms. Isoseismic chart p. 497.

A = +·7079, B = +·1274, C = +·6947; $\delta = -4$; $h = -3$;
D = +·177, E = −·984; G = +·684, H = +·123, K = −·719.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Moncalieri		1·9	294	e 0 35	+ 1	1 0	+ 1	i 0 39	P_g	—
Chur		2·7	350	e 0 46k	+ 1	e 1 30	S_g	—	—	—
Rome		2·8	144	0 49	+ 2	i 1 22	0	i 1 35	S_g	i 1·7
Triest		2·9	60	0 47	− 1	1 21	− 3	0 57	P_g	i 1·9
Zurich		3·4	340	e 0 54	− 1	e 1 54	S_g	e 1 6	P_g	—
Neuchatel		3·6	321	e 0 58	0	e 1 31	−11	—	—	—
Marseilles		3·6	256	e 1 6	P*	—	—	e 1 24	P_g	e 1·9
Basle		3·8	332	e 1 0	− 1	e 1 46	− 1	—	—	—
Besançon		4·2	317	i 1 7	0	i 1 56	− 1	—	—	4·6
Stuttgart		4·6	352	e 1 10	− 2	i 2 2	− 5	i 1 31	P_g	—
Clermont-Ferrand		5·2	290	e 1 22	+ 1	e 2 21	− 1	—	—	—
Sarajevo		5·9	90	1 32	+ 1	i 2 42	+ 2	i 1 46	P*	—
Prague		6·6	25	e 1 41	0	e 3 6	+ 8	—	—	e 3·6
Paris		7·1	313	e 1 47	− 1	2 58	−12	e 1 56	P*	4·7
Kecskemet		7·2	65	e 2 3	P*	3 55	S_g	e 2 24	P_g	e 5·6
Szeged		7·2	70	e 2 28	P_g	e 3 36	S*	e 3 56	S_g	e 5·9
Belgrade		7·4	81	1 50a	− 2	i 3 28	+10	e 3 39	S*	e 5·7
Uccle		7·7	331	e 2 7	P*	i 4 2	S*	i 4 17	S_g	—
De Bilt		8·6	338	—	—	e 4 11	S*	—	—	e 5·1
Algiers		9·2	141	e 2 22	+ 6	e 4 12	+ 9	—	—	9·6
Hamburg		9·4	358	e 3 34	?	e 4 33	S*	e 5 7	S_g	—
Sofia		9·7	95	e 2 26	+ 4	e 5 19	S_g	—	—	—
Heligoland	N.	10·1	352	—	—	e 5 6	S*	—	—	—
Kew		10·1	339	e 2 27	− 1	i 4 23	− 2	i 5 40	S_g	e 7·2
Bucharest		11·4	82	e 2 49	+ 2	—	—	—	—	7·0
Toledo		11·4	253	e 2 44	→ 3	e 4 56	0	—	—	—
Almeria		12·1	237	2 57	0	5 26	SS	3 4	PP	—
Granada		12·6	241	e 2 43k	−20	—	—	—	—	e 9·7
Istanbul		14·2	96	6 17	S	(6 17)	SS	—	—	7·6
Upsala		16·3	14	e 3 56	+ 4	e 7 15	SS	—	—	e 8·2
Pulkovo		19·8	31	e 4 33	− 2	e 8 24	+11	—	—	9·9
Moscow		20·9	36	e 4 46	0	8 45	+10	—	—	—
Ksara		22·4	109	e 5 10	+ 8	e 9 20	+16	—	—	—
Sverdlovsk		33·7	50	6 43	− 2	e 12 26	+18	—	—	17·1
Tchimkent		42·5	71	e 9 1	+62	—	—	—	—	—

Additional readings:—
Rome iZ = +55s., +1m.0s., and +1m.9s., iE = +1m.29s.
Triest S_g = +1m.29s., SS = +1m.41s.
Stuttgart iEN = +1m.18s., i = +1m.37s., iNW = +1m.54s., iZ,NE = +1m.57s., iS_gZ = +2m.29s., iS_gNE = +2m.34s.
Sarajevo i = +2m.10s.
Paris i = +3m.39s.
Kecskemet ePPSE = +3m.58s., iSZ = +4m.25s., iS = +4m.29s., iE = +5m.5s., eN = +5m.25s., eSSSZ = +5m.31s.
Szeged ePPP = +3m.14s., eN = +3m.39s., eE = +4m.6s., eSN = +4m.24s., eSSSE = +5m.20s.
Belgrade eZ = +2m.36s., iNE = +4m.20s. and +4m.54s.
Algiers e = +2m.45s. and +3m.0s., e? = +5m.36s.
Hamburg eN = +5m.13s.
Kew iS* = +5m.11s.
Almeria P_cP = +9m.6s.
Long waves were also recorded at Stonyhurst, Copenhagen, Scoresby Sund, Bergen, and San Fernando.

Oct. 15d. Readings also at 6h. (near Tananarive), 8h. (Bozeman), 10h. (Sverdlovsk), 11h. (near Balboa Heights), 15h. (Tchimkent, Zurich, and near Samarkand), 18h. (Tucson (2)), 19h. (Basle, near Manila, Jena, Stuttgart, and Zurich) 20h. (Mount Wilson, Riverside, and Pasadena), 23h. (Samarkand).

Oct. 16d. 17h. Local shock.

Chur ePg = 13m.2s., eSg = 13m.20s.
Ravensburg ePE = 13m.6s., iE = 13m.9s., eEN = 13m.24s., iSE = 13m.26s., iN = 13m.30s.
Zurich ePg = 13m.14s., eSg = 13m.40s.
Stuttgart ePZ = 13m.20s., iP* = 13m.23s., iNW = 13m.32s., iSNW = 13m.39s., iSNE = +13m.42s., iS* = 13m.46s., 1 = 13m.49s., iNW = 13m.54s.
Triest Pg = 13m.24s., PP = 13m.30s., Sg = 13m.50s.
Basle ePg = 13m.27s., eSg = 14m.1s.
Neuchatel ePg = 13m.28s., iPg = 13m.35s.
Jena eP = 14m.0s., eN = 14m.23s., eE = 14m.30s.
Clermont-Ferrand eP = 14m.8s.

Oct. 16d. Readings also at 3h. (La Plata), 6h. (Erevan), 8h. (Almata, Frunse, Tchimkent, and near Samarkand), 12h. (Ksara), 13h. (Baku and Sverdlovsk), 14h. (Ksara), 16h. (Christchurch and near Wellington), 17h. (Adelaide, Brisbane, Melbourne, Riverview, Perth, and Ksara), 18h. (Baku and Sverdlovsk), 23h. (Oaxaca, Tacubaya, Vera Cruz, and Tucson).

Oct. 17d. 6h. 22m. 9s. Epicentre 14°·7S. 167°·3E.

A = −·9440, B = +·2127, C = −·2522; $\delta = -2$; $h = +6$;
D = +·220, E = +·976; G = +·246, H = −·055, K = −·968.

Tables for depth of focus 0·010 have been used.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Brisbane		18·4	224	i 4 9	− 1	i 7 33	+ 5	—	—	—
Apia		20·3	90	i 4 34k	+ 4	i 8 14	+ 7	i 4 41	pP	—
Riverview		24·0	215	i 5 6a	0	i 9 15	+ 1	5 44	pP	e 11·0
Sydney		24·0	215	i 5 3	− 3	i 9 7	− 7	—	—	e 11·1
Arapuni		24·4	164	5 11	+ 1	9 28	+ 8	10 13	sS	—
New Plymouth		25·0	167	5 19	+ 3	9 35	+ 5	—	—	—
Tuai		25·5	161	5 20	− 1	9 38	− 1	16 6	S_cS	—
Wellington		27·3	168	i 5 36	− 1	i 10 4	− 4	5 59	pP	—
Christchurch		29·1	173	i 5 51a	− 3	i 10 35	− 2	i 6 53	PP	—
Melbourne		30·4	216	i 6 5	0	i 10 58	+ 1	—	—	12·9
Adelaide		32·8	226	i 6 25	− 1	i 11 31	− 4	i 6 32	pP	13·8
Palau		39·2	301	7 23	+ 3	13 18	+ 5	—	—	—
Honolulu		49·5	44	i 8 44	+ 2	15 39	− 2	i 8 54	pP	i 20·2
Perth		49·8	240	8 54	+ 9	15 43	− 3	i 9 26	pP	22·6
Manila		54·3	300	e 9 21	+ 3	i 16 53	+ 6	10 5	pP	—
Numadu		56·4	332	9 37	+ 3	—	—	—	—	—
Mito		56·8	334	9 32	− 4	—	—	—	—	—
Nagoya		57·3	332	9 41	+ 1	17 29	+ 2	—	—	—
Oiwake		57·6	333	9 42	0	—	—	—	—	—
Sendai		58·2	336	9 45	− 1	17 42	+ 4	—	—	—
Mizusawa		58·9	337	i 9 54	+ 3	17 48	0	—	—	—
Hukuoka		59·5	325	9 51?	− 4	—	—	—	—	—
Akita		59·8	336	9 49	− 8	—	—	—	—	—
Sapporo		62·2	340	10 13	− 1	19 58	?	—	—	—
Zi-ka-wei	z.	63·4	317	10 19	− 3	i 19 3	+18	10 55	pP	—
Hong Kong		63·7	305	10 26	+ 3	18 53	+ 5	23 12	SS	—
Vladivostok		66·1	333	e 10 37	− 2	i 19 18	0	13 26	PP	25·0
Phu-Lien		69·2	299	e 11 1	+ 3	i 19 59	+ 4	—	—	—
Ferndale		83·9	46	e 12 51	PP	e 22 51	+17	—	—	—
Branner		84·0	49	e 12 23	+ 2	e 22 32	− 3	e 15 40	PP	—
San Francisco		84·0	49	e 12 51?	pP	e 22 51?	+16	e 15 51?	PP	—
Ukiah		84·0	47	e 12 20	− 1	e 22 33	− 2	e 12 58	sP	e 34·4
Berkeley		84·1	49	e 12 21	0	e 22 31	− 5	i 12 55	pP	e 38·1
Santa Clara		84·2	49	i 12 32	+10	i 22 41	+ 4	—	—	e 35·2
Lick		84·4	49	e 12 24	+ 1	e 22 32	− 7	e 15 42	PP	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Santa Barbara		84·7	53	i 12 25	+ 1	—	—	i 15 44	PP	—
Fresno	N.	85·5	50	e 12 29k	+ 1	—	—	—	—	i 38·8
Calcutta	N.	85·7	294	i 12 45a	+16	i 22 48	− 4	e 13 9	pP	—
Pasadena		85·8	53	i 12 30k	0	e 22 48	− 5	i 13 0	pP	i 35·4
Sitka		85·8	27	e 12 49	pP	e 22 37	[− 7]	23 36	sS	35·0
Mount Wilson		85·9	53	i 12 26k	− 4	e 22 47	− 7	38 39	P'P'	—
La Jolla		86·1	55	i 12 33	+ 2	e 22 49	[+ 4]	i 13 2	pP	—
College		86·3	17	e 12 30	− 2	22 47	[+ 1]	e 15 52	PP	e 35·1
Riverside		86·4	53	i 12 33k	0	e 22 48	[+ 1]	i 13 3	pP	—
Haiwee		86·7	51	i 12 35	+ 1	e 22 51	[+ 2]	e 15 59	PP	—
Tinemaha		86·8	51	i 12 36	+ 1	e 22 49	[0]	e 16 0	PP	—
Victoria		87·8	38	e 12 39	0	e 23 3	[+ 7]	e 31 15	SSS	39·9
Seattle		88·1	39	—	—	i 21 42	?	—	—	e 34·8
Colombo	E.	89·3	277	12 52	+ 6	23 6	[0]	—	—	42·2
Tucson		91·0	57	i 12 56k	+ 2	e 23 13	[− 3]	13 23	pP	37·3
Kodaikanal	E.	92·4	280	i 13 5a	+ 4	i 23 26	[+ 3]	i 28 29	SS	40·1
Salt Lake City		92·7	47	e 12 41	−21	e 22 58	[−27]	24 14	pS	i 37·7
Hyderabad		93·2	287	e 13 8	+ 3	23 29	[+ 2]	16 42	PP	39·9
Butte		93·7	42	e 13 15	+ 8	23 33	[+ 4]	e 16 48	PP	e 36·7
Bozeman		95·7	43	e 13 10	− 6	i 23 40	[− 2]	e 17 1	PP	37·8
Agra	E.	95·9	296	13 16a	− 1	23 37	[− 6]	17 37	PPP	—
Dehra Dun	N.	96·7	300	e 13 37?	+17	e 23 46	[− 1]	—	—	e 34·4
Tacubaya	N.	98·0	71	e 13 29?	+ 3	i 23 52	[− 2]	—	—	—
Bombay		98·8	287	e 13 30	0	i 24 0	[+ 1]	i 24 46	PS	38·4
Semipalatinsk		99·3	320	13 35	+ 3	e 23 59	[− 1]	—	—	—
Almata		100·2	313	e 13 43	+ 7	—	—	—	—	—
Frunse		101·2	311	e 14 49	pP	—	—	—	—	—
Andijan		103·1	309	14 7	+18	i 24 21	[+ 3]	i 18 37	?	—
Lincoln		103·9	50	e 15 26	sP	25 6	−24	i 27 23	pS	e 42·7
Tchimkent		105·4	310	14 11	P	—	—	—	—	—
Samarkand		107·1	307	—	—	e 24 6	[−30]	—	—	—
Florissant		108·6	53	e 14 15	P	i 24 43	[0]	i 18 44	PP	—
St. Louis		108·7	53	e 18 47	PP	i 24 43	[− 1]	i 27 20	sS	—
Chicago		110·8	49	e 14 12	P	i 24 52	[0]	e 18 49	PP	e 45·0
Sverdlovsk		111·3	325	i 14 26	P	i 24 54	[0]	i 18 59	PP	42·9
Tananarive		111·9	243	e 19 5	PP	e 25 3	[+ 7]	e 28 27	PS	52·4
Huancayo		112·5	109	e 18 24	[− 1]	25 2	[+ 3]	e 19 14	PP	45·3
Balboa Heights		114·5	86	e 18 51?	[+22]	—	—	—	—	—
La Plata		114·6	139	19 21	PP	34 57	SS	—	—	47·8
Columbia		115·9	58	e 19 48	PP	e 25 9	[− 3]	e 29 15	PS	e 47·5
Pittsburgh		116·6	51	i 19 43	PP	i 25 19	[+ 4]	i 29 20	PS	—
Toronto		116·8	47	—	—	e 25 3	[−12]	e 29 15	PS	47·9
La Paz		117·1	117	e 17 6	?	25 27	[+11]	i 19 41	PP	53·6
Georgetown		118·3	52	e 18 42	[+ 6]	i 25 25	[+ 4]	i 19 39	pPKP	—
Ottawa		119·2	45	i 18 38	[0]	25 23	[− 1]	20 3	PP	50·8
Baku		120·2	308	18 45	[+ 5]	25 33	[+ 6]	30 11	pPS	55·9
Philadelphia		120·3	52	e 20 1	PP	e 25 36	[+ 8]	e 29 39	PS	e 51·4
Shawinigan Falls		121·0	43	i 18 46	[+ 4]	e 25 31	[+ 1]	—	—	32·8
Fordham		121·2	50	i 18 46k	[+ 4]	i 25 32	[+ 1]	i 20 8	PP	e 51·5
Seven Falls		122·2	42	19 15	pPKP	24 53	[−41]	29 22	PS	e 49·9
Harvard		122·7	48	i 18 46	[+ 1]	i 25 36	[0]	e 20 23	PP	e 52·9
Grozny		122·8	312	e 18 59	[+14]	e 27 13	SKKS	—	—	—
Weston		122·9	48	i 18 46	[+ 1]	i 30 20	SS	e 20 21	PP	—
Cape Town		123·2	211	e 19 15	pPKP	i 25 37	[0]	20 17	PP	—
Johannesburg		123·2	224	e 18 39	[− 7]	i 25 45	[+ 8]	i 20 33	PP	—
Scoresby Sund		123·8	4	i 20 29	PP	25 40	[+ 1]	e 32 11	PPS	51·3
Moscow		123·9	328	—	—	29 56	PS	36 14	SS	e 58·3
Erevan		124·3	309	e 18 46	[− 2]	—	—	e 22 36	PPP	—
East Machias		125·1	44	e 15 31	P	25 45	[+ 2]	e 15 44	pP	e 50·0
Pulkovo		125·1	335	e 15 30	P	25 39	[− 4]	e 20 41	PP	—
Halifax		127·8	43	e 20 51?	PP	—	—	—	—	49·9

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
San Juan		128·8	77	e 15 23	P	e 25 53	[− 3]	e 21 17	pPP	—
Bermuda		129·6	59	24 26	pPPP	e 38 12	SS	e 33 4	PPS	e 52·7
Upsala		129·7	341	i 22 4	SKP	i 27 46	SKKS	e 31 11	PS	e 52·9
Rio de Janeiro		132·2	140	i 23 19	SKP	i 31 29	PS	—	—	i 53·3
Ksara		132·3	302	i 19 7a	[+ 4]	i 22 27	SKP	i 19 37	pPKP	—
Bergen		132·5	348	i 22 7	SKP	i 26 16	[+13]	i 24 34	PPP	e 54·9
Cernauti		133·8	325	e 19 27	[+21]	27 51?	SKKS	22 3	PP	67·9
Copenhagen		134·8	341	19 10a	[+ 3]	—	—	22 29	PP	61·8
Istanbul		135·3	314	19 12	[+ 4]	—	—	—	—	—
Bucharest		135·8	320	e 19 14k	[+ 5]	e 23 13	PKS	e 22 47	PP	—
Hamburg		137·3	341	e 19 18	[+ 6]	e 45 5	SSS	e 22 51	PP	e 57·9
Heligoland		137·4	343	e 19 19	[+ 7]	e 35 51	?	e 22 49	PP	e 60·0
Kecskemet	z.	138·0	327	e 19 18	[+ 4]	e 28 51	SKKS	i 22 42	PP	—
Edinburgh		138·1	352	e 19 16	[+ 2]	26 6	[− 7]	e 22 38	PP	—
Prague		138·4	334	e 19 18	[+ 4]	e 40 21	SS	e 22 9	PP	e 55·9
Sofia		138·4	319	e 19 18	[+ 4]	e 40 15	SS	i 22 57	PKS	—
Belgrade		138·9	324	i 19 17a	[+ 2]	i 41 50	sSS	i 22 53	PKS	e 53·7
Jena		138·9	336	e 19 8	[− 7]	—	—	e 22 45	PKS	e 49·9
De Bilt		140·0	343	e 19 10a	[− 8]	i 22 18	PP	i 19 21	pPKP	32·8
Stonyhurst		140·1	350	e 19 15	[− 3]	i 40 40	SS	i 22 36	PP	55·9
Bidston		140·7	351	i 19 8	[−10]	e 28 4	SKKS	i 22 56	PKS	e 56·9
Uccle		141·4	344	i 19 15a	[− 4]	i 25 56	[−22]	i 22 26	PP	e 58·9
Stuttgart		141·6	337	e 19 15	[− 5]	i 29 7	SKKS	i 19 28	pPKP	e 57·8
Oxford		141·9	349	i 19 21	[+ 1]	e 40 51	SS	22 30	PP	—
Kew		142·0	347	i 19 18a	[− 3]	i 26 38	[+19]	e 19 58	pPKP	e 57·9
Triest		142·0	330	19 18	[− 3]	26 32	[+13]	22 56	PP	59·9
Zurich		142·9	336	e 19 20	[− 2]	—	—	e 20 19	pPKP	—
Chur		143·0	335	i 19 21	[− 2]	—	—	—	—	—
Basle		143·2	337	e 19 22	[− 1]	—	—	—	—	—
Paris		143·8	343	i 19 22	[− 1]	40 48	SS	20 30	pPKP	e 64·9
Neuchatel		143·9	337	e 19 24	[+ 1]	—	—	—	—	—
Besançon		144·0	338	e 19 26	[+ 2]	—	—	e 22 36	PP	—
Jersey		144·5	349	e 19 25	[0]	e 25 51	[−32]	e 44 31	SSSS	e 55·9
Moncalieri		145·2	335	i 19 27	[+ 1]	e 24 39	?	(e 32 52)	PS	e 32·9
Rome		145·3	325	i 19 28k	[+ 2]	i 41 28	SS	i 19 58	pPKP	—
Clermont-Ferrand		146·3	340	i 19 33	[+ 5]	—	—	—	—	—
Marseilles		147·5	335	e 19 51?	pPKP	—	—	—	—	—
Toledo		153·8	345	i 19 41	[+ 2]	i 30 19	SKKS	i 20 7	pPKP	—
Algiers		153·9	330	i 19 44	[+ 5]	26 51	[+16]	20 40	pPKP	e 52·9
Almeria		155·9	340	19 49	[+ 7]	26 21	[−16]	i 20 21	pPKP	60·9
Granada		156·2	342	19 44	[+ 1]	25 16	?	23 2	PP	—
San Fernando		157·6	347	19 50	[+ 6]	i 30 44	SKKS	24 28	PP	52·9

Additional readings :—
Riverview iN = +9m.24s., iE = +9m.39s., isS?N = +10m.13s., iE = +10m.26s., iN = +10m.39s.
Arapuni SS = +11m.14s., i = +13m.17s.
Wellington PP = +6m.28s., iZ = +6m.40s. and +6m.50s., P_cP? = +9m.16s., sS = +10m.49s., SS = +11m.43s., S_cP? = +12m.16s., P_cS? = +12m.33s., S_cS = +16m.15s., sS_cS = +17m.10s.?
Christchurch iEZ = +11m.56s., iZ = +12m.16s., iE = +13m.13s.
Adelaide i = +6m.59s., iPP = +7m.24s., i = +7m.59s., +10m.11s., and +10m.21s., iSS = +12m.58s.
Honolulu isP = +9m.23s., i = +9m.34s., P_cP = +10m.7s., i = +10m.13s., ePPP = +11m.29s., isS = +15m.49s., iS_cS = +18m.31s., iSS = +19m.11s., sSS = +19m.39s., isSS = +19m.43s.
Perth PP = +10m.51s., i = +11m.11s., +11m.51s., and +13m.25s., P_cS = +14m.39s., PS = +15m.58s., i = +16m.44s. and +18m.24s., SS = +19m.21s., SSS = +20m.26s., i = +21m.14s. and +22m.6s.
Zi-ka-wei PPZ = +11m.3s., iZ = +13m.37s., S?Z = +14m.43s., iZ = +16m.7s.
Vladivostok i = +11m.8s., +13m.45s., and +17m.14s.
Hong Kong P_cP = +10m.54s., S_cS = +20m.14s., SSS? = +27m.6s.
Ukiah ePP = +15m.33s., ePPP = +17m.17s., eSP = +23m.26s., eSS = +27m.54s.
Berkeley eN = +12m.33s., iZ = +15m.38s., eSEZ = +22m.35s.
Santa Barbara ePKP,PKPZ = +38m.39s.
Calcutta iSN = +23m.4s., isSN = +23m.48s.
Pasadena isPZ = +13m.13s., iPPZ = +15m.53s., iN = +22m.59s., ePKKPZ = +30m.35s., iPKP,PKPZ = +38m.39s., iSKP,PKPZ = +41m.49s., ePKP,PKP,PKPZ = +59m,16s.

Continued on next page.

Sitka PPP = +17m.53s., i = +20m.56s., iS = +22m.48s., PS = +23m.54s., i = +25m.6s., esS = +28m.49s., SSS = +31m.19s.
Mount Wilson iPKKPZ = +30m.34s., iSKP,PKPZ = +41m.48s., ePKP,PKP,PKPZ = +59m.2s.
La Jolla ePKP,PKPZ = +38m.37s., eSKP,PKPNZ = +41m.47s.
College ePPP = +17m.33s., eSS = +28m.37s., esSS = +29m.8s., eSSS = +32m.18s.
Riverside iPPEZ = +15m.57s., iPKKPZ = +30m.33s., ePKP,PKPZ = +38m.26s.
Haiwee iPKKPZ = +30m.33s., ePKP,PKP = +38m.41s., eSKP,PKPZ = +41m.47s.
Tinemaha ePKP,PKP = +38m.35s.
Tucson sP = +13m.36s., ePP = +16m.23s., epPP = +16m.46s., sPP = +17m.7s., ePPP = +18m.31s., SKKS = +23m.21s., S = +23m.46s., iS = +23m.53s., pS = +24m.8s., esS = +24m.19s., iPS = +24m.58s., eSS = +29m.42s., esSS = +30m.37s., eSSS = +32m.58s., i = +35m.59s.
Kodaikanal iSE = +24m.10s.
Salt Lake City ePPP = +18m.58s., S = +23m.44s., SSS = +33m.1s.
Hyderabad SN = +24m.4s., PSN = +25m.0s., SSN = +30m.23s.
Butte eSP = +25m.23s., ePKKP = +29m.36s., eSS = +30m.29s., eSSS = +34m.0s.
Bozeman ePPP = +19m.20s., epPPP = +19m.36s., eSKKS = +24m.15s., esS = +25m.2s., SP = +25m.30s., sSP = +26m.28s., PKKP = +29m.46s., SS = +30m.53s., eSSS = +34m.25s.
Agra iE = +24m.26s., SSS?E = +31m.19s.
Bombay iPEN = +13m.34s., LqEN = +32m.12s.
Lincoln ePKP = +18m.14s., i = +24m.23s., eSKKS = +25m.38s., SP = +28m.30s., SSS = +40m.33s.
Florissant iPKPZ = +18m.10s., ipPKPZ = +18m.35s., iZ = +19m.25s., iSKKSE = +25m.37s., eSN = +26m.17s., esSN = +27m.16s., iSPE = +28m.13s.
St. Louis iSEN = +26m.20s., iEN = +27m.8s., iSPEN = +28m.14s.
Chicago i = +25m.54s., eS = +26m.23s., iPS = +28m.34s., epPS = +28m.49s., eSPP = +29m.19s., eSS = +34m.14s., iSS = +34m.39s., sSS = +35m.9s., i = +37m.4s., eSSS = +39m.8s.
Sverdlovsk eP = +18m.24s., i = +25m.53s., isS = +27m.34s., PS = +28m.31s., sSS = +25m.21s.
Tananarive eSE = +27m.45s., E = +28m.54s., N = +29m.15s., E = +29m.19s., SSE = +34m.48s., EN = +47m.21s.
Huancayo S = +26m.15s., ePS = +28m.47s., i = +33m.7s., eSS = +34m.27s., isSS = +34m.59s., iSSS = +38m.8s.
Columbia esPP = +20m.14s., eS = +27m.19s., eSS = +35m.24s., eSSS = +40m.9s.
Pittsburgh e? = +20m.26s., iSKKS = +26m.35s., ePPS = +30m.30s., iSS = +34m.17s.
Toronto e = +35m.39s.
La Paz iPPPZ = +22m.15s., iPSZ = +29m.23s., iPPSZ = +30m.37s., SSZ = +35m.45s., SSSZ = +40m.1s.
Georgetown iPP = +19m.59s., iS = +27m.42s.
Ottawa iZ = +22m.5s., SKKSE = +26m.51s., iZ = +28m.55s., PS = +29m.39s., iZ = +32m.29s., SS = +36m.21s., SSSS = +46m.51s.?
Baku sSS = +27m.13s.
Philadelphia eSS = +36m.34s.
Fordham iZ = +22m.6s., iSKKSE = +27m.2s., eZ = +32m.21s.
Seven Falls SKKS = +26m.22s., SS = +35m.51s.
Harvard iZ = +22m.1s., iSKKSZ = +27m.7s., iPSZ = +30m.18s., eSSE = +37m.3s.
Weston i = +22m.12s., e = +38m.26s.
Cape Town SKPN = +21m.37s., eE = +22m.28s., iN = +22m.40s., iSKKSE = +27m.10s., PSE = +30m.11s., iSSE = +37m.4s.
Johannesburg e?N = +21m.27s., e?E = +22m.33s., e?N = +23m.21s. and +26m.33s.
Scoresby Sund isPP = +21m.7s., epPPP = +23m.40s., iSKKS = +26m.39s., eSP = +30m.16s., epPSE = +30m.44s., esPS = +30m.56s., iSS = +37m.12s., isSS = +38m.6s., iSSS = +41m.59s.
Moscow pPS = +30m.36s., sSS = +37m.24s.
East Machias ePKP = +19m.3s., ePP = +20m.41s., sPP = +21m.14s., PPP = +23m.17s., PSKS = +30m.46s., iPPS = +32m.14s., i = +32m.18s., eSS = +37m.31s., sSS = +37m.46s.
Pulkovo PKP = +18m.51s., pPP = +21m.11s., SKKS = +26m.39s., SP = +29m.48s., sSS = +37m.30s.
San Juan ePKP = +18m.55s., i = +22m.21s., ipPPP = +24m.14s., esSP = +31m.40s., eSPP = +32m.14s., eSS = +37m.53s.
Bermuda i = +40m.58s.
Upsala iE = +22m.10s. and +22m.51s., iSE = +27m.55s., iSN = +27m.59s., eN = +32m.57s., eSSS = +40m.51s. ?
Ksara iPP = +21m.33s., PPS = +33m.55s., sSS = +40m.5s.
Bergen iZ = +25m.25s.
Copenhagen +20m.20s. and +21m.45s., eZ = +21m.51s., eEN = +22m.40s.
Hamburg eN = +23m.55s. and +28m.44s.
Kecskemet eZ = +19m.38s., ePKPZ = +21m.54s., ePPZ = +24m.41s., eZ = +25m.26s., eSKKSZ = +32m.6s., ePSKSZ = +34m.54s.
Edinburgh PKS = +22m.57s.
Prague ePPP = +23m.45s., e = +34m.39s. and +44m.3s.
Belgrade iZ = +19m.52s. and +22m.18s., iNE = +29m.23s.
Jena ePZ = +19m.12s., ePEN = +19m.15s., iPE = +19m.33s., eZ = +21m.38s., eN = +21m.43s., e = +22m.8s., eN = +23m.38s.

Continued on next page.

Bidston iSKP = +22m.13s., iSPP = +23m.21s., i = +23m.49s., ePPP = +25m.39s., ipSKS = +26m.50s., ipSKKS = +28m.55s., ePS = +32m.23s., iSKKS = +35m.3s., e = +40m.31s., iSSS = +40m.44s., i = +42m.9s., eSSS = +45m.27s.
Uccle iZ = +20m.1s., iEN = +22m.42s., iSKP = +22m.58s., iSKKS = +29m.6s., iSSE = +40m.48s., iSSSN = +46m.0s.
Stuttgart iZ = +19m.21s., iN = +20m.41s., iPPE = +22m.19s., eSKPE = +23m.5s., iSKKSN = +29m.11s., ePPSE = +35m.5s., eSSE = +40m.43s.
Kew iZ = +19m.36s., isPKPZ = +20m.16s., iPPZ = +22m.31s., iSKPN = +22m.46s., iZ = +22m.55s., iPKSN = +23m.4s., ipPPZ = +23m.7s., isPPN = +23m.30s., iNZ = +24m.10s., ePPPNZ = +25m.46s., ipSKSEN = +27m.10s., eSKKSN = +28m.28s., ipSKKSN = +29m.10s., ePSN = +32m.46s., iPPPZ = +34m.10s., ipPPPZ = +34m.46s., isPPPZ = +34m.59s., iSKKSN = +35m.22s., iZ = +37m.2s. and +37m.11s., eN = +40m.51s., isSSEN = +41m.4s., iN = +42m.37s., eSSSN = +45m.43s.
Triest PP = +24m.11s., i = +29m.11s., e = +32m.15s., ePS = +33m.32s., SS = +40m.33s.
Zurich ePP = +22m.25s.
Chur i = +19m.25s.
Basle e = +19m.29s. and +21m.7s.
Paris iPP = +22m.40s., PKS = +23m.15s., PPS = +35m.22s., PSS = +44m.4s., SSS = +47m.22s.
Besançon iPKS = +23m.11s.
Jersey e = +20m.28s., +21m.8s., and +23m.7s.
Rome iZ = +19m.40s., iPKP$_2$N? = +19m.46s., iPKP$_2$Z = +19m.51s., iZ = +20m.26s. and +22m.48s., iPPZ = +23m.36s., iSKS = +25m.34s., iZ = +30m.16s., iPSPN = +35m.50s., iN = +37m.3s., iSSN = +42m.21s., iN = +46m.1s., +46m.49s., +47m.58s., and +60m.3s.
Algiers PP = +22m.39s., i = +23m.36s., PPP = +25m.42s., SKKS = +29m.30s., PSKS? = +23m.12s., PPS = +35m.12s., e = +36m.22s., SS? = +41m.31s., e = +45m.51s.
Almeria SKP = +23m.18s., PP = +23m.36s., PPS = +38m.25s., SS = +43m.26s., SSS = +45m.3s.
Granada iPKPN = +18m.54s., pPKPE = +19m.13s., PKP$_2$E = +19m.30s., pPPE = +23m.21s., SKKSE = +29m.31s., SSSN = +48m.12s.
San Fernando SN = +31m.48s.

Oct. 17d. 8h. 59m. 32s. Epicentre 14°·7S. 167°·3E. (as at 6h.).

$A = -\cdot 9440$, $B = +\cdot 2127$, $C = -\cdot 2522$; $\delta = -2$; $h = +6$.

Tables for depth of focus 0·010 have been used.

		△ °	Az. °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	Supp. m. s.		L. m.
Brisbane		18·4	224	i 4 16	+ 6	i 7 28	0	i 4 34	PP	—
Riverview		24·0	215	i 5 7	+ 1	i 9 18	+ 4	—	—	e 11·9
Sydney		24·0	215	e 5 4	− 2	i 9 10	− 4	—	—	—
Wellington		27·3	168	i 5 36	− 1	e 12 51	?	—	—	—
Melbourne		30·4	216	i 6 1	− 4	i 10 52	− 5	—	—	12·8
Adelaide		32·8	226	—	—	i 11 30	− 5	—	—	i 15·8
Perth		49·8	240	i 7 33	?	i 15 43	− 3	i 9 21	pP	25·5
Pasadena	z.	85·8	53	e 12 30	0	—	—	—	—	—
Mount Wilson	z.	85·9	53	i 12 31	+ 1	—	—	—	—	—
Riverside	z.	86·4	53	e 12 33	0	—	—	—	—	—
Tinemaha	z.	86·8	51	e 13 2	pP	—	—	—	—	—
Tucson		91·0	57	e 12 56	+ 2	e 23 38	− 3	e 16 56	PP	i 39·8
Ksara		132·3	302	e 21 33	PP	—	—	e 21 55	pPP	—
Helwan	z.	136·8	298	e 22 22	PP	—	—	e 22 37	pPP	—
Rome		145·3	325	i 19 26	[0]	—	—	—	—	—
Clermont-Ferrand		146·3	340	i 19 33	[+ 5]	—	—	—	—	—

Additional readings :—
Brisbane iPPE = +4m.40s., iSE = +7m.34s.
Tucson epPPP = +19m.5s., esS = +24m.32s., esSS = +30m.37s.
Ksara i = +22m.24s.
Rome iZ = +19m.37s.

Oct. 17d. Readings also at 3h. (near Mizusawa), 6h. (near Andijan), 7h. (Tucson (2), Mizusawa, and Tchimkent), 8h. (Rome), 9h. (near La Paz), 16h. (Florissant), 17h. (near Andijan), 18h. (Tinemaha, Mount Wilson, Pasadena, Haiwee, La Plata, La Paz, and Tucson), 20h. (Fresno, Lick, Berkeley, Branner, near Andijan and Tucson), 23h. (near Branner, Ksara, Baku, and Sverdlovsk).

Oct. 18d. Readings at 0h. (Baku and Sverdlovsk), 1h. (San Juan, Baku, and Sverdlovsk), 5h. (near Mizusawa), 7h. (near Tananarive), 9h. (near Samarkand), 11h. (near Samarkand, Baku, Sverdlovsk, Tucson, and College), 12h. (Perth and near Samarkand), 13h. (Samarkand), 14h. (Tinemaha, Haiwee, Mount Wilson, Huancayo, Riverside, Pasadena, and Tucson), 18h. (Tucson (2)), 19h. (near Mizusawa, Tucson, and La Paz), 20h. (Tucson), 21h. (Tucson, near New Plymouth, Bunnythorp, Wellington, Tuai, and La Paz), 22h. (Piatigorsk, Grozny, Erevan, Sotchi, Tucson, and Baku), 23h. (Tucson (2)).

Oct. 19d. 11h. 53m. 49s. Epicentre 47°·8N. 69°·5W.

Shock felt widely in the United States between Rhode Island and Lake Erie, with slight damage in the area between Murray Bay and the River Loup.

Epicentre 47°·8′N. 69°·5 ± 0°·2W.

Morris J. S. Innes.

Earthquake Notes, September, 1940. Vol. XII, No. 1-2, p. 16. The Saint Lawrence Earthquake of October 19, 1939.

R. Bodle.

United States Earthquakes, 1939. Washington, 1941, p. 6, Chart p. 61.

Radius of macroseismic area 700-900kms.

$A = +\cdot2361$, $B = -\cdot6315$, $C = +\cdot7385$; $\delta = -8$; $h = -5$;
$D = -\cdot937$, $E = -\cdot350$; $G = +\cdot259$, $H = -\cdot692$, $K = -\cdot674$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Seven Falls		1·1	233	i 0 34	+12	i 0 46	+ 7	—	—	—
Shawinigan Falls		2·6	241	i 0 45	+ 1	i 1 15	− 2	—	—	—
East Machias		3·4	153	i 1 1k	+ 6	i 1 40	+ 3	i 1 51	S_g	—
Ottawa		4·9	243	i 1 17	0	i 2 11	− 4	—	—	—
Halifax		5·2	125	i 1 33	P*	i 2 21	− 1	—	—	—
Harvard		5·5	196	e 1 27	+ 2	e 2 29	− 1	e 3 9	S_g	—
Williamstown		5·7	208	e 1 31	+ 3	i 2 41	+ 6	i 1 47	P*	—
Fordham		7·6	205	i 1 57k	+ 2	i 3 28	+ 5	4 30	S_g	—
Toronto		8·1	242	—	—	i 3 26	− 9	i 4 3	S*	—
Philadelphia		8·9	210	i 4 17	S	(i 4 17)	S*	—	—	—
Pittsburgh		10·5	229	i 2 45	+10	i 4 51	+16	—	—	—
Cleveland		10·6	236	e 2 43	+ 7	i 4 26	−11	i 5 21	SS	—
Chicago		14·2	252	—	—	i 5 48	−16	—	—	i 7·2
Chicago, Loyola		14·2	252	e 3 25	+ 1	i 6 6	+ 2	—	—	i 7·2
Columbia		16·3	216	e 4 13	PP	e 7 16	SS	—	—	—
Florissant		17·6	248	e 4 6	− 2	i 7 30	+ 7	i 4 21	PP	9·0
St. Louis		17·6	246	e 4 7	− 1	i 7 27	+ 4	i 4 23	PP	—
Cape Girardeau		18·1	243	e 4 9	− 5	i 7 38	+ 3	—	—	i 8·1
Lincoln		20·6	261	e 4 41	− 2	e 8 18	−11	4 51	PP	e 10·6
Saskatoon		24·1	296	—	—	9 41	+ 7	—	—	12·2
Bozeman		28·3	293	—	—	e 11 19	+36	—	—	e 12·8
Butte		29·2	294	6 59	PP	e 11 39	+41	—	—	e 12·6
Salt Lake City		30·8	274	—	—	e 11 31	+ 8	—	—	—
Spokane	E.	31·8	289	—	—	e 13 36	SSS	—	—	i 16·4
Tucson		34·8	260	i 6 56a	+ 2	12 32	+ 7	e 8 15	PP	e 15·2
Victoria		35·3	293	—	—	e 14 11?	SS	—	—	i 16·9
Tinemaha		37·0	272	i 7 14	+ 1	—	—	—	—	—
Haiwee		37·3	271	e 7 16	0	—	—	—	—	—
Riverside	z.	38·1	268	i 7 23	+ 1	—	—	—	—	—
Palomar	z.	38·2	266	i 7 25	+ 2	—	—	—	—	i 20·0
Mount Wilson		38·4	268	i 7 26a	+ 1	—	—	—	—	e 20·3
Pasadena		38·6	268	i 7 26a	0	—	—	—	—	e 20·3
La Jolla	z.	38·7	266	i 7 30	+ 3	—	—	—	—	—
Ukiah		39·2	279	—	—	e 14 2	+30	—	—	e 16·6
Kew		43·4	58	—	—	e 21 5	?	—	—	e 24·2

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Toledo		46·6	75	e 8 37	+ 5	—	—	—	—	—
La Paz	Z.	64·0	178	10 39	+ 1	—	—	—	—	—
Sverdlovsk		67·8	27	11 5	+ 3	20 3	+ 3	—	—	31·2
Ksara		74·9	58	i 11 50a	+ 6	e 21 42	PS	—	—	41·7

Additional readings :—
East Machias i = +1m.56s., +2m.2s., and +2m.8s.
Williamstown iP = +2m.3s., iS = +2m.7s.
Fordham i = +3m.35s.
Pittsburgh iZ = +3m.7s. and +3m.21s.
Chicago (Loyola) i = +5m.45s.
Florissant iPE = +4m.14s., iN = +7m.15s.
St. Louis iN = +4m.38s., eN = +7m.15s., iE = +7m.48s.
Cape Girardeau iPEN = +4m.12s., eEN = +6m.17s., iEN = +6m.58s., eEN = +7m.18s.
Salt Lake City eS = +11m.49s.
Spokane eSSSE = +14m.26s.
Tucson ePPP = +8m.43s.
Long waves were also recorded at Rome, Paris, Granada, De Bilt, Baku, Stonyhurst, Bidston, College, and Sitka.

Oct. 19d. 21h. 32m. 44s. Epicentre 39°·8N. 29°·6E. (as on 1939 Sept. 15d.).

A = +·6698, B = +·3805, C = +·6376 ; $\delta = -5$; $h = -2$;
D = +·494, E = −·869 ; G = +·554, H = +·315, K = −·770.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Istanbul		1·3	342	1 55	?	2 31	?	—	—	—
Bucharest		5·3	330	e 1 22a	0	i 2 30	+ 5	i 1 36	P*	—
Sofia		5·5	303	e 1 24	− 1	i 2 48	S*	i 1 37	P*	—
Ksara		7·8	138	e 1 56	− 2	e 3 35	+ 7	e 4 33	S_g	—
Belgrade		8·4	309	e 3 2k	+56	i 3 17	−26	i 4 23	S*	—
Sotchi		8·5	60	2 16	+ 9	e 3 54	+ 9	—	—	6·8
Cernauti	N.	8·9	343	e 2 6	− 6	3 55	0	—	—	4·3
Sarajevo		9·3	300	e 2 33	PPP	e 4 47	S*	i 5 5	S_g	—
Szeged		9·5	316	e 3 28	?	e 4 5	− 5	i 5 4	S_g	e 6·8
Helwan	Z.	10·0	172	i 2 25k	− 2	4 12	−10	4 58	S*	—
Kecskemet	Z.	10·1	318	e 3 52	?	e 4 44	SSS	e 5 24	S_g	e 6·4
Budapest		10·8	319	e 3 55	?	—	—	—	—	5·7
Erevan		11·4	83	2 58	+11	—	—	—	—	—
Grozny		12·6	68	e 3 24	PPP	—	—	—	—	—
Triest		13·0	302	3 13	+ 4	5 54	SS	3 18	PP	—
Rome		13·1	284	e 3 11	+ 1	i 5 42	+ 4	i 5 50	SS	e 6·5
Prague		14·8	319	e 3 34	+ 2	e 6 34?	SS	—	—	e 7·3
Baku		15·5	81	e 3 44	+ 2	e 6 45	SS	—	—	8·5
Chur		16·2	302	e 3 50	0	—	—	—	—	—
Jena		16·8	317	e 1 57	?	e 5 37	?	—	—	e 8·3
Moscow		16·8	18	3 53	− 5	7 4	− 1	—	—	—
Moncalieri		17·0	295	e 2 57	−64	i 7 0	−10	—	—	10·4
Zurich		17·0	303	e 3 59a	− 2	—	—	—	—	—
Stuttgart		17·1	308	i 3 59	− 3	e 7 21	+ 9	e 4 13	PP	—
Basle		17·7	304	e 4 8	− 2	e 7 46	SS	—	—	e 10·1
Neuchatel		17·9	301	e 4 11	− 1	—	—	—	—	e 10·1
Hamburg	E.	19·2	323	e 4 37	+ 9	—	—	—	—	e 9·6
Copenhagen		19·5	331	4 30a	− 1	8 9	+ 3	—	—	11·3
Pulkovo		20·0	2	e 4 31	− 6	i 8 13	− 4	—	—	9·6
Uccle		20·8	310	4 44	− 1	i 8 36	+ 3	—	—	e 11·3
Algiers		21·0	271	e 4 50	+ 3	8 42	+ 5	5 10	PP	11·3
Paris		21·3	304	e 4 50	0	e 8 37	− 6	—	—	e 12·3
Kew		23·8	310	i 5 14	− 1	i 9 34	+ 6	—	—	e 12·8
Almeria		25·2	274	5 24	− 5	9 34	−18	5 43	PP	—
Toledo		25·7	281	e 5 32	− 1	9 53	− 8	—	—	—
Stonyhurst		25·8	315	e 7 0	?	e 10 10	+ 8	—	—	17·3
Bidston		26·0	313	—	—	i 9 34	−32	—	—	e 12·3
Sverdlovsk		26·4	39	i 5 49	+ 9	10 10	− 2	13 22	L_q	17·3
Andijan		32·4	74	6 39	+ 5	e 14 15	SSS	—	—	—
Kodaikanal	E.	51·6	112	e 8 16?	−54	—	—	—	—	—
Calcutta	N.	52·2	92	—	—	e 16 33	− 6	—	—	—

For Notes see next page.

NOTES TO OCT. 19d. 21h. 32m. 44s.

Additional readings :—
Bucharest iN = +1m.26s., iS*E = +2m.49s.
Sofia iEN = +2m.37s., iE = +2m.43s.
Belgrade i = +4m.34s., iNW = +4m.40s.
Sarajevo e = +2m.58s.
Szeged eE = +5m.28s., i = +5m.41s., iN = +5m.51s., iE = +6m.3s., eN = +6m.15s.
Helwan iZ = +3m.22s., S-Z = +5m.31s.
Erevan e = +3m.29s.
Triest SS = +6m.31s., i = +7m.8s.
Rome iE = +4m.2s. and +4m.48s., eZ = +5m.46s., i?E = +6m.4s.
Algiers PPP = +5m.21s., SS = +9m.24s.
Kew eEZ = +12m.10s.
Long waves were also recorded at Heligoland and De Bilt.

Oct. 19d. Readings also at 5h. (Wellington), 6h. (near Manila), 7h. (Ksara), 9h. (Basle), 10h. (Tucson and Little Rock), 13h. (near Balboa Heights), 14h. (Harvard and Ottawa), 15h. (Tucson), 17h. (near Andijan), 18h. (Ottawa), 19h. (Zurich and Tucson), 20h. (Andijan and Edinburgh), 22h. (Istanbul (3)), 23h. (Tucson, Istanbul, and La Paz).

Oct. 20d. 20h. 6m. 7s. Epicentre 8°·8N. 82°·7W. (as on 1937 April 13d.).

The present epicentre would appear to be very slightly further south than the shock of 1937, April 13d., but the observational evidence is not unanimous.

$A = +\cdot1256$, $B = -\cdot9804$, $C = +\cdot1520$; $\delta = +6$; $h = +7$;
$D = -\cdot992$, $E = -\cdot127$; $G = +\cdot019$, $H = -\cdot151$, $K = -\cdot988$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m s.		m.
Balboa Heights		3·1	87	i 0 51	0	i 1 13	−16	—	—	1·5
Merida	N.	13·8	332	i 3 6	−13	e 5 42	−12	—	—	—
San Juan		18·7	58	e 4 23	+ 1	i 8 3	SS	—	—	13·5
Huancayo		22·0	160	e 4 44	−14	e 8 30	−24	e 5 9	PP	—
Columbia		25·1	4	e 5 32	+ 4	e 10 8	+17	e 6 59	PPP	—
Bermuda		28·7	33	e 5 58	− 3	—	—	—	—	e 12·1
La Paz		29·0	149	i 6 0a	− 4	i 12 43	SSS	—	—	16·1
St. Louis		30·4	349	(e 6 16)	0	(e 11 23)	+ 7	e 7 19	PP	e 11·4
Florissant	N.	30·7	349	(i 6 18)	− 1	(e 11 23)	+ 2	e 7 17	PP	e 11·4
Philadelphia		31·7	12	e 6 28	+ 1	e 11 53	+16	—	—	e 13·9
Fordham		32·9	14	i 6 45	+ 7	e 12 14	+18	—	—	—
Chicago		33·3	353	e 6 39	− 2	e 12 3	+ 1	e 8 6	PP	e 14·1
Toronto		34·8	5	e 6 41	−13	e 12 17	− 8	—	—	15·9
Weston		34·9	15	e 7 13	+18	e 12 40	+13	8 18	PP	—
Harvard		35·0	15	e 6 55	− 1	e 12 45	+17	e 8 17	PP	e 18·9
Tucson		35·0	316	6 57a	+ 1	e 12 34	+ 6	e 8 10	PP	e 14·1
Ottawa		37·0	9	i 7 13	0	e 13 11	+12	e 8 47	PP	21·9
East Machias		38·2	19	e 8 48	PP	e 13 34	+17	e 9 21	PcP	e 16·0
Halifax		39·3	23	i 9 1	PP	—	—	—	—	21·9
Seven Falls		39·5	13	e 8 17	+43	e 16 17	SS	—	—	18·9
La Jolla		39·9	312	e 7 41	+ 4	—	—	—	—	—
Riverside		40·5	314	e 7 43	+ 1	—	—	—	—	—
Salt Lake City		41·0	327	e 9 14	PP	—	—	—	—	e 16·2
Mount Wilson		41·1	314	e 7 49	+ 2	—	—	—	—	—
Pasadena		41·2	314	e 7 49	+ 1	—	—	e 8 44	?	e 22·9
Haiwee		42·1	316	e 7 56	+ 1	—	—	—	—	—
Santa Barbara	Z.	42·5	313	e 8 1	+ 2	—	—	—	—	—
Tinemaha		42·8	317	i 8 3	+ 2	—	—	—	—	—
Bozeman		44·1	333	e 8 15	+ 3	e 14 22	−23	—	—	e 17·9
Butte		45·1	333	e 8 18	− 2	e 18 23	ScS	e 10 5	PP	e 18·9
Ukiah		47·2	317	e 11 16	PPP	e 15 41	+12	e 19 1	SS	e 19·3
Rio de Janeiro		49·9	130	i 15 53	S	(i 15 53)	−14	—	—	—
Sitka		62·9	332	e 10 22	− 8	e 22 13	SS	e 14 25	PPP	—
College		71·6	337	e 11 21	− 4	e 20 42	− 2	e 14 16	PP	e 30·3
Toledo		75·7	52	11 46	− 3	—	—	—	—	35·9

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Granada		76·1	54	i 11 54	+ 3	—	—	e 16 4	PPP	34·7
Almeria		77·0	55	e 11 56	0	i 21 57	+12	12 19	P_eP	36·3
Paris		80·3	43	e 12 53?	+39	—	—	—	—	37·9
Clermont-Ferrand		80·8	45	e 12 16	− 1	—	—	—	—	—
Uccle	E.	81·4	40	e 12 22	+ 2	e 22 38	+ 7	e 23 29	PS	e 37·9
Prague		87·9	40	—	—	e 35 5	?	—	—	—
Rome		88·0	48	e 12 58	+ 5	e 23 28	[+ 8]	e 29 28	SS	e 43·4
Pulkovo		93·7	28	—	—	e 34 20	SSS	—	—	—
Helwan		105·9	56	—	—	e 24 53	[− 2]	e 27 59	PS	—
Ksara		108·0	51	e 18 58	PP	e 28 22	PS	—	—	—
Sverdlovsk		108·0	20	—	—	e 25 2	[− 2]	e 28 22	PS	40·9
Baku		114·4	38	e 19 50	PP	e 29 20	PS	—	—	e 51·4
Calcutta	N.	147·6	15	e 19 53	[+10]	—	—	—	—	—
Kodaikanal	E.	152·7	48	e 21 53	?	—	—	—	—	e 81·9

Additional readings :—
Huancayo eP = +4m.55s., ePPP = +5m.19s., S = +8m.36s.
Florissant iN = +6m.21s.
Florissant and St. Louis give P as S and S as L.
Chicago eP_eP = +8m.53s.
Tucson ePPP = +8m.30s.
Ottawa e = +14m.11s. and +15m.53s.?
Ukiah eS = +15m.53s.
College ePPP = +16m.5s., eSS = +25m.21s., eSSS = +28m.5s.
Almeria PP = +16m.27s.
Uccle eSSE = +27m.57s., eSSSE = +31m.13s.
Rome e = +14m.13s. and +15m.36s., eSSS = +33m.36s.?
Long waves were also recorded at Vera Cruz, Cape Town, Bidston, Jersey, Santa Clara, Stonyhurst, De Bilt, Scoresby Sund, and Kew.

Oct. 20d. Readings also at 0h. (Istanbul), 4h. (Neuchatel, Chur, Zurich, Stuttgart, Rome, Basle, Belgrade, Sarajevo, Istanbul, Triest, and Sofia), 5h. (Bucharest), 7h. (Samarkand, Wellington, Ukiah, Haiwee, La Paz, Huancayo, Tucson (2), Riverside, Mount Wilson, Ksara, Pasadena, and Palomar), 8h. (Triest and La Paz), 11h. (Szeged, Jena, Stuttgart, Palomar, Pasadena, Mount Wilson, Riverside, Tucson, Triest, near Belgrade, Sarajevo, Rome, Basle, Sofia, and near Andijan), 12h. (Andijan and Bermuda), 17h. (Ksara and Helwan), 20h. (Andijan and near Almata), 22h. (Seattle).

Oct. 21d. Readings at 0h. (Szeged), 5h. (Moncalieri), 6h. (Basle and near Andijan), 8h. (near Harvard, Fordham, Ottawa, near Williamstown (2), San Juan, Riverview, near Shawinigan Falls, and Perth), 9h. (near Harvard and near Fordham), 10h. (near Mizusawa), 11h. (Pasadena, Mount Wilson, Riverside, and Tucson), 12h. (La Paz, La Plata, Pasadena, Mount Wilson, Riverside, and Tucson), 15h. (near Wellington), 16h. (near Algiers), 18h. (near Samarkand), 19h. (near Harvard, near Fordham, Ottawa, and Williamstown), 22h. (near Manila, Frunse, Istanbul, near Samarkand, and Andijan), 23h. (Balboa Heights and near Mizusawa (2)).

Oct. 22d. 14h. 39m. 35s. Epicentre 42°·4N. 144°·2E.

Intensity IV at Kusiro ; III at Obihiro and Urakawa ; II at Nemuro, Hatinohe, Hakodate, Aomori, Miyako, Morioka, Abashari ; I at Mizusawa, Sendai, Hukusima, Miyako, Kakioka, and Muroran.

See Seismological Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo, 1949, p. 29.

$A = -·6008$, $B = +·4333$, $C = +·6718$; $\delta = +2$; $h = -3$;
$D = +·585$, $E = +·811$; $G = -·545$, $H = +·393$, $K = -·741$.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Nemuro	1·4	47	0 32k	+ 5	0 49	+ 3	—	—	—
Sapporo	2·2	288	0 41k	+ 3	1 1	− 5	—	—	—
Hatinohe	2·7	227	0 47a	+ 2	1 17	− 2	—	—	—
Mori	2·8	264	0 49	+ 2	1 41	+19	—	—	—
Aomori	3·0	238	0 53	+ 3	1 26	− 1	—	—	—

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Miyako		3·2	211	0 54	+ 2	1 30	− 2	—	—	—
Mizusawa		4·0	217	1 6	+ 2	1 48	− 4	—	—	—
Akita		4·1	230	1 11	P*	1 52	− 3	—	—	—
Sendai		4·8	213	1 21	+ 6	2 14	+ 2	—	—	—
Hukusima		5·4	214	1 25a	+ 1	2 25	− 3	—	—	—
Onahama		6·0	205	1 35	+ 3	2 36	− 7	—	—	—
Mito		6·6	207	1 42k	+ 1	2 52	− 6	—	—	—
Utunomiya		6·7	211	1 43	+ 1	2 55	− 5	—	—	—
Kakioka		6·9	209	1 43	− 2	2 56	− 9	—	—	—
Maebasi		7·2	215	1 51	+ 2	3 10	− 3	—	—	—
Nagano		7·3	221	1 53a	+ 3	3 15	0	—	—	—
Tokyo Cen. Met. Ob.		7·5	209	1 54	+ 1	3 16	− 4	—	—	—
Wazima		7·5	231	1 55	+ 2	3 18	− 2	—	—	—
Yokohama		7·8	209	1 59a	+ 1	3 20	− 8	—	—	—
Hunatu		8·1	213	2 3	+ 1	3 14	−21	—	—	—
Mera		8·2	206	2 4	+ 1	3 36	− 2	—	—	—
Misima		8·3	211	2 5	+ 1	3 35	− 5	—	—	—
Vladivostok		9·1	279	i 2 17	+ 3	i 3 59	− 1	—	—	4·8
Nagoya		9·2	220	2 19	+ 3	3 58	− 5	—	—	—
Osaka		10·3	224	2 34	+ 2	4 41	SS	—	—	—
Koti		12·2	227	2 55	− 3	5 26	+10	—	—	—
Zi-ka-wei	Z.	21·3	246	e 4 47	− 3	i 8 37	− 6	—	—	—
Hong Kong		32·1	241	11 34	S	(11 34)	− 9	14 52	?	—
Manila		34·2	222	6 48	− 1	12 45	+29	—	—	—
Almata		48·1	295	e 8 52	+ 9	—	—	—	—	—
Frunse		49·8	296	e 11 32	PPP	—	—	—	—	—
Calcutta	N.	50·2	265	e 9 27	+27	i 16 4	− 7	—	—	—
Andijan		52·2	294	9 11	− 4	e 16 33	− 6	—	—	—
Sverdlovsk		52·6	317	i 9 16	− 2	16 35	− 9	—	—	24·4
Baku		67·0	305	e 12 22	?	e 19 40	PS	—	—	e 34·4
Tinemaha		71·0	57	e 11 20	− 2	—	—	—	—	—
Haiwee		71·8	57	i 11 24	− 2	—	—	—	—	—
Mount Wilson		72·9	59	i 11 31	− 2	—	—	—	—	—
Pasadena		72·9	59	e 11 31	− 2	—	—	—	—	—
Riverside	Z.	73·5	59	i 11 33	− 3	—	—	—	—	—
Copenhagen		74·1	335	11 36	− 4	—	—	—	—	38·4
La Jolla		74·3	60	i 11 39	− 2	—	—	—	—	—
Palomar	Z.	74·3	59	e 11 38	− 3	—	—	—	—	—
Jena		78·3	332	e 12 0	− 3	—	—	—	—	—
Tucson		78·8	57	12 4	− 2	—	—	e 13 6	sP	—
Ksara		79·7	307	i 12 9a	− 2	e 22 28	+15	e 23 16	PS	—
Stuttgart		81·0	332	i 12 16	− 2	—	—	i 12 41	pP	—
Basle		82·6	332	e 12 22	− 4	—	—	—	—	—
Helwan		85·2	307	e 12 34	− 5	e 22 55	[− 7]	—	—	—
Rome		85·5	327	—	—	i 22 58	[− 6]	—	—	e 42·6
Weston		89·7	25	i 12 58	− 3	i 23 23	[− 8]	i 13 20	pP	—
Fordham		90·3	28	e 13 0	− 4	e 23 26	[− 9]	e 13 23	pP	—

Additional readings :—
Vladivostok i = +2m.52s. and +4m.23s.
Copenhagen +11m.30s.?
Ksara e = +12m.29s.
Rome eN = +32m.31s., eZ = +35m.33s.
Weston isS = +23m.43s.
Fordham esPZ = +13m.40s., i = +24m.53s.
Long waves were also recorded at Uccle, Paris, and Prague.

Oct. 22d. Readings also at 0h. (Stuttgart, Triest, Sofia, Sarajevo, Belgrade, Chur, Zurich, Rome, and Ksara), 1h. (Ksara and Bucharest), 3h. (Ksara), 7h. (New Plymouth and near Wellington), 8h. (Bermuda), 10h. (Huancayo, Frunse, Samarkand (2), near Andijan, and Almata), 11h. (Samarkand, Cape Girardeau, Pasadena, Mount Wilson, Haiwee, Riverside, La Jolla, Palomar, near Harvard, Santa Barbara, Tinemaha, near La Paz, Tucson, and Mizusawa), 12h. (San Juan, Almata, Andijan, and Frunse), 13h. (Tucson), 16h. (Andijan and Frunse), 22h. (near Mizusawa), 23h. (Rome and La Paz).

Oct. 23d. Readings at 4h. (near Berkeley), 7h. (near Stuttgart, near Basle, Zurich, Chur, and Triest), 10h. (Ksara and Sitka), 11h. (Jena (4)), 16h. (La Paz and Triest), 20h. (Triest, Grozny, and Erevan).

Oct. 24d. 9h. Epicentre near Celebes.

Manila P = 4m.22s., S?EN = 6m.17s.
Hong Kong P? = 6m.19s., S? = 8m.56s., L = 9m.59s.
Sverdlovsk P = 13m.7s., S = 22m.19s., L = 35m.
Baku eP = 13m.36s., eS = 23m.8s., eL = 45m.
Ksara iP = 14m.34s.a, ePP = 17m.33s., eS = 24m.34s., L = 51m.

Oct. 24d. 14h. 43m. 29s. Epicentre 42°·2N. 133°·8E.

$A = -\cdot5143$, $B = +\cdot5363$, $C = +\cdot6692$; $\delta = -5$; $h = -2$;
$D = +\cdot722$, $E = +\cdot692$; $G = -\cdot463$, $H = +\cdot490$, $K = -\cdot743$.

Tables for depth of focus 0·060 have been used.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Vladivostok		1·7	303	i 1 9	+13	i 1 59	+19	—	—	—
Mizusawa		6·4	116	i 1 43	+ 5	3 2	+ 7	—	—	—
Osaka		7·7	170	i 1 53	0	i 3 22	0	—	—	—
Hukuoka		9·0	198	2 7	− 1	3 46	− 2	—	—	—
Copenhagen		70·6	330	i 10 32	− 2	—	—	—	—	—
Stuttgart		77·1	327	e 11 9	− 1	—	—	—	—	—
Tinemaha		77·4	51	i 11 13	+ 1	—	—	i 11 31	pP	—
Haiwee	z.	78·2	51	i 11 16	0	—	—	—	—	—
Pasadena		79·4	53	i 11 22a	− 1	—	—	—	—	—
Mount Wilson		79·5	53	i 11 23a	0	—	—	i 14 38	PP	—
Riverside	z.	80·0	53	i 11 25a	− 1	—	—	—	—	—
La Jolla	z.	80·9	54	i 11 32	+ 1	—	—	—	—	—
Clermont-Ferrand		82·0	328	e 11 35	− 1	—	—	—	—	—
Tucson		85·1	50	e 11 52	0	—	—	e 12 1	pP	—

Oct. 24d. Readings also at 8h. (Triest (2)), 9h. (Tucson), 12h. (Palomar, Riverside, Mount Wilson, Pasadena, Tinemaha, and Tucson), 16h. (Tucson), 17h. (Tananarive, Berkeley, Lick, near Branner, Fresno, Mizusawa, and Ottawa), 18h. (near Mizusawa, Ottawa, Tucson, Tacubaya, Baku, Sverdlovsk, Oaxaca, and Vladivostok), 19h. (Ottawa).

Oct. 25d. Readings at 0h. (Erevan and Triest), 2h. (near Perth), 3h. (Hukuoka), 4h. (Moncalieri), 7h. (Colombo, Kodaikanal, and Ksara), 10h. (Triest, Perth, and Ksara), 12h. (Ksara), 14h. (near Fordham and Harvard), 16h. (near Tananarive, Rome, and Andijan), 20h. (near Hukuoka).

Oct. 26d. 0h. 57m. 25s. Epicentre 0°·2S. 18°·0W.

$A = +\cdot9511$, $B = -\cdot3090$, $C = -\cdot0035$; $\delta = +8$; $h = +7$;
$D = -\cdot309$, $E = -\cdot951$; $G = -\cdot003$, $H = +\cdot001$, $K = -1\cdot000$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Granada		39·5	18	i 7 36	+ 2	e 13 50	+13	i 9 6	PP	21·9
Almeria		39·6	19	7 52	+17	14 5	+27	16 16	SS	19·2
Algiers		41·7	25	e 9 21	PP	e 16 51	SS	—	—	22·6
Toledo		41·9	16	i 7 55	+ 1	e 14 13	0	—	—	—
Clermont-Ferrand		49·4	19	e 8 54	+ 1	—	—	e 10 40	PP	—
Rome		50·1	29	i 8 56	− 3	i 16 11	+ 1	e 10 35	PP	e 21·9
San Juan		50·7	294	e 12 2	PPP	e 16 1	−17	—	—	—
Jersey		51·1	11	e 13 5	?	—	—	—	—	e 27·6
Paris		51·9	16	e 9 11	− 1	e 16 39	+ 4	—	—	e 25·6
La Paz	z.	52·0	249	9 13	0	16 45	+ 9	—	—	27·6

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Basle	52·5	21	e 9 16	− 1	e 16 46	+ 3	—	—	—
Kew	53·6	13	e 12 55	PPP	—	—	—	—	e 28·6
Uccle	54·3	16	—	—	17 5	− 2	—	—	e 23·6
Bermuda	54·7	310	—	—	e 18 5	S_cS	—	—	e 23·8
Bidston	54·8	9	e 12 39	PPP	—	—	—	—	e 27·6
Helwan	55·6	52	9 38	− 2	17 27	+ 2	11 50	PP	—
De Bilt	55·7	17	—	—	e 17 29	+ 3	—	—	e 24·2
Huancayo	58·1	256	—	—	e 17 52	− 6	e 21 50	SS	23·7
Ksara	60·7	50	i 10 16a	− 1	e 18 6	−26	—	—	—
Copenhagen	61·0	18	—	—	18 41	+ 6	—	—	26·6
Fordham	65·0	316	i 10 41	− 3	e 19 25	− 1	—	—	—
Philadelphia	65·5	315	—	—	e 18 35	−57	—	—	—
Ottawa	68·0	321	i 11 2	− 1	—	—	—	—	36·6
Pulkovo	70·5	23	e 13 55	PP	e 24 59	SS	—	—	33·1
Baku	73·4	47	e 11 49	+13	e 21 8	+ 3	—	—	38·6
Sverdlovsk	84·0	32	12 39	+ 6	e 22 50	− 7	—	—	39·6
Tucson	92·5	302	e 13 14	0	—	—	—	—	—

Additional readings :—
Rome eZ = +9m.9s., iZ = +9m.41s., i = +10m.5s., e = +10m.20s., iPPP = +11m.30s., e = +12m.58s., eSSZ = +19m.32s.
Helwan eZ = +12m.58s.
Long waves were also recorded at La Plata, Harvard, Stuttgart, East Machias, Rio de Janeiro, San Fernando, Hamburg, Prague, Vladivostok, Colombo, and Lincoln.

Oct. 26d. 21h. Undetermined shock.

Tuai P? = 27m.12s., S = 28m.13s.
Wellington eP = 27m.53s., S = 29m.21s.
Christchurch S? = 30m.31s.
Sydney e = 30m.36s. and 34m.57s., eL = 38·5m.
Brisbane iE = 30m.48s., eN = 34m.48s., eE = 35m.24s.
Riverview iPE = 30m.50s., eN = 31m.13s., eS?E = 35m.7s., eLE = 38·3m.
Melbourne e = 32m.37s., i = 36m.27s. and 39m.20s., eL = 40·4m.
Palomar iPZ = 38m.4s.
Mount Wilson iP = 38m.6s.
Pasadena ePNZ = 38m.6s., eL = 70·0m.
Riverside ePZ = 38m.7s.
Vladivostok e = 38m.7s., L = 39·5m.
Adelaide eP = 38m.9s., eS? = 42m.36s., e = 44m.23s.
Haiwee eN = 38m.17s.
Tinemaha ePEN = 38m.19s.
Huancayo eP = 40m.14s., eSKS = 49m.52s., ePS = 51m.7s., ePPS = 53m.11s., eSS = 56m.27s., eSSS = 60m.16s., eL = 65m.23s.
Tucson ePP = 42m.23s., ePPP = 44m.46s., eSKS = 49m.52s., eS = 50m.4s., ePPS = 51m.31s., eSSS = 60m.36s., eL = 65m.7s.
Perth i = 42m.33s., 42m.50s., 50m.17s., 56m.8s., 56m.47s., and 70m.43s.
Sverdlovsk e = 44m.33s., i = 48m.3s., e = 51m.54s.
Kodaikanal eE = 44m.0s.
Moscow i = 44m.56s.
Ksara ePKP = 45m.7s., i = 45m.26s., ePP = 48m.51s., PPS = 62m.15s.
Long waves were also recorded at Arapuni, New Plymouth, Ukiah, Paris, Uccle, De Bilt, Baku, Harvard, Fordham, East Machias, and Colombo.

Oct. 26d. Readings also at 0h. (near Manila, Frunse, and Andijan), 1h. (near Mizusawa), 2h. (near Tananarive and near Manila), 3h. (near Mizusawa), 5h. (Triest and La Paz), 7h. (Frunse and Andijan (2)), 8h. (Riverview, Sydney, Sverdlovsk, Vladivostok, and Manila), 12h. (Tacubaya), 13h. (Samarkand, Frunse, and Andijan), 16h. (near Andijan), 17h. (Ottawa), 19h. (La Paz), 21h. (Stonyhurst), 22h. (Erevan, Grozny, Vladivostok, and Baku), 23h. (La Paz, Pulkovo, and Sverdlovsk).

Oct. 27d. 1h. 36m. 32s. Epicentre 47°·8N. 69°·5W. (as on 1939, Oct. 19d.).

$A = +\cdot2361$, $B = -\cdot6315$, $C = +\cdot7385$; $\delta = -8$; $h = -5$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Seven Falls		1·1	233	i 0 25	+ 3	i 0 34	− 5	—	—	—
Shawinigan Falls		2·6	241	0 42	− 2	1 12	− 5	0 50	P_g	—
East Machias		3·4	153	e 1 2	P*	e 1 44	S*	—	—	—
Ottawa		4·9	243	i 1 12	− 5	i 2 6	− 9	1 23	P*	—
Harvard		5·5	196	i 1 23	− 2	i 2 11	−19	i 1 33	P*	—
Williamstown		5·7	208	i 1 28	0	—	—	—	—	—
Fordham		7·6	205	i 2 44	P_g	i 3 28	+ 5	i 3 44	S*	—
Florissant		17·6	248	—	—	e 7 21	− 2	e 7 33	SS	i 9·0
St. Louis	N.	17·6	246	—	—	e 7 0	−23	i 8 3	SSS	—

Additional readings :—
Shawinigan Falls i = +1m.2s.
Ottawa i = +1m.30s., iS* = +2m.21s.
Harvard iSZ = +1m.49s.
Fordham i = +4m.1s.
Florissant eSE = +7m.27s.
Long waves were also recorded at Cape Girardeau.

Oct. 27d. Readings also at 4h. (near Tananarive and near Samarkand), 5h. (Vera Cruz (2), Oaxaca (2), Tacubaya (2), Tucson, Mount Wilson, Palomar, and Riverside), 6h. (College, Huancayo, Sverdlovsk, Baku, Riverview, Ksara, Wellington, and Christchurch), 7h. (Samarkand), 8h. (Samarkand), 10h. (Manila), 11h. (near Zurich, Basle, Triest, near Stuttgart, Jena, Sydney, Christchurch, Wellington, Ksara, Riverview, and Huancayo), 12h. (Agra, Bombay, Pulkovo, Kodaikanal, near Almata, Baku, Sverdlovsk, Andijan, and Frunse), 14h. (Tuai, Wellington, New Plymouth, and Christchurch), 15h. (Pasadena, Palomar, Riverside, Mount Wilson, and Tucson), 20h. (Sverdlovsk and Baku), 21h. (Balboa Heights), 23h. (Frunse, Andijan, and Samarkand).

Oct. 28d. 2h. Local shock.

Intensity VI at Dubrovnik and Niksik.

J. Mihailovic.

Annuaire microseismique et macroseismique, annee XIX, 1939, Beograd 1940, p. 104.

Belgrade iP = 27m.31s.a, iZ = 27m.38s., iS = 28m.5s.
Triest e = 28m.14s., 28m.28s., and 29m.0s., SS = 29m.30s.
Zurich eP = 28m.16s., eS? = 30m.31s.
Rome e = 28m.54s., 29m.38s., and 30m.31s.
Stuttgart ePZ = 29m.31s., iNW = 29m.45s., eNW = 29m.54s., 30m.38s., and 32m.52s.
Chur e = 30m.9s.
Basle e = 30m.16s. and 31m.42s.
Jena eE = 31m.0s., eN = 31m.22s., eE = 31m.36s., eN = 31m.41s.

Oct. 28d. Readings also at 2h. (Christchurch and near Monowai), 6h. (Ksara), 10h. (Frunse, near Andijan, and Samarkand), 12h. (La Paz), 14h. (near Lick), 17h. (near Mizusawa), 18h. (Oaxaca), 19h. (Balboa Heights), 21h. (near Phu-Lien).

Oct. 29d. 0h. Undetermined shock. Epicentre probably in the Marianne Islands.

Miyakozima P = 48m.8s., S = 54m.12s.
Manila ePEZ = 50m.18s., SEN = 54m.11s., LEN = 56·5m.
Kobe P = 51m.7s.
Vladivostok e = 53m.3s. and 57m.5s., L = 60·1m.
Tokyo, Cen. Met. Obs. P = 56m.0s.
Sverdlovsk P = 57m.8s., S = 66m.49s., L = 80·5m.
Santa Barbara ePZ = 58m.14s.
Riverside iP = 58m.16s.
Haiwee ePNZ = 58m.19s.
Pasadena ePNZ = 58m.20s., iZ = 58m.32s.
La Paz ePZ = 65m.13s.
Ksara e = 67m.36s.
Baku e = 68m.31s., eL = 89·3m.

Oct. 29d. Readings also at 0h. (Sverdlovsk and Manila), 1h. (Rome), 3h. (near La Paz and Bermuda), 7h. (near Mizusawa), 11h. (Riverside, Pasadena, and Mount Wilson), 12h. (Salt Lake City), 13h. (Melbourne), 15h. (Hastings), 16h. (La Paz), 17h. (Sitka), 19h. (Balboa Heights, Christchurch, and Andijan), 22h. (Pasadena and Mount Wilson).

Oct. 30d. 13h. 12m. 37s. Epicentre 16°·6S. 174°·0W.

$A = -\cdot 9536$, $B = -\cdot 1002$, $C = -\cdot 2839$; $\delta = -1$; $h = +5$;
$D = -\cdot 105$, $E = +\cdot 995$; $G = +\cdot 282$, $H = +\cdot 030$, $K = -\cdot 959$.

Tables for depth of focus 0·015 have been used.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Apia		3·5	38	i 0 48a	− 6	i 2 21	+45	—	—	—
Arapuni		23·2	200	—	—	e 9 23	+28	i 10 23	SSS	—
Wellington		26·4	199	5 29	+ 3	10 33	SS	16 8	ScS	—
Christchurch		29·2	199	e 5 49	− 3	11 31	+58	13 31	L_g	e 16·0
Brisbane		32·3	245	i 6 17a	− 2	i 11 17	− 5	e 12 17	SS	—
Riverview		35·7	234	i 6 48	0	i 12 10	− 4	i 8 17	pP	—
Melbourne		41·6	231	i 7 38	+ 1	e 14 49	+66	i 9 23	PP	—
Adelaide		46·0	237	e 8 13	+ 1	i 14 39	− 7	e 10 46	PPP	—
Palau		56·2	291	9 30	+ 1	—	—	—	—	—
Perth		64·8	242	i 11 40	pP	i 18 53	− 3	i 20 13	sS	i 31·0
Tokyo, Cen. Met. Ob.		68·0	321	10 15	−32	—	—	—	—	—
Misima		68·1	320	10 46	− 2	—	—	—	—	—
Kobe		70·2	318	11 0	− 1	19 57	− 3	—	—	—
Manila		71·3	292	i 11 7k	0	20 23	+10	—	—	—
Mori		71·9	327	11 4	− 7	—	—	—	—	—
Santa Barbara		72·4	45	i 11 14	0	—	—	—	—	—
Branner		72·5	41	e 11 16	+ 2	—	—	—	—	—
Berkeley		72·8	41	i 11 16k	0	—	—	i 11 52	pP	—
Pasadena		73·3	46	i 11 19a	0	e 20 37	+ 1	e 11 53	pP	—
Mount Wilson		73·4	46	i 11 20a	0	—	—	i 11 57	pP	—
Fresno	N.	73·7	42	e 11 22	0	e 20 38	− 2	e 12 26	pP	—
Riverside		73·7	46	i 11 21	− 1	—	—	i 11 59	pP	—
Haiwee		74·5	44	i 11 28	+ 2	—	—	i 12 4	pP	—
Tinemaha		74·9	44	i 11 28a	0	—	—	—	—	—
Vladivostok		77·4	323	i 11 41	− 1	i 21 20	− 1	—	—	32·0
Tucson		77·5	51	e 11 44	+ 1	e 21 16	− 6	e 12 6	pP	e 31·7
Zinsen		77·5	316	11 42	− 1	—	—	—	—	—
Hong Kong		80·3	297	11 57	− 1	(21 48)	− 4	12 42	pP	21·8
College		83·6	11	e 12 11	− 4	e 22 16	− 9	17 42	PPP	—
Phu-Lien		86·3	293	e 12 31	+ 2	22 42	[+ 2]	—	—	—
Huancayo		94·7	104	e 18 57	PPP	23 42	[+13]	e 25 11	PS	e 38·1
La Paz	Z.	99·9	110	e 15 31	?	—	—	—	—	—
Calcutta	N.	103·1	290	e 18 18	PP	e 24 3	[− 8]	—	—	—
Kodaikanal	E.	110·5	276	e 18 23	[+ 6]	—	—	—	—	—
San Juan		111·6	76	e 14 36	pP	e 24 51	[+ 3]	e 19 31	pPP	—
Agra	E.	113·1	293	i 19 7	PP	i 24 51	[− 3]	i 28 41	PS	—
Almata		115·0	311	e 19 3	PP	—	—	—	—	—
Bombay		116·7	283	e 16 11	pP	i 25 11	[+ 3]	i 19 38	PP	—
Frunse		116·9	311	e 19 21	PP	—	—	—	—	—
Sverdlovsk		122·8	328	e 14 42	P	i 25 31	[+ 2]	e 19 51	PP	47·4
Pulkovo		133·4	343	e 21 25	PP	e 31 31	PS	e 33 12	PPS	62·9
Moscow		134·1	336	e 19 5	[+ 1]	e 31 35	PS	i 21 27	PP	—
Baku		135·3	312	e 19 9	[+ 4]	e 41 29	SSP	i 22 28	PP	61·4
Copenhagen		140·7	355	22 11	PP	—	—	—	—	—
De Bilt	Z.	144·6	1	i 19 21k	[0]	—	—	i 22 53	PP	—
Jena		145·5	354	e 19 23	[0]	—	—	e 19 49	pPKP	—
Prague		145·9	351	—	—	e 34 23?	PS	—	—	—
Uccle		145·9	3	i 19 26k	[+ 3]	—	—	22 49	PP	—
Paris		147·8	4	i 19 32	[+ 6]	—	—	—	—	46·4
Stuttgart	N.E.	147·8	356	e 19 30	[+ 4]	—	—	e 20 11	pPKP	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	Supp. m. s.		L. m.
Ksara		148·1	308	i 19 31a	[+ 4]	26 29	[+ 8]	i 20 13	pPKP	—
Basle		149·1	358	e 19 34	[+ 5]	—	—	—	—	—
Zurich		149·2	357	e 19 29	[0]	—	—	—	—	—
Chur		149·7	357	e 19 33	[+ 4]	—	—	—	—	—
Clermont-Ferrand		150·8	4	e 19 35	[+ 4]	—	—	—	—	—
Helwan		153·3	305	i 19 38k	[+ 3]	30 7	?	20 17	pPKP	—
Rome		154·2	348	e 19 37k	[+ 1]	—	—	i 19 59	pPKP	—
Toledo		155·2	18	i 20 5	pPKP	—	—	i 20 55	pPKP	44·9
Granada	Z.	157·8	20	e 20 19a	pPKP	32 41	PS	i 23 56	PP	—

Additional readings :—
Riverview eE = +12m.58s., iSN = +13m.15s., esSN = +14m.57s., iS_cSE = +16m.59s.
Melbourne i = +9m.55s., e = +17m.30s. and +22m.29s.
Adelaide i = +15m.42s. and +17m.57s.
Perth i = +13m.26s., +15m.31s., +21m.20s., and +26m.30s.
Pasadena esPZ = +12m.14s., iPPZ = +13m.51s.
Mount Wilson iPPZ = +14m.4s.
Tucson $ePcP$ = +12m.0s., esP = +12m.16s., ePP = +14m.39s., epPP = +15m.16s., ePPP = +16m.32s., epPPP = +16m.41s., $eScS$ = +21m.31s., epS = +21m.59s., ePS = +22m.26s., eSS = +26m.19s., eSSS = +29m.56s.
College epPP = +16m.1s., S = +22m.21s., esS = +23m.14s., SP = +23m.23s.
Huancayo esS = +24m.30s., ePS = +25m.30s., ePKKP = +29m.10s., esSS = +31m.10s., eSSS = +33m.54s.
Agra i = +25m.59s.
Sverdlovsk i = +16m.18s., e = +18m.58s., i = +20m.19s., e = +26m.41s., i = +27m.3s.
Pulkovo i = +12m.18s., e = +22m.55s., i = +23m.28s., e = +32m.8s.
Moscow i = +22m.23s. and +23m.32s., e = +28m.31s., +32m.27s., and +39m.55s.
Baku i = +23m.40s., e = +35m.47s.
Copenhagen i = +22m.41s., eN = +22m.53s., eZ = +23m.52s.
Ksara sPKP = +20m.30s., iPP = +23m.0s., SKKS = +29m.5s., SKSP = +32m.36s.
Clermont-Ferrand i = +19m.39s.
Helwan $sPcPZ$ = +19m.58s., sPKPZ = +20m.32s., iPPEZ = +23m.29s., ipPPZ = +24m.5s., SE = +30m.53s., $ScSE$ = +31m.8s., sSE = +32m.3s., PPSE = +33m.48s.
Rome eZ = +20m.54s., iPP = +23m.35s., eZ = +24m.31s., e = +30m.7s., iPSKS = +32m.5s., e = +32m.47s., +33m.38s., and +37m.27s.?, eSS = +40m.5s., e = +43m.37s., eSSS = +46m.27s. ?
Toledo e = +23m.44s. and +24m.21s.

Oct. 30d. 17h. 42m. 25s. Epicentre 0°·2N. 125°·2E. (as on 1939, June 13d.).

A = −·5764, B = +·8171, C = +·0035; $\delta = -10$; $h = +7$;
D = +·817, E = +·576; G = −·002, H = +·003, K = −1·000.

		Δ °	Az. °	P. m. s.	O−C. s.	S. m. s.	O−C. s.	Supp. m. s.		L. m.
Manila		14·9	344	e 3 41	+ 7	7 25	L	—	—	(7·4)
Kobe		35·6	15	7 2	+ 1	—	—	—	—	—
Nagoya		36·5	16	6 55	−14	—	—	—	—	—
Nagano		38·2	17	7 24	+ 1	13 18	+ 1	—	—	—
Riverview		41·7	147	e 8 1	+ 9	e 14 6	− 4	—	—	—
Calcutta	N.	42·2	305	e 9 58	PP	e 17 43	SS	—	—	—
Vladivostok		43·2	7	i 8 4	0	14 30	− 2	—	—	—
Mori		43·9	16	8 9	− 1	—	—	—	—	—
Kodaikanal		48·5	284	—	—	e 15 35?	−13	—	—	—
Agra	E.	52·6	305	e 12 37	PPP	—	—	—	—	—
Almata		60·7	322	e 10 16	+ 1	—	—	—	—	—
Frunse		62·0	320	e 10 26	+ 2	—	—	—	—	—
Andijan		62·5	317	10 27	− 1	18 52	− 2	—	—	—
Sverdlovsk		76·3	330	i 11 49	− 3	21 24	−13	—	—	37·6
Moscow		88·5	326	i 12 52	− 4	—	—	—	—	—
Ksara		89·3	304	i 12 59	0	e 24 59	PS	16 35	PP	—
Tinemaha		110·8	49	e 17 8	?	—	—	—	—	—
Haiwee		111·3	50	e 17 3	?	—	—	—	—	—
Pasadena		111·7	53	e 16 50	?	—	—	—	—	—
Mount Wilson	Z.	111·8	53	i 16 49	?	—	—	—	—	—
Riverside	Z.	112·4	53	e 16 49	?	—	—	—	—	—
Tucson		118·1	52	e 16 37	?	—	—	—	—	—

Oct. 30d. 22h. 0m. 57s. Epicentre 32°·5S. 179°·0W. (as on 1937 Sept. 1d.).

$A = -\cdot8449$, $B = -\cdot0147$, $C = -\cdot5347$; $\delta = -2$; $h = +1$;
$D = -\cdot017$, $E = +1\cdot000$; $G = +\cdot535$, $H = +\cdot009$, $K = -\cdot845$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tuai		7·0	205	1 27	−19	2 38	−30	—	—	3·3
Arapuni		7·1	216	e 1 39	− 9	—	—	—	—	3·5
New Plymouth		8·6	219	2 25	+16	3 58	+10	—	—	—
Wellington		10·1	208	e 2 30	+ 2	3 45	−40	—	—	4·8
Christchurch		12·9	209	—	—	4 47	?	—	—	—
Brisbane		24·7	276	e 5 21	− 3	e 9 27	−17	—	—	—
Riverview		25·0	259	e 5 26	− 1	e 11 1	?	—	—	e 12·3
Sydney		25·0	259	e 5 27	0	e 8 57	?	—	—	e 12·2
Melbourne		29·8	250	e 6 33?	+22	i 11 18	+11	—	—	15·1
Adelaide		35·2	254	e 8 43	PP	—	—	—	—	e 15·2
Perth		54·3	252	i 11 8	PP	i 14 6	?	—	—	i 27·2
Pasadena		87·5	47	e 12 47	− 4	—	—	—	—	e 46·0
Mount Wilson	Z.	87·7	47	i 12 48	− 4	—	—	—	—	—
Vladivostok		87·7	327	—	—	e 24 51	PS	—	—	44·2
Riverside	Z.	87·9	47	e 12 49	− 4	—	—	—	—	—
Haiwee		89·0	45	e 13 4	+ 6	—	—	—	—	—
Tinemaha	Z.	89·5	44	e 12 57	− 3	—	—	—	—	—
Tucson		91·0	51	e 13 8	+ 1	—	—	—	—	—
Huancayo		94·8	107	e 21 49	PKS	—	—	—	—	—
Kodaikanal	E.	106·8	272	e 18 3?	PKP	—	—	—	—	—
Sverdlovsk		133·0	320	e 19 6	[−12]	e 22 42	PKS	—	—	61·0
Moscow		145·6	324	e 19 37	[− 3]	—	—	—	—	—
Pulkovo		146·5	333	e 19 38	[− 4]	—	—	—	—	—
Ksara		150·8	281	e 20 8	PKP	34 5	SKSP	e 23 48	PP	—
Rome		166·9	318	e 19 59	[− 8]	e 32 11	{+23}	i 24 59	PP	e 87·3

Additional readings :—
Christchurch +4m.56s.
Adelaide e = +10m.13s., i = +11m.11s.
Perth i = +19m.8s. and +24m.48s.
Vladivostok e = +31m.32s.
Tucson eP = +13m.24s.
Rome ePKP$_3$ = +21m.10s., ePSKS = +35m.26s.?, e = +37m.6s.? and +40m.45s.
Long waves were also recorded at Calcutta, Colombo, Ukiah, La Paz, Baku, Helwan, De Bilt, Paris, and Granada.

Oct. 30d. Readings also at 2h. (Ksara, Kodaikanal, Helwan, Samarkand, and La Paz), 3h. (Manila and La Paz), 4h. (near Manila (2) and Samarkand), 5h. (near Manila), 12h. (Jena (2)), 13h. (Jena and near Manila), 17h. (Huancayo and La Paz), 18h. (Sverdlovsk, Vladivostok, Bunnythorp, and Wellington), 22h. (Andijan (2) and Frunse), 23h. (New Plymouth and near Wellington).

Oct. 31d. 6h. 47m. 14s. Epicentre 44°·2N. 10°·2E. (as on 1939 Oct. 15d.).

$A = +\cdot7079$, $B = +\cdot1274$, $C = +\cdot6947$; $\delta = -4$; $h = -3$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Moncalieri		1·9	294	i 0 42	P_g	1 2	S_g	—	—	—
Chur		2·7	350	e 0 47	+ 2	e 1 16	− 3	—	—	—
Rome		2·8	144	i 1 0	P_g	i 1 24	+ 2	i 1 30	S_g	i 1·8
Triest		2·9	60	e 0 48	0	i 1 25	+ 1	0 52	P*	e 2·0
Zurich		3·4	340	e 0 54	− 1	e 1 50	S_g	e 1 4	P*	—
Neuchatel		3·6	321	e 0 58	0	e 1 35	− 7	—	—	—
Basle		3·8	332	e 0 59	− 2	e 2 6	S_g	—	—	—
Besançon		4·2	317	—	—	i 1 58	+ 1	i 2 20	+ 1	—
Stuttgart		4·6	352	e 1 9	− 3	i 2 1	− 6	e 1 23	P*	—
Clermont-Ferrand		5·2	290	e 1 25	+ 4	—	—	—	—	—
Jena		6·8	9	e 1 33	−11	—	—	—	—	e 2·8
Uccle	N.	7·7	331	—	—	e 3 29	+ 4	—	—	—
Hamburg	N.	9·4	358	—	—	e 4 46?	S*	—	—	—

For Notes see next page.

NOTES TO OCT. 31d. 6h. 47m. 14s.

Additional readings :—
Rome i = +1m.16s., iS_g = +1m.42s.
Triest SS = +1m.45s.
Besançon i = +2m.40s.
Stuttgart ePZ = +1m.13s., iP_gNE = +1m.30s., iNE = +1m.39s., iNW = +2m.18s., iS^*NE = +2m.26s., iS_gNW = +2m.33s.
Jena eN = +2m.25s., eZ = +2m.28s.
Long waves were also recorded at Kew.

Oct. 31d. Readings also at 3h. (near Chur, Zurich, Basle, near Stuttgart, Triest, Rome, Tacubaya, Mount Wilson, Pasadena, Riverside, Tucson, and Tinemaha), 5h. (La Paz), 7h. (Andijan, Tinemaha, Tucson, Riverside, Pasadena, and Mount Wilson), 9h. (near Branner, Tucson, Riverside, Pasadena, and Mount Wilson), 12h. (Samarkand, Erevan, Grozny, Sverdlovsk, and Baku), 13h. (near Tananarive and Neuchatel), 16h. (Balboa Heights and Tucson), 17h. (near Mizusawa, Tucson (2), Pasadena, and Mount Wilson), 18h. (near Erevan, Grozny, Baku, and Istanbul), 20h. (Tacubaya and Bucharest), 21h. (De Bilt, Pulkovo, Belgrade, Ksara, Tacubaya (2), Bucharest, near Istanbul, Baku, Pasadena, Mount Wilson, Tucson, Sverdlovsk, Riverside, Tinemaha, near La Paz, Rome, and Triest), 22h. (Tacubaya), 23h. (Tucson).

Nov. 1d. 6h. 7m. 40s. Epicentre 16°·1S. 168°·3E. (as on 1939, August 12d.).

$A = -\cdot9413$, $B = +\cdot1949$, $C = -\cdot2756$; $\delta = -1$; $h = +6$;
$D = +\cdot203$, $E = +\cdot979$; $G = +\cdot270$, $H = -\cdot056$, $K = -\cdot961$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Brisbane		18·1	229	i 4 8	− 6	i 7 32	− 3	i 4 56	PP	—
Sydney		23·5	217	e 5 8	− 4	i 9 2	−21	—	—	—
Riverview		23·5	217	e 5 9	− 3	i 9 28	+ 5	—	—	e 11·3
Melbourne		29·9	218	e 7 43	PPP	i 11 28	+19	i 12 10	SS	14·1
Adelaide		32·5	230	e 5 42	−52	i 11 49	0	e 7 57	PPP	—
Perth		50·0	242	i 8 35	−23	i 16 17	+ 8	i 20 24	SS	25·7
Manila		55·8	301	e 9 45	+ 4	18 10	+42	—	—	29·3
Vladivostok		67·7	333	e 11 3	+ 2	i 20 1	+ 3	—	—	30·8
Santa Barbara	Z.	84·8	53	e 12 38	+ 1	—	—	—	—	—
Pasadena	Z.	85·9	53	i 12 44	+ 1	—	—	—	—	—
Mount Wilson	Z.	86·0	53	i 12 43	0	—	—	—	—	—
Riverside	Z.	86·4	53	i 12 46	+ 1	—	—	—	—	—
Haiwee		86·8	51	e 12 50	+ 3	—	—	—	—	—
Tinemaha		86·9	50	i 12 49	+ 1	—	—	—	—	—
Calcutta	N.	87·1	295	—	—	i 23 27	− 1	—	—	—
Colombo	E.	90·4	277	—	—	e 23 20?	[−15]	—	—	—
Tucson		91·0	57	e 13 8	+ 1	—	—	—	—	—
Huancayo		111·1	110	—	—	e 35 23	SSP	e 37 50	SSS	e 42·7
Baku		121·8	308	e 19 40	[+44]	e 28 24	{+58}	30 10	PS	e 59·5
Ksara		133·8	301	e 22 3	PP	—	—	e 23 36	PPP	73·0
Rome		146·9	325	i 19 39	[− 3]	—	—	i 23 12	PP	—

Additional readings :—
Brisbane iE = +6m.20s., iSE = +7m.38s.
Melbourne i = +12m.40s.
Adelaide i = +15m.16s. and +15m.54s.
Perth i = +24m.55s.
Tucson eP = +13m.19s.
Ksara e = +36m.58s.
Rome eE = +20m.40s., iN = +21m.43s.
Long waves were also recorded at Sverdlovsk, De Bilt, and Ukiah.

Nov. 1d. 11h. Undetermined shock.

Almata eP = 15m.35s., iS = 17m.33s.
Frunse eP = 15m.36s.
Tchimkent eP = 15m.36s., eS = 17m.37s.
Agra eE = 15m.58s., S = 16m.58s.
Bombay e?EN = 16m.20s., and 20m.33s., eE = 20m.51s. and 21m.27s., iEN = 22m.13s., iE = 22m.40s.
Samarkand eP = 16m.35s.
Sverdlovsk P = 18m.54s., S = 23m.20s., L = 25·6m.
Calcutta ePN? = 19m.18s., eSN? = 21m.45s., iLN = 22·8m., ePcPN = 25m.53s.
Grozny eP = 19m.20s., eS = 24m.20s., L = 32·5m.
Baku e = 20m.10s., 22m.57s., and 24m.42s.
Pulkovo e = 21m.6s. and 32m.32s.
Kodaikanal eE = 23m.20s., eSE = 25m.9s., LE = 26·2m.
Colombo iE = 24m.18s., LE = 28·2m.
Irkutsk e = 27m.0s.
Moscow e = 30m.19s., eL = 33·6m.

Nov. 1d. 19h. Undetermined shock.

La Paz iPZ = 12m.58s.a, SZ = 13m.55s., LZ = 14·1m.
Huancayo eP = 14m.30s., epP = 15m.9s., eS = 16m.47s., S = 16m.51s., iS = 17m.2s., L = 18·1m.
San Francisco eN = 19m.0s.
Tucson iP = 22m.19s.k, iPcP = 22m.43s., epP = 23m.11s., ePP = 24m.42s., eS = 30m.53s.
Lincoln eP = 22m.26s., ePPP = 26m.53s., eS = 31m.29s., esSS = 36m.33s.
La Jolla ePZ = 22m.48s.
Riverside iP = 22m.50s.k, ipPZ = 23m.47s.
Mount Wilson iP = 22m.54s.k, ipPNZ = 23m.51s.
Pasadena iP = 22m.54s.k, pPZ = 23m.51s.
Haiwee iPNZ = 23m.2s.
Tinemaha iP = 23m.6s.k.
Long waves were also recorded at San Juan.

Nov. 1d. Readings also at 0h. (Pasadena, Mount Wilson, Riverside, Tucson, Ukiah, Seattle, Bozeman, Butte, Fresno, and Fordham), 5h. (Riverview, Tucson, and Mount Wilson), 6h. (Riverside and Tinemaha), 7h. (Manila), 8h. (Tacubaya (2)), 9h. (Tucson and Pasadena), 10h. (Ksara and Tacubaya), 11h. (near Samarkand, Tchimkent, and Sitka), 17h. (Tucson), 18h. (Columbia), 20h. (Manila, Vladivostok, Sverdlovsk, Santa Barbara, Tinemaha, Haiwee, Pasadena, Mount Wilson, Riverside, Lincoln, and Tucson), 21h. (Tinemaha, Haiwee, Pasadena, Mount Wilson, Riverside, Lincoln, Tucson, and Huancayo), 22h. (Tucson).

Nov. 2d. Readings at 0h. (Sotchi, Grozny, and Erevan), 4h. (Balboa Heights), 5h. (Apia), 11h. (De Bilt and Tucson), 14h. (Ksara), 15h. (Huancayo, Rome (2), Sverdlovsk, Moscow, Baku, Rio de Janeiro, Ksara, and La Paz), 17h. (Ksara, Williamstown, Harvard, near Fordham, and Ottawa), 18h. (La Paz and Ottawa), 19h. (Ottawa), 20h. (Adelaide and Ottawa), 21h. (Butte, Mount Wilson, Tinemaha, Pasadena, Riverside, Fordham, and Tucson), 22h. (Bucharest).

Nov. 3d. 19h. 39m. 13s. Epicentre 16°·1S. 168°·3E. (as on Nov. 1d.).

A = −·9413, B = +·1949, C = −·2756; $\delta = -1$; $h = +6$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Brisbane		18·1	229	i 4 11	− 3	i 7 47	+12	—	—	—
Sydney		23·5	217	e 5 17	+ 5	e 9 44	+21	—	—	e 12·5
Riverview	N.	23·5	217	e 5 30	PP	e 9 42	+19	—	—	e 13·0
Melbourne		29·9	218	—	—	i 11 15	+ 6	i 13 54	?	16·0
Vladivostok		67·7	333	i 9 51	−70	e 25 12	SS	e 13 35	PP	27·7
Santa Barbara	Z.	84·8	53	e 12 37	0	—	—	—	—	—
Pasadena		85·9	53	e 12 41a	− 2	—	—	—	—	e 40·9
Mount Wilson		86·0	53	i 12 43a	0	—	—	—	—	—
La Jolla		86·1	54	e 12 44	0	—	—	—	—	—
Riverside		86·4	53	i 12 44a	− 1	—	—	—	—	—

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Haiwee	86·8	51	e 12 45	− 2	—	—	—	—	—
Tinemaha	86·9	50	e 12 53	+ 5	—	—	—	—	—
Tucson	91·0	57	e 13 8	+ 1	—	—	—	—	—
Lincoln	102·4	52	e 12 5	?	—	—	—	—	—
Sverdlovsk	113·0	325	e 18 10	[−29]	e 27 15	{+49}	—	—	49·8
Toledo	155·4	346	e 19 33	[−22]	—	—	—	—	—

Additional readings :—
Vladivostok e = +10m.6s., +10m.45s., +15m.34s., and +22m.2s.
Pasadena iZ = +12m.50s. and +13m.6s.
Riverside iZ = +12m.54s.
Long waves were recorded at Ksara.

Nov. 3d. Readings also at 2h. (College), 6h. (Manila and Samarkand), 7h. (Samarkand), 8h. (near Mizusawa and Sverdlovsk), 18h. (near Tananarive), 20h. (Baku, Pulkovo, Frunse, Grozny, Tchimkent, Rome, Fordham (2), and near Samarkand), 21h. (near Tananarive).

Nov. 4d. 10h. 15m. 19s. Epicentre 32°·5N. 49°·0E. (as on 1937, Nov. 19d.).

A = +·5544, B = +·6377, C = +·5347 ; δ = −8 ; h = +1 ;
D = +·755, E = −·656 ; G = +·351, H = +·404, K = −·845.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Baku		7·9	6	2 0	+ 1	i 3 29	− 1	—	—	4·0
Erevan		8·5	336	2 15	+ 8	4 46	S_g	—	—	—
Grozny		11·1	348	2 48	+ 5	6 0	L	—	—	(6·0)
Ksara		11·1	281	i 2 48k	+ 5	5 8	+19	—	—	6·4
Sotchi		13·3	329	3 12	− 1	7 28	L	—	—	(7·5)
Helwan	Z.	15·4	264	i 3 41k	+ 1	i 6 38	+ 6	i 3 56	PP	(e 8·5)
Samarkand		16·2	59	3 44	− 6	7 0	+ 9	—	—	10·7
Tchimkent		19·0	53	e 4 23	− 3	—	—	—	—	—
Bucharest		21·5	311	i 4 54	+ 2	i 8 48	+ 1	i 5 0	pP	—
Cernauti	N.	23·5	318	e 5 9a	− 3	9 23	0	—	—	14·7
Almata		24·5	55	e 5 29	+ 7	e 10 3	+23	—	—	14·7
Moscow		24·6	344	i 5 23	0	i 9 41	− 1	—	—	10·8
Dehra Dun	N.	24·9	87	e 5 16?	−10	e 9 37	−10	—	—	e 14·5
Belgrade		25·3	307	i 5 30k	0	i 10 4	+10	—	—	e 14·2
Bombay		25·3	117	e 5 31	+ 1	i 9 58	+ 4	i 6 7	PP	12·6
Sverdlovsk		25·6	14	i 5 32	0	9 57	− 2	13 53	L_g	17·2
Agra	E.	25·7	94	i 5 30a	− 3	10 1	0	6 14	PP	—
Szeged		26·0	311	i 5 39	+ 3	e 10 19	+13	e 6 15	PP	e 13·0
Kecskemet	Z.	26·6	312	e 5 41	− 1	e 10 22	+ 6	e 7 6	PPP	—
Semipalatinsk		29·2	42	e 6 6	+ 1	—	—	—	—	—
Pulkovo		30·0	341	i 6 11	− 1	e 11 6	− 4	—	—	e 14·0
Triest		30·1	307	6 12a	− 1	i 11 10	− 2	6 29	pP	e 14·7
Rome		30·4	299	i 6 15	− 1	i 11 15	− 1	i 7 18	PP	e 15·5
Hyderabad	E.	30·5	112	e 6 19	+ 2	11 19	+ 1	—	—	15·5
Prague		31·0	315	e 6 19	− 2	e 11 26	0	—	—	e 18·7
Jena		33·0	315	e 6 41	+ 2	—	—	e 7 57	PP	e 14·7
Chur		33·2	308	e 6 39	− 1	e 11 56	− 4	—	—	—
Stuttgart		33·8	311	e 6 44	− 2	e 12 4	− 6	i 7 55	PP	—
Zurich		34·0	309	i 6 46a	− 2	e 12 5	− 8	—	—	—
Moncalieri		34·2	304	e 5 11	?	i 12 19	+ 3	—	—	19·9
Upsala		34·3	333	e 6 46	− 4	e 12 6	−11	8 0	PP	e 18·7
Copenhagen		34·4	324	e 6 51a	0	12 19	0	—	—	—
Kodaikanal	E.	34·4	123	i 6 53k	+ 2	i 12 20	+ 1	—	—	—
Basle		34·7	309	e 6 51	− 3	e 12 19	− 5	—	—	—
Hamburg		34·8	319	i 6 53a	− 1	e 15 23	SSS	—	—	—
Neuchatel		35·0	308	e 6 55	− 1	e 12 22	− 6	—	—	—
Calcutta	N.	36·1	95	—	—	i 12 28	−17	e 16 34	SSS	e 18·0
Heligoland		36·2	320	e 7 13	+ 7	e 12 35	−12	—	—	e 16·7
De Bilt		37·2	316	i 7 4a	−11	e 12 58	− 4	—	—	18·7
Uccle		37·4	313	i 7 16a	0	i 13 4	− 1	i 8 43	PP	e 19·7

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Clermont-Ferrand		37·5	304	e 7 16	− 1	—	—	8 22	PP	e 25·7
Algiers		37·8	289	e 7 20	0	e 13 7	− 4	8 32	PP	17·5
Paris		38·2	309	e 7 30	+ 7	e 17 10	SS	—	—	e 24·7
Colombo	E.	38·4	125	7 26	+ 1	13 18	− 2	—	—	—
Almeria		42·1	291	7 56	+ 1	14 12	− 4	9 23	PP	—
Toledo		42·9	295	e 8 1	− 1	e 14 26	− 1	—	—	17·5
Granada		43·0	291	i 8 7a	+ 4	e 15 26	+57	10 14	P_cP	23·0
Irkutsk		44·1	46	e 8 13	+ 1	—	—	—	—	—
San Fernando		45·2	290	—	—	15 0	− 1	—	—	26·7
Phu-Lien		52·3	88	e 16 39	S	(e 16 39)	− 1	—	—	—
Hong Kong		58·0	82	17 54	S	(17 54)	− 3	—	—	—
Zi-ka-wei	z.	60·4	69	e 10 13	0	—	—	—	—	—
Manila		67·2	87	e 11 26	+28	19 53	+ 1	—	—	—
College		82·1	8	e 12 30	+ 6	e 22 40	+ 2	e 23 31	PPS	e 50·0
San Juan		100·0	299	—	—	e 24 22	[− 5]	e 32 15	SS	e 50·8
Bozeman		100·1	345	e 14 1	+12	e 24 16	[−11]	e 18 0	PP	e 41·0
Tinemaha	z.	109·8	349	e 29 39	PKKP	—	—	—	—	—
Mount Wilson	z.	112·4	348	e 19 19	PP	—	—	e 29 36	PKKP	—
Pasadena	z.	112·6	348	e 29 41	PKKP	—	—	—	—	e 66·3
Tucson		112·8	341	e 18 17	[−22]	e 25 2	[−21]	e 19 16	PP	e 45·3
Huancayo		125·2	279	e 32 25	PPS	—	—	—	—	e 56·5

Additional readings :—
Ksara P_g = +3m.50s.
Helwan PPZ = +4m.20s., eZ = +5m.16s., eL is given as eS.
Bucharest PPN = +5m.12s., pPP?N = +5m.15s., iN = +5m.57s., P_cPN = +8m.43s., iSE = +8m.51s., iSSEN = +9m.18s.
Belgrade eNW = +12m.18s.
Bombay iE = +11m.4s.
Agra SSE = +11m.19s.
Szeged eN = +7m.6s., eP_cP = +9m.1s., eSSE = +11m.11s.
Kecskemet eS?Z = +8m.22s.
Triest PP = +7m.0s., PPP = +7m.17s., i = +11m.27s., e = +11m.31s., sS = +21m.37s., SS = +12m.53s., i = +14m.25s.
Rome e = +9m.22s. and +14m.15s.
Jena e = +8m.29s.
Stuttgart iNW = +7m.23s., eSE = +12m.9s., eSSN = +13m.43s.
Upsala eSE = +12m.10s., iS = +12m.18s., iSSN = +14m.16s., SSS = +14m.41s.?
Copenhagen i = +6m.57s.
Calcutta eN = +11m.37s.
De Bilt iZ = +7m.15s.
Uccle SS = +15m.52s.
Algiers e = +9m.10s. and +10m.48s.
Paris e = +21m.11s.
Almeria PPP = +9m.56s.
Granada P_cS = +13m.42s., S_cS = +18m.37s.
College eS = +22m.45s.
San Juan eS = +25m.17s., eSSS = +35m.48s.
Bozeman ePPP = +20m.1s., eS = +25m.6s., ePS = +26m.58s., ePPS = +27m.27s., ePKKP = +29m.44s., eSS = +32m.0s.
Tucson ePPP = +21m.47s., eS = +27m.6s. and +27m.13s., ePS = +28m.49s., ePKKP = +29m.4s., ePPS = +29m.42s., eSS = +34m.33s., eSSS = +39m.8s.
Long waves were also recorded at Bergen, Cape Town, Kew, Bidston, Jersey, Stonyhurst, Tananarive, Rio de Janeiro, and La Paz.

Nov. 4d. Readings also at 0h. (near Port au Prince), 1h. (near Port au Prince), 2h. (Bozeman), 3h. (near Port au Prince and La Paz), 5h. (Kodaikanal, Harvard, Colombo, Agra, Bombay, and Ksara), 6h. (Calcutta), 7h. (Calcutta, Ksara, Kodaikanal, Bombay, Agra, Colombo, Sverdlovsk, and Baku), 8h. (Mizusawa and Tucson), 12h. (Helwan, Sverdlovsk, Baku, and Ksara), 14h. (Lick, Fresno, Berkeley, near Branner, Riverside, Mount Wilson, Tinemaha, Bucharest, and Pasadena), 18h. (near Grozny and Ksara), 19h. (Ksara, Pasadena, and Riverside), 21h. (Tucson), 23h. (Moncalieri, Zurich, Basle, Triest, and Tucson).

Nov. 5d. 2h. 2m. 8s. Epicentre 7°·4N. 34°·3W.

$A = +\cdot8193$, $B = -\cdot5589$, $C = +\cdot1280$; $\delta = +1$; $h = +7$;
$D = -\cdot564$, $E = -\cdot826$; $G = +\cdot106$, $H = -\cdot072$, $K = -\cdot992$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
San Juan		32·8	293	e 6 25	−12	11 55	+ 1	—	—	e 13·7
Bermuda		37·7	315	—	—	e 13 7	− 3	—	—	15·7
San Fernando		38·6	37	e 9 35	PPP	—	—	—	—	23·4
Granada		40·7	38	i 7 54k	+10	13 41	−14	i 9 19	PP	20·2
La Paz		41·0	234	i 7 46a	0	14 5	+ 6	9 20	PP	20·9
Almeria		41·2	40	7 35	−13	13 57	− 5	9 27	PP	—
Toledo		42·2	35	e 7 56	0	e 14 17	0	—	—	18·3
Algiers		44·8	44	e 8 18	+ 1	e 14 52	− 3	e 10 3	PP	e 22·9
Huancayo		45·1	245	e 8 22	+ 2	i 15 1	+ 2	e 10 6	PP	i 18·3
East Machias		47·0	328	e 8 35	0	e 15 9	−17	e 10 21	PP	e 18·9
La Plata		47·6	206	7 58	−41	15 34	− 1	—	—	22·5
Harvard		47·9	323	i 8 44	+ 2	—	—	—	—	—
Fordham		48·4	321	i 8 52a	+ 6	i 15 54	+ 8	—	—	e 21·9
Williamstown		49·1	322	i 8 52	+ 1	—	—	—	—	—
Jersey		49·7	26	—	—	e 16 32	+28	e 22 22	?	—
Clermont-Ferrand		50·0	33	e 8 57	− 1	—	—	—	—	23·3
Vermont		50·1	324	—	—	e 16 17	+ 7	—	—	e 21·6
Columbia		50·5	309	e 11 57	PPP	e 16 15	− 1	—	—	—
Kew		52·1	26	—	—	e 16 51	+13	—	—	i 24·0
Pittsburg	z.	52·3	317	i 9 17	+ 2	—	—	—	—	—
Neuchatel		52·9	35	e 9 18	− 2	—	—	—	—	—
Stonyhurst		53·0	23	—	—	i 17 0	+10	—	—	23·9
Basle		53·5	34	e 9 24	0	—	—	—	—	—
Rome		53·7	43	e 9 18	− 8	e 16 58	− 1	e 11 24	PP	e 20·8
Uccle		53·8	29	—	—	i 17 4	+ 3	—	—	e 23·9
Zurich		54·0	35	e 9 31	+ 3	—	—	—	—	—
De Bilt		55·0	28	—	—	e 23 45	SSS	—	—	—
Stuttgart		55·1	34	e 10 2	+26	—	—	—	—	e 26·4
Triest		56·2	39	e 9 41	− 3	17 36	+ 3	e 12 3	PP	27·9
Chicago		58·2	315	e 9 54	− 4	e 18 1	+ 2	—	—	e 26·7
Prague		58·7	34	—	—	e 18 9	+ 3	—	—	—
Bucharest		63·9	43	e 15 52?	?	—	—	—	—	38·9
Helwan		65·2	61	10 42	− 3	19 29	+ 1	13 7	PP	—
Upsala		65·2	26	—	—	e 19 23	− 5	—	—	e 32·9
Ksara		69·5	57	i 11 10a	− 2	e 20 32	+12	15 22	PPP	—
Tucson		74·7	301	e 11 44	+ 1	e 21 11	− 8	e 14 26	PP	e 30·5
Bozeman		75·5	315	e 11 43	− 5	e 21 37	+ 9	e 22 16	PS	e 36·0
La Jolla		80·1	302	e 12 14	+ 1	—	—	—	—	—
Riverside		80·2	303	i 12 14	0	—	—	—	—	—
Haiwee		80·6	305	e 12 16	0	—	—	—	—	—
Mount Wilson		80·7	303	i 12 17	+ 1	—	—	—	—	—
Pasadena	z.	80·8	303	e 12 17	0	—	—	—	—	—
Tinemaha		80·8	306	e 12 18	+ 1	—	—	—	—	—
Santa Barbara		82·1	303	e 12 22	− 2	—	—	—	—	—
Ukiah		84·5	308	—	—	e 23 16	S_cS	e 27 41	SS	—
Sverdlovsk		86·5	33	12 50	+ 4	23 24	+ 2	29 10	SS	34·9
Colombo	E.	112·8	79	—	—	e 35 22	SS	—	—	—

Additional readings :—
Granada $P_cP = +10$m.16s.
La Paz SS = +17m.2s.
Almeria e = +13m.2s.
Algiers e = +17m.32s.
Huancayo PPP = +10m.39s.
East Machias $eP_cP = +10$m.1s., ePPP = +11m.1s., $eS_cS = +17$m.55s.
Fordham i = +9m.48s.
Clermont-Ferrand e = +9m.39s.
Kew iN = +23m.43s.
Pittsburgh iZ = +9m.22s., eZ = +10m.13s.
Basle e = +15m.2s.
Rome ePP = +10m.15s., e = +12m.32s., iZ = +14m.57s., iSN = +15m.53s.

Continued on next page.

Triest +10m.30s., +11m.20s., and +11m.52s., ePPP = +12m.52s.?, e = +13m.39s., +14m.48s. and +19m.19s., SS = +21m.52s.?, e = +25m.10s. and +25m.25s.
Tucson ePPP = +16m.14s., eS$_c$S = +21m.54s.
Bozeman eSS = +26m.40s.
Long waves were also recorded at Scoresby Sund, Hamburg, Heligoland, Paris, Vladivostok, Irkutsk, and Rio de Janeiro.

Nov. 5d. Readings also at 3h. (Zurich, Neuchatel, and near Basle), 5h. (Almata), 7h. (Ksara), 8h. (Manila and Basle), 16h. (Fresno, Branner, Berkeley, near Lick, San Francisco, and Tucson).

Nov. 6d. Readings at 0h. (near Mizusawa), 1h. (Bagnères), 4h. (near Tananarive and Calcutta), 6h. (near La Paz), 7h. (near Manila), 8h. (Tucson), 12h. (Mizusawa), 16h. (Tucson and St. Louis), 17h. (La Paz), 18h. (La Paz and Columbia), 20h. (near Huancayo), 21h. (Tucson, San Juan, La Paz, Mount Wilson, La Jolla, Pasadena, and Riverside), 22h. (La Paz and Huancayo).

Nov. 7d. 3h. 53m. 22s. Epicentre 24°·4N. 120°·7E.

A = −·4655, B = +·7839, C = +·4108; δ = −5; h = +4;
D = +·860, E = +·511; G = −·210, H = +·353, K = −·912.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Taityu		0·3	180	0 8	− 3	0 13	− 5	—	—	—
Sintiku		0·5	34	0 14	0	0 21	− 2	—	—	—
Arisan		0·9	174	0 23	+ 3	0 35	+ 1	—	—	—
Karenko		0·9	117	0 19	− 1	0 32	− 2	—	—	—
Giran		1·0	69	0 21	0	0 34	− 2	—	—	—
Taihoku		1·0	50	0 19	− 2	0 35	− 1	—	—	—
Hokoto		1·4	230	−0 16	−43	0 11	−35	—	—	—
Tainan		1·4	198	0 29	+ 2	0 49	+ 3	—	—	—
Taito		1·7	166	0 33	+ 2	0 55	+ 1	—	—	—
Kosyun		2·4	179	0 41	0	1 17	+ 5	—	—	—
Hong Kong		5·5	251	1 46	P$_g$	2 56	S$_g$	—	—	3·7
Zi-ka-wei		6·8	6	e 1 40	− 4	3 8	+ 5	i 3 43	S$_g$	i 4·0
Manila		9·8	177	e 2 28	+ 4	4 51	S*	—	—	6·1
Phu-Lien		13·5	257	e 3 15	0	e 6 10	SS	—	—	7·1
Osaka		16·4	48	e 4 3	+10	e 7 9	+13	e 4 23	PPP	—
Calcutta	N.	29·7	273	e 10 25	S	(e 10 25)	−41	e 13 32	SSS	i 18·5
Irkutsk		30·5	340	e 3 38?	?	e 8 8	?	—	—	12·6
Almata		40·4	310	e 8 34	+53	—	—	—	—	—
Colombo	E.	42·8	253	e 12 8	?	—	—	—	—	—
Kodaikanal		43·4	260	e 13 38?	P$_c$S	—	—	—	—	—
Bombay		44·7	273	e 13 23	P$_c$S	e 15 2	+ 8	e 18 30	SSS	—
Samarkand		47·3	302	e 8 31	− 6	—	—	—	—	—
Sverdlovsk		53·6	324	e 9 24	− 1	—	—	28 38?	L$_q$	32·8
Moscow		66·4	322	e 10 53	0	—	—	—	—	e 36·2
College		68·8	27	—	—	e 19 49	−22	—	—	—
Ksara		72·8	300	e 11 45	+13	e 22 36	PS	e 14 49	PP	—
Helwan		77·7	298	e 12 1	+ 1	e 21 56	+ 4	—	—	—

Additional readings:—
Hokasyo P = +53m.57s., S = +54m.27s.
Zi-ka-wei iE = +3m.33s.
Calcutta ePPN = +11m.15s., eSN = +15m.20s., eSSN = +16m.45s., eS$_c$SN = +21m.9s.
Moscow e = +7m.48s. and +29m.17s.
Long waves were also recorded at Frunse, Jersey, Upsala, Kew, Hukuoka, Uccle, De Bilt, Baku, Prague, Bergen, Stonyhurst, and Bidston.

Nov. 7d. 15h. 43m. 54s. Epicentre 18°·0N. 72°·0W.

Intensity VI-VII at Port au Prince. Observatoire Meteorologique du Seminaire St. Martial, Port au Prince, Relève des Macroseismes de 1938-1946.

$A = +\cdot2941$, $B = -\cdot9051$, $C = +\cdot3071$; $\delta = +1$; $h = +5$;
$D = -\cdot951$, $E = -\cdot309$; $G = +\cdot095$, $H = -\cdot292$, $K = -\cdot952$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Port au Prince		0·6	330	i 0 14	− 1	i 0 21	− 5	—	—	—
San Juan		5·5	84	e 1 26	+ 1	2 34	+ 4	—	—	i 3·7
Balboa Heights		11·6	220	e 2 6?	−44	—	—	—	—	e 13·1
Fordham		22·8	357	e 5 7	+ 2	e 9 12	+ 1	—	—	e 11·5
Williamstown		24·7	359	e 5 20	− 4	—	—	—	—	—
Chicago		27·2	333	e 6 9	PP	—	—	—	—	e 16·1
Huancayo		30·0	186	e 6 29	+17	e 11 22	+12	—	—	e 14·6
La Paz	z.	34·5	173	e 6 57	+ 5	—	—	—	—	21·1
Tucson		37·7	300	e 7 19	0	e 12 49	−21	e 8 29	PP	e 15·3
Bozeman		42·5	319	e 8 17	+18	e 14 16	− 6	e 10 31	PPP	e 17·1
Riverside	z.	43·4	301	e 8 5	− 1	—	—	—	—	—
Mount Wilson	z.	44·0	301	e 8 8	− 3	—	—	i 9 56	P_cP	—
Pasadena	z.	44·1	301	e 8 11	− 1	—	—	i 9 55	P_cP	e 29·1
Tinemaha		44·7	305	e 8 17	+ 1	—	—	—	—	—
Santa Barbara	z.	45·4	301	e 8 21	− 1	—	—	—	—	—

Additional readings:—
Huancayo eS = +11m.37s.
Tucson eP = +8m.20s., ePPP = +9m.2s.
Bozeman eP = +8m.29s., eS = +14m.46s.
Long waves were also recorded at Lincoln, Sitka, and College.

Nov. 7d. Readings also at 0h. (La Paz), 2h. (Ottawa, Manila, and Williamstown), 3h. (Samarkand), 4h. (Riverside, Tucson, Mount Wilson, and Pasadena), 6h. (near Branner), 8h. (Honolulu, Riverside, Pasadena, Mount Wilson, and Tucson), 18h. (La Jolla, Lick, Fresno, Haiwee, Santa Barbara, Tinemaha, Tucson, Mount Wilson, Pasadena, and Riverside), 22h. (Frunse, Samarkand, and Almata).

Nov. 8d. 17h. 21m. 10s. Epicentre 36°·2N. 58°·0E. (as on 1938 Dec. 19d.).

$A = +\cdot4286$, $B = +\cdot6860$, $C = +\cdot5880$; $\delta = +4$; $h = 0$;
$D = +\cdot848$, $E = -\cdot530$; $G = +\cdot312$, $H = +\cdot499$, $K = -\cdot809$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Baku		7·6	306	i 2 20	P*	3 40	S*	—	—	—
Erevan		11·3	295	e 2 48	+ 2	e 5 13	SS	—	—	—
Grozny		11·8	311	2 52	− 1	e 5 6	0	—	—	11·1
Frunse		14·4	57	e 3 26	− 1	e 6 4	− 5	i 6 50	SSS	(i 8·2)
Ksara		18·3	267	i 4 18	+ 1	i 7 57	+18	8 38	SS	—
Agra	E.	19·2	111	4 27	− 1	8 7	+ 8	—	—	—
Sverdlovsk		20·7	5	e 4 40	− 4	8 31	0	10 2	L_g	12·6
Bombay		21·6	138	i 4 57	+ 3	i 9 4	+15	i 5 16	PP	12·7
Istanbul		23·1	290	5 2	− 6	9 24	+ 8	—	—	15·1
Helwan		23·2	261	5 10	+ 1	9 23	+ 5	10 20	SS	12·7
Moscow		24·0	332	5 17	0	9 37	+ 5	—	—	14·5
Bucharest		25·5	298	e 5 34	+ 2	10 16	+19	e 6 31	PP	17·1
Hyderabad	E.	26·0	131	e 6 7	+31	10 52	SS	—	—	14·5
Belgrade	N.W.	29·6	298	—	—	e 13 31	SSS	—	—	e 20·6
Calcutta	N.	29·6	108	e 6 41	+32	e 11 13	+ 9	e 12 6	SS	i 16·6
Pulkovo		29·6	332	e 6 26	+17	e 11 35	+31	—	—	14·2
Kodaikanal	E.	31·3	141	e 6 50?	+26	—	—	—	—	—
Prague		34·2	308	e 11 8	?	e 16 40	?	—	—	e 18·8
Upsala		35·1	325	—	—	e 13 50?	SS	e 15 50?	SSS	e 18·8
Colombo	E.	35·4	141	—	—	12 51	+17	—	—	18·2

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.	L.
	°	°	m. s.	s.	m. s.	s.	m. s.	m.
Rome	35·5	293	e 8 3	PP	i 13 32	+56	8 45 PPP	e 18·4
Irkutsk	36·2	49	—	—	e 12 50?	+ 3	— —	19·8
Hamburg	37·4	313	—	—	e 12 50?	−15	— —	e 19·8
Toledo	48·1	294	e 8 42	− 1	—	—	— —	—
Manila	59·8	94	e 14 39	PPP	22 40	SS	— —	32·8
Bozeman	97·9	352	e 11 3	?	—	—	— —	—

Additional readings :—
Frunse L is given as S.
Bombay eEN = +9m.26s.
Helwan eE = +9m.50s.
Bucharest eEN = +8m.0s., eE = +9m.18s., iE = +11m.12s., iN = +11m.16s.
Calcutta eN = +14m.3s., eS$_c$SN = +17m.8s.
Upsala eN = +16m.3s.
Rome e = +10m.11s. and +16m.4s.
Long waves were also recorded at Vladivostok, La Paz, Fordham, Huancayo, Phu-Lien, Cape Town, Zi-ka-wei, College, and other European stations.

Nov. 8d. Readings also at 1h. (Tucson, Mount Wilson, Riverside, and Pasadena), 2h. (Manila), 3h. (Tucson (2)), 5h. (Tucson, Fordham, and Williamstown), 6h. (near Ottawa), 10h. (Almata and Frunse), 11h. (near Grozny), 13h. (San Francisco, Branner, near Lick, Fresno, near Berkeley, and Huancayo), 14h. (La Paz and College), 16h. (Edinburgh), 17h. (Tucson and near Manila), 18h. (Bucharest), 19h. (Brisbane, Agra, Adelaide, Sydney, Riverside, Ukiah, Ksara, Colombo, Kodaikanal, Tucson, Pasadena, Riverside, Mount Wilson, and Huancayo), 20h. (Sverdlovsk, La Paz, and Baku), 21h. (near Baku and Grozny).

Nov. 9d. 16h. 6m. 24s. Epicentre 12°·5N. 143°·0E.

A = −·7799, B = +·5877, C = +·2151; δ = −10; h = +6;
D = +·602, E = +·799; G = −·172, H = +·129, K = −·977.

Tables for depth of focus 0·010 have been used.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.	L.
		°	°	m. s.	s.	m. s.	s.	m. s.	m.
Manila		21·5	278	e 4 46	+ 4	8 40	+10	— —	—
Koti		22·7	340	4 54	0	9 39	SS	— —	—
Osaka		23·1	345	3 57	−61	8 9	−49	— —	—
Nagoya		23·2	349	5 2	+ 3	—	—	— —	—
Tokyo		23·2	353	4 59	0	9 26	+26	— —	—
Sendai		25·7	357	5 26	+ 3	9 49	+ 7	— —	—
Vladivostok		32·1	345	e 6 14	− 6	i 11 18	− 6	— —	14·5
Irkutsk		50·4	330	e 8 46	− 3	e 15 41	−13	— —	e 26·6
Calcutta	N.	52·8	289	e 9 40	+32	i 16 17	−10	— —	—
Almata		64·1	313	e 10 31	+ 5	—	—	— —	—
Sverdlovsk		75·5	327	i 11 33	− 2	20 59	− 7	— —	34·6
Baku		84·3	310	12 26	+ 4	22 35	− 3	— —	41·6
Grozny		86·7	314	e 12 37	+ 3	—	—	— —	—
Moscow		88·3	327	e 12 40	− 2	e 22 53	[− 6]	— —	52·1
Haiwee		89·9	53	i 12 49	0	—	—	— —	—
Pasadena		90·2	55	i 12 50k	− 1	—	—	— —	—
Pulkovo		90·3	333	e 12 51	0	e 23 33	− 2	— —	e 49·1
Riverside		90·9	55	i 12 53k	− 1	—	—	— —	—
La Jolla	z.	91·3	56	i 12 55	− 1	—	—	— —	—
Tucson		96·7	55	e 13 21	+ 1	—	—	— —	—
Ksara		96·9	306	e 13 16	− 5	e 27 14	PPS	— —	55·6
La Paz	z.	149·6	102	19 39	[+ 6]	—	—	— —	—

Additional readings :—
Calcutta iN = +17m.19s.
Tucson eP = +14m.4s.—

Nov. 9d. Readings also at 1h. (Vladivostok, Morioka, Gihu, Nagano, Sikka, Pasadena, Haiwee, Irkutsk, Mount Wilson, Santa Barbara, Tinemaha, Riverside, Sverdlovsk, and Tucson), 5h. (La Paz and Huancayo), 9h. (Manila, La Paz, and Sverdlovsk), 10h. (Baku), 11h. (Huancayo and Adelaide), 12h. (Mizusawa, Sverdlovsk, and Baku), 13h. (Sydney, Riverview, Ksara, and Adelaide), 14h. (Huancayo), 17h. (Moncalieri, Frunse, Samarkand, and Almata), 18h. (Merida and Tucson), 19h. (Melbourne), 22h. (near Granada).

Nov. 10d. 16h. 49m. 36s. Epicentre 54°·2S. 159°·0E.

$A = -\cdot5485$, $B = +\cdot2106$, $C = -\cdot8092$; $\delta = +1$; $h = -7$;
$D = +\cdot358$, $E = +\cdot934$; $G = +\cdot755$, $H = -\cdot290$, $K = -\cdot588$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Christchurch		13·9	46	i 3 21a	0	e 5 43	−14	—	—	—
Wellington		16·7	45	(i 3 53)	− 4	i 3 53	P	—	—	—
Melbourne		19·0	325	e 4 19	− 7	e 7 52	− 3	—	—	—
Arapuni		19·7	43	—	—	e 8 18	+ 8	—	—	—
Riverview		21·1	343	i 4 47	− 1	i 8 44	+ 5	—	—	—
Sydney		21·1	343	i 4 42	− 6	i 8 42	+ 3	—	—	10·6
Adelaide		24·0	316	i 5 19	+ 2	i 9 37	+ 5	—	—	i 11·6
Brisbane		27·1	349	i 5 48	+ 2	e 10 18	− 6	—	—	—
Perth		37·8	289	i 5 29	?	i 13 24	+13	—	—	16·0
Manila		75·8	322	e 13 38	?	21 43	+12	—	—	30·6
Colombo	E.	89·2	283	—	—	e 23 54	+ 7	—	—	—
Kodaikanal	E.	93·3	283	—	—	e 24 24?	0	—	—	—
Calcutta	N.	97·4	298	—	—	e 23 50	[−24]	—	—	—
Huancayo		99·6	126	—	—	e 24 45	[+20]	e 25 39	S	42·1
Pasadena	Z.	113·0	64	i 30 11	PPS	—	—	—	—	—
Mount Wilson	Z.	113·2	64	i 30 11	PPS	—	—	—	—	—
Riverside	Z.	113·3	64	i 30 14	PPS	—	—	—	—	—
Haiwee	Z.	114·7	62	i 30 10	PPS	—	—	—	—	—
Tucson		115·5	70	e 18 48	[+ 4]	e 25 40	[+ 6]	e 21 1	PPP	—
Baku		132·0	284	e 22 24	PP	e 34 54	PPS	e 37 42	?	54·6
Ksara		135·7	266	e 19 30	[+ 7]	e 25 18	PPP	e 37 19	?	62·4
Sverdlovsk		136·3	308	—	—	e 40 23	SS	e 45 23	SSS	54·9
Granada		159·2	221	e 21 3a	PKP_2	e 26 41	[−23]	24 46	PP	82·5
Uccle		164·2	267	—	—	e 45 24	SS	—	—	e 73·4

Additional readings :—
Melbourne iP = +4m.29s.
Riverview iEN = +4m.54s.
Adelaide i = +5m.24s., +7m.21s., +8m.14s., and +9m.48s.
Brisbane eN = +8m.54s., eEN = +11m.30s.
Perth i = +11m.19s. and +12m.47s.
Huancayo ePS = +27m.12s., SS = +32m.39s., eSSS = +36m.24s.
Tucson eS = +27m.32s., ePPS = +30m.42s., eSS = +34m.12s., eSSS = +40m.50s.
Granada SKSP = +31m.24s.
Long waves were also recorded at Bombay, Irkutsk, Bozeman, and other European stations.

Nov. 10d. 20h. 20m. 48s. Epicentre 9°·4S. 148°·9E.

$A = -\cdot8449$, $B = +\cdot5097$, $C = -\cdot1623$; $\delta = -1$; $h = +7$;
$D = +\cdot517$, $E = +\cdot856$; $G = +\cdot139$, $H = -\cdot084$, $K = -\cdot987$.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Brisbane	18·4	168	i 4 12	− 6	i 7 48	+ 7	i 4 42	PP	—
Riverview	24·4	175	i 5 24a	+ .3	i 9 42	+ 3	—	—	e 12·8
Sydney	24·4	175	—	—	e 9 40	+ 1	—	—	—
Adelaide	27·1	199	e 5 45	− 1	i 10 21	− 3	i 6 26	PP	e 14·2
Melbourne	28·5	186	—	—	i 10 52	+ 6	—	—	13·9
Manila	36·5	310	e 7 6	− 3	12 52	+ 1	—	—	17·2
Perth	38·0	229	9 47	PPP	i 13 17	+ 3	10 32	PP	18·6
Christchurch	39·8	153	e 7 43	+ 7	13 41	− 1	—	—	—
Taito	42·0	321	7 54	0	—	—	—	—	—
Kagosima	44·4	337	8 15	+ 1	—	—	—	—	—

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Nagoya		45·7	347	8 28	+ 4	—	—	—	—	—
Tokyo Cen. Met. Ob.		45·7	350	8 23	− 1	15 10	+ 2	—	—	—
Hong Kong		46·4	314	8 31	+ 1	15 20	+ 2	10 20	PP	—
Nagano		46·9	349	8 34	0	—	—	—	—	—
Sendai		48·0	352	8 44	+ 1	14 43	−58	—	—	—
Phu-Lien		51·2	307	e 9 10	+ 3	—	—	—	—	—
Vladivostok		54·5	345	e 9 30	− 2	i 17 16	+ 6	—	—	27·2
Calcutta	N.	67·3	300	e 7 44	?	i 20 0	+ 6	—	—	—
Colombo	E.	70·7	281	11 20	0	20 36	+ 2	—	—	36·2
Irkutsk		72·3	333	e 11 30	+ 1	20 54	+ 2	—	—	e 36·2
Kodaikanal	E.	73·7	284	i 11 38a	0	i 21 12	+ 4	—	—	—
Bombay		80·1	291	i 12 16	+ 3	i 22 16	− 8	e 15 1	PP	—
Almata		83·6	316	e 12 30	− 2	—	—	—	—	—
College		87·5	22	—	—	e 23 30	− 1	—	—	e 36·7
Samarkand		89·8	310	e 11 18	?	—	—	—	—	—
Sverdlovsk		96·9	326	13 31	− 3	24 9	[− 2]	e 17 28	PP	41·2
Pasadena		97·6	56	e 13 38	0	—	—	—	—	e 48·7
Mount Wilson	Z.	97·7	56	e 13 37	− 1	—	—	—	—	—
Haiwee	Z.	98·0	54	e 13 41	+ 2	—	—	—	—	—
Riverside	Z.	98·3	56	e 13 39	− 2	—	—	—	—	—
Tucson		103·6	58	e 14 10	+ 6	e 24 42	[− 2]	e 20 0	PPP	e 42·6
Bozeman		103·7	45	—	—	e 24 53	[+ 9]	e 27 21	PS	e 47·6
Ksara		114·3	302	e 18 31	[−11]	e 29 23	PS	e 19 38	PP	—
Helwan		118·5	299	e 20 9	PP	e 25 46	[+ 1]	e 27 18	SKKS	—
Chicago		120·9	46	e 19 0	[+ 6]	e 26 6	[+13]	e 22 30	PPP	e 47·0
Uccle	E.	129·5	332	—	—	e 38 48	SS	e 44 0	SSS	e 66·2
Rome		129·9	318	e 19 12	[0]	e 27 53	{−26}	e 21 47	PP	e 59·5
Huancayo		131·2	115	e 22 45	PKS	e 32 22	PS	e 45 17	SSS	e 50·1
Toledo		141·2	326	e 19 34	[+ 1]	—	—	e 22 40	PKS	—
Granada		142·8	323	i 19 34	[− 1]	26 15	[−28]	23 22	PKS	e 77·1
San Juan		144·9	71	e 19 47	[+ 8]	e 23 43	PKS	e 22 49	PP	—

Additional readings :—
Adelaide e = +7m.22s., i = +10m.36s. and +11m.45s.
Perth i = +11m.49s. and +12m.42s., S = +14m.57s., P_cS = +15m.57s., SS = +16m.50s., SSS = +17m.20s., i = +17m.50s.
Bombay eE = +26m.6s.
Tucson eP = +14m.16s., eSKS = +24m.55s.
Bozeman eSSS = +36m.34s.
Ksara PPS = +30m.32s.
Helwan eE = +26m.36s.
Chicago eSKKS = +26m.58s., eSS = +36m.19s., eSSS = +40m.29s.
Uccle e = +47m.30s.
Rome eZ = +19m.54s., eSKPZ = +22m.32s., e = +43m.44s., e = +46m.13s. and +53m.40s.?
Huancayo PSPS = +39m.57s.
Granada SKSP = +33m.20s., PPS = +35m.12s., SS = +41m.46s., SSS = +47m.36s.
Long waves were also recorded at Kew, Paris, De Bilt, and Fordham.

Nov. 10d. Readings also at 0h. (Tucson), 2h. (Samarkand), 3h. (Bozeman, Tucson, Butte, Lincoln, Berkeley, Mount Wilson, Pasadena, Riverside, Ukiah, and near Mizusawa), 4h. (Prague and Samarkand), 6h. (Mizusawa), 7h. (near Andijan), 8h. (Grozny, Erevan, Sotchi, and Ksara), 9h. (Balboa Heights), 11h. (Granada), 13h. (Moncalieri), 16h. (La Paz and La Plata (2)), 18h. (La Paz (2), La Plata (2), Huancayo, and near Clermont-Ferrand), 19h. (Berkeley, Lick, San Francisco, Bozeman, Ukiah, Tucson, and near Ferndale), 21h. (Samarkand).

Nov. 11d. Readings at 4h. (Rome, Zurich, Bucharest, Triest, and Samarkand), 6h. (Tchimkent, Frunse, Almata, Samarkand, and La Plata), 7h. (College, La Paz, Mizusawa, and Lincoln), 8h. (Bozeman, Chicago, Sverdlovsk, Irkutsk, Palomar, Riverside, Mount Wilson, Tucson, and Lincoln), 9h. (Lincoln, Mount Wilson, and Tucson), 12h. (Ottawa and Mizusawa), 15h. (Columbia), 18h. (near Granada (2), Toledo (2), and Almeria (2)), 19h. (Huancayo, La Paz, and La Plata), 20h. (Pasadena, La Jolla, Mount Wilson, and Riverside).

Nov. 12d. Readings at 1h. (near Mizusawa), 5h. (Mount Wilson, Tucson, Sverdlovsk, and Baku), 7h. (Kodaikanal, Calcutta, Agra, Baku, Grozny, Sverdlovsk, Andijan, Almata, Frunse, Pasadena, and Samarkand), 12h. (Samarkand), 18h. (Tacubaya and Tucson), 22h. (San Juan and Manila).

Nov. 13d. 7h. 45m. 53s. Epicentre 47°·5N. 122°·4W.

Intensity VI-VII at Centralia, Elma, Olympia, and Velm; V at Auburn, Kent, and Port Orchard. Epicentre south-west of Puget Sound. Macroseismic epicentre 47°·0N. 123°·0E. 212,000 square miles affected.

Howard A. Coombs and J. D. Barksdale.

The Olympic earthquake of Nov. 13, 1939. Bulletin of the Seismological Society of America, Vol. 32, No. 1, Jan., 1942. Berkeley and Los Angeles, pp. 1-6. Intensity table, isoseismic chart, two figures, and résumé in English.

R. Bodle.

United States Earthquakes, 1939, Washington, p. 22, chart p. 64.

$A = -\cdot3633$, $B = -\cdot5725$, $C = +\cdot7350$; $\delta = -3$; $h = -4$;
$D = -\cdot844$, $E = +\cdot536$; $G = -\cdot394$, $H = -\cdot621$, $K = -\cdot678$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Seattle		0·2	22	i 0 1a	P_g	i 0 14	S_g	—	—	—
Victoria		1·2	326	i 0 55	+31	i 1 10	+29	—	—	—
Spokane		3·5	83	i 0 53	− 4	i 1 41	+ 1	i 1 58	S_g	—
Butte		6·9	98	i 1 50	+ 5	i 3 33	S*	i 2 7	P*	i 3·8
Ferndale		7·0	190	e 2 10	P*	e 3 33	S*	e 2 15	P_g	—
Bozeman		8·1	100	i 2 6	+ 4	i 3 40	+ 7	i 2 40	P_g	e 4·2
Ukiah		8·4	183	e 1 54	−12	e 3 17	−26	—	—	4·1
San Francisco		9·5	180	—	—	e 5 7?	S_g	—	—	e 8·1
Berkeley		9·6	180	i 2 21	0	e 4 14	+ 2	i 2 38	P_g	—
Branner		10·1	179	e 2 27	− 1	e 5 57	S_g	—	—	—
Salt Lake City		10·1	128	i 2 34	+ 6	e 4 34	+ 9	—	—	5·2
Santa Clara	Z.	10·2	177	e 2 24	− 7	i 5 0	S*	—	—	—
Fresno	N.	10·9	169	e 2 42	+ 2	e 4 15	−29	e 2 57	PP	—
Tinemaha		10·9	162	e 2 41	+ 1	—	—	e 2 52	PP	—
Saskatoon		11·2	60	i 2 51	+ 7	i 5 16	SS	—	—	6·1
Haiwee	N.	11·8	163	i 2 54	+ 1	—	—	i 3 9	PP	—
Sitka		12·4	326	3 0	− 1	i 5 30	+ 9	i 3 13	PP	e 5·9
Santa Barbara		13·2	170	i 3 12	+ 1	—	—	—	—	—
Mount Wilson		13·7	164	i 3 17a	− 1	—	—	i 3 29	PP	—
Pasadena		13·7	165	i 3 17a	− 1	i 6 14	+22	i 3 28	PP	e 6·9
Riverside		14·0	162	i 3 22a	0	—	—	i 3 30	PP	—
Palomar	Z.	14·7	163	i 3 30	− 1	i 6 34	SS	—	—	—
Denver		14·8	115	e 3 36	+ 4	e 6 36	SS	i 3 39	pP	i 8·0
La Jolla		15·1	164	i 3 37	+ 1	—	—	—	—	—
Tucson		17·6	146	i 4 9a	+ 1	7 7	−16	i 4 39	PPP	8·7
Lincoln		19·6	99	i 4 32	0	i 8 12	+ 4	i 4 49	PP	i 10·0
College		22·1	332	4 58	− 1	e 8 58	0	e 5 17	PP	e 9·5
Florissant		24·8	98	e 5 25	0	i 9 55	+ 9	i 5 39	pP	—
St. Louis		25·0	98	i 5 26	− 1	e 9 57	+ 8	i 5 42	pP	e 13·3
Chicago		25·2	90	i 5 31	+ 2	i 9 54	+ 2	i 10 22	SS	i 11·0
Chicago (Loyola)		25·2	90	i 5 27	− 2	e 9 42	−10	i 5 55	PP	i 13·6
Little Rock		25·8	109	e 5 37	+ 3	e 10 16	+14	—	—	—
Cape Girardeau		26·2	100	i 5 35	− 3	i 10 21	+12	i 5 53	pP	14·0
Toronto		30·4	81	—	—	e 11 13	− 3	—	—	16·1
Pittsburgh		31·1	86	i 6 22	0	i 11 31	+ 3	i 7 21	PP	—
Ottawa		31·9	76	i 6 27	− 2	e 11 43	+ 3	—	—	e 16·6
Shawinigan Falls		33·4	72	e 6 41	− 1	e 12 2	− 1	—	—	17·1
Columbia		33·7	97	e 7 0	+15	e 12 10	+ 2	e 7 58	PP	e 15·4
Georgetown		33·7	86	e 6 41	− 4	e 12 8	0	—	—	i 16·9
Tacubaya		33·8	137	i 6 41	− 5	i 12 11	+ 1	—	—	—
Philadelphia		34·5	84	e 8 3	PP	—	—	—	—	i 15·2
Williamstown		34·6	78	i 6 51	− 2	—	—	i 8 1	PP	i 17·8
Fordham		35·0	81	i 6 54k	− 2	—	—	i 7 58	PP	i 17·4
Harvard		35·8	78	i 7 1	− 2	i 12 36	− 5	—	—	e 18·6
Weston		36·0	78	i 7 3	− 2	i 12 47	+ 3	i 13 11	sS	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
East Machias		37·6	73	e 8 15	PP	e 13 16	+ 8	e 9 0	PPP	17·3
Honolulu		38·7	240	e 7 31	+ 4	e 13 36	+11	e 8 49	PP	e 15·7
Balboa Heights		52·8	121	e 9 19	0	e 16 40	− 7	—	—	—
San Juan		54·0	102	e 9 28	0	17 1	− 2	e 12 51	PPP	e 21·4
Pulkovo		70·8	14	11 21	+ 1	20 36	+ 1	—	—	—
Uccle		71·9	33	11 26	− 1	20 54	+ 6	—	—	e 33·1
Huancayo		72·6	131	i 11 31	0	e 20 40	−16	e 14 28	PP	e 29·6
Paris		72·8	35	e 11 33	+ 1	—	—	—	—	e 38·1
Irkutsk		72·9	333	11 30	− 3	20 55	− 4	—	—	38·1
Jena	z.	74·3	29	e 11 39	− 2	—	—	—	—	—
Stuttgart		75·3	31	e 11 47k	0	—	—	—	—	—
Clermont-Ferrand		75·6	37	i 12 49	+61	—	—	—	—	—
Basle		75·8	34	e 11 46	− 4	—	—	(e 18 11)	PPP	e 18·2
Moscow		75·8	3	e 11 48	− 2	21 26	− 5	—	—	—
Sverdlovsk		76·0	359	i 11 49	− 2	i 21 30	− 4	—	—	36·6
Zurich		76·3	34	i 12 1k	+ 9	—	—	—	—	—
Chur		77·1	32	i 11 57	0	—	—	—	—	—
Toledo		77·2	45	i 11 57k	0	21 48	+ 1	14 28	PP	33·1
Granada		79·5	46	i 12 11k	+ 1	i 22 33	+22	12 27	P_cP	36·8
Triest		79·6	30	e 12 18a	+ 8	i 22 26	+14	12 32	pP	e 38·6
La Paz		80·1	127	i 12 11k	− 2	i 22 10	− 8	—	—	e 44·1
Almeria		80·4	45	12 17	+ 2	22 1	−20	12 27	P_cP	—
Rome		82·4	33	i 12 25	0	i 22 51	+10	i 12 40	P_cP	e 37·8
Sotchi		87·9	13	e 12 54	+ 1	—	—	—	—	—
Almata		88·0	346	e 12 53	0	—	—	—	—	—
Frunse		88·8	348	e 12 58	0	—	—	—	—	—
Grozny		89·0	9	e 12 57	− 1	—	—	—	—	—
Tchimkent		90·0	352	e 13 1	− 2	—	—	—	—	—
Baku		92·2	6	e 13 20	+ 7	e 24 10	− 4	30 25	SS	44·6
Samarkand		92·8	353	e 13 16	0	—	—	—	—	—
Ksara		96·7	18	i 13 34k	+ 1	i 26 16	PS	i 13 50	pP	46·6

Additional readings :—
Seattle iP = +5s., iS = +17s.
Spokane i = +2m.13s.
Butte i = +2m.23s. and +2m.55s.
Ferndale eE = +2m.31s., eN = +3m.7s.
Bozeman iP = +2m.9s., i = +2m.58s. and +3m.14s., iS = +3m.46s.
Ukiah eP = +2m.7s., S = +3m.22s.
Berkeley iN = +2m.28s.
Branner iE = +2m.39s., iN = +2m.42s.
Salt Lake City eS = +4m.41s.
Denver iE = +3m.52s., isPEN = +4m.12s., eE = +6m.4s., esSE = +6m.57s., iE = +7m.26s.
Tucson i = +5m.48s., iS = +7m.49s.
Lincoln ePPP = +5m.15s., iS = +8m.36s.
Florissant iE = +5m.51s., iE = +10m.15s., iN = +10m.18s., isSE = +10m.22s.
St. Louis isPEN = +5m.56s., eN = +6m.58s., isPN = +10m.24s., iEN = +10m.51s.
Chicago iP = +5m.47s. and +5m.52s., eP_cP = +8m.42s.
Cape Girardeau iEN = +6m.6s., isSE = +11m.2s., iE = +11m.35s.
Pittsburgh iZ? = +6m.55s., iPPPZ = +7m.30s., iZ? = +7m.42s. and +11m.4s., iS = +11m.37s.
Ottawa e = +14m.43s.
Columbia eP = +7m.45s., ePPP = +8m.41s., eS = +12m.31s.
Philadelphia ePPP = +8m.12s.
Williamstown i = +9m.24s.
Weston i = +18m.50s. and +22m.7s.
East Machias eS = +13m.20s.
Honolulu eP = +7m.40s., ePPP = +9m.31s., iS = +13m.41s.
Huancayo iS = +20m.57s., eSS = +26m.3s.
Jena iZ = +11m.55s.
Stuttgart iPZ = +12m.2s., eNE = +12m.47s.
Clermont-Ferrand e = +13m.25s.
Toledo i = +12m.0s. and +12m.11s.
Granada PP = +15m.34s., SS = +27m.37s.
Triest i = +12m.26s., ePP = +15m.32s., PPP = +17m.0s., sS = +22m.44s., PS = +23m.4s., SS = +27m.51s., SSS = +28m.7s.
Almeria pP = +12m.41s., sP = +12m.54s., PP = +15m.27s.
Rome isP = +12m.50s., e = +23m.35s.
Baku eSSS = +35m.1s.
Ksara PPS = +26m.54s.
Long waves were also recorded at Vermont, Kodaikanal, Colombo, and Prague.

Nov. 13d. Readings also at 5h. (Samarkand), 7h. (Vermont), 12h. (near Tananarive), 18h. (near Basle), 19h. (near Osaka and Stuttgart), 20h. (Stuttgart and Samarkand), 21h. (St. Louis and Florissant), 22h. (near Tananarive).

Nov. 14d. 12h. 37m. 48s. Epicentre 35°·0S. 179°·5W. (as on 1938 Oct. 21d.).

$A = -\cdot8210$, $B = -\cdot0071$, $C = -\cdot5710$; $\delta = +13$; $h = 0$;
$D = -\cdot009$, $E = +1\cdot000$; $G = +\cdot571$, $H = +\cdot005$, $K = -\cdot821$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Riverview		24·2	266	i 5 20$_a$	+ 1	e 9 40	+ 5	—	—	e 12·6
Sydney		24·2	266	—	—	e 9 52	+17	—	—	e 12·8
Brisbane		24·6	280	i 5 24	+ 1	i 9 54	+12	i 10 30	SS	e 13·3
Melbourne		28·6	254	i 5 59	− 1	e 10 48	0	i 6 42	PP	16·6
Adelaide		34·2	258	e 10 22	?	e 12 12	− 4	e 14 52	SSS	—
Pasadena	z.	89·6	47	e 12 59	− 2	—	—	—	—	e 46·2
Mount Wilson	z.	89·7	47	e 13 1	0	—	—	—	—	—
Riverside	z.	89·9	47	e 13 3	+ 1	—	—	—	—	—
Tucson		92·9	52	e 13 15	− 1	—	—	—	—	—
Huancayo		94·5	108	e 13 14	− 9	i 24 39	+ 5	—	—	—
Sitka		99·0	22	e 9 22	?	—	—	—	—	—
Ksara		150·9	276	e 21 35	?	e 33 49	PS	—	—	85·7

Nov. 14d. Readings also at 0h. (Samarkand, near Tananarive, Tchimkent, and Andijan), 1h. (near Balboa Heights and La Paz), 2h. (Samarkand, Andijan, Cape Town, Haiwee, Tinemaha, Palomar, Baku, Ksara, Huancayo, Tucson, Pasadena, Riverside, and Mount Wilson), 3h. (Sverdlovsk), 7h. (Berkeley), 13h. (Kodaikanal), 21h. (Vladivostok, Balboa Heights, and Sverdlovsk.

Nov. 15d. 2h. 53m. 46s. Epicentre 39°·6N. 75°·2W.

Intensity V in Salam County (New Jersey).

Epicentre 39°39′N. 75°13′W. (13 miles North-east of Salam).

Macroseismic area 6000 square miles.

R. Bodle.

United States Earthquakes, 1939; Washington, 1941, p. 7. Chart p. 62.

$A = +\cdot1974$, $B = -\cdot7470$, $C = +\cdot6349$; $\delta = +7$; $h = -2$;
$D = -\cdot967$, $E = -\cdot255$; $G = +\cdot162$, $H = -\cdot614$, $K = -\cdot773$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Philadelphia		0·4	3	i 0 10	− 3	—	—	—	—	i 0·3
Georgetown		1·2	244	0 33	+ 9	0 50	+ 9	—	—	—
Williamstown		3·5	24	i 0 56	− 1	i 1 48	S*	1 54	S_g	—
Pittsburgh	z.	3·7	284	—	—	e 1 48	+ 3	i 2 0	S_g	—
Harvard		3·9	41	e 1 4	+ 2	e 1 46	− 4	—	—	—
Weston		4·1	45	i 1 4	− 1	i 1 58	+ 3	i 1 12	P*	—
Ottawa		5·8	357	i 1 45	P*	i 2 34	− 4	i 2 57	S*	—

Additional readings:—
Pittsburgh iZ = +2m.3s., iSZ = +2m.9s.
Harvard eS = +1m.55s.
Williamstown iP = +1m.0s. and +1m.3s., iS = +1m.37s. and +1m.44s.
Weston iS = +1m.46s., i = +2m.12s.
Ottawa S* = +2m.46s., S_g = +3m.0s.

Nov. 15d. Readings also at 1h. (San Juan), 2h. (Lincoln), 4h. (Huancayo and Tucson), 5h. (Ksara), 7h. (near Tananarive and near Branner), 9h. (near Andijan and Tchimkent), 10h. (near Basle), 12h. (La Paz), 17h. (Riverview, Brisbane, Melbourne, Riverside, Adelaide, Sydney, Pasadena, Mount Wilson, Ksara, Tucson, and Huancayo), 18h. (Baku, Sverdlovsk, and Rome), 19h. (Fordham, near Mizusawa, and La Paz), 21h. (Huancayo), 22h. (La Plata and near Manila), 23h. (near Triest and near Branner).

Nov. 16d. Readings at 1h. (Triest and Balboa Heights), 3h. (Tucson), 5h. (Tacubaya), 9h. (College), 16h. (Tucson), 18h. (near Mizusawa), 21h. (Tucson), 22h. (Haiwee, Pasadena, Riverside, and Tucson).

Nov. 17d. 18h. 39m. 26s. Epicentre 20°·5S. 179°·0W.

$A = -\cdot9373$, $B = -\cdot0164$, $C = -\cdot3481$; $\delta = -3$; $h = +5$;
$D = -\cdot017$, $E = +1\cdot000$; $G = +\cdot348$, $H = +\cdot006$, $K = -\cdot937$.

Tables for depth of focus 0·060 have been used.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Apia		9·6	47	i 2 24$_a$	+10	4 15	+14	—	—	—
Tuai		18·6	190	3 49	− 1	6 47	− 9	—	—	—
New Plymouth		19·5	195	4 0	+ 1	7 10	− 2	—	—	—
Wellington		21·4	193	4 13	− 4	7 32	−12	—	—	—
Christchurch		24·0	195	—	—	e 7 19	−68	—	—	—
Brisbane		26·4	250	e 7 40	?	i 8 58	− 8	—	—	—
Riverview		29·6	237	—	—	e 9 45	−11	e 12 42	SSS	—
Sydney		29·6	237	—	—	e 9 40	−16	e 12 40	SSS	—
Melbourne		35·6	233	i 6 21	− 1	i 11 13	−15	—	—	14·4
Manila		68·5	296	i 10 22k	+ 1	18 42	− 7	—	—	—
Sendai		69·5	328	10 27	0	—	—	—	—	—
Nagano		69·8	324	10 27	− 2	—	—	—	—	—
Osaka		69·8	321	10 30	+ 1	—	—	—	—	—
Mizusawa		70·1	329	(e 10 31)	+ 1	e 10 31	P	—	—	—
Miyazaki		70·5	317	10 34	+ 1	—	—	—	—	—
Vladivostok		77·7	326	i 11 14	0	i 20 28	− 2	—	—	—
Santa Barbara		78·5	47	i 11 17k	− 1	—	—	—	—	—
Branner		78·6	43	e 11 18	0	—	—	—	—	—
Santa Clara	E.	78·7	43	e 11 11	− 8	e 19 59	−42	—	—	—
La Jolla		79·3	49	i 11 21k	− 1	—	—	—	—	—
Pasadena		79·4	47	i 11 21k	− 2	e 20 51	+ 3	e 13 29	pP	—
Mount Wilson		79·5	47	i 11 21k	− 2	—	—	i 13 27	pP	—
Riverside		79·8	47	i 11 23k	− 2	—	—	—	—	—
Haiwee		80·6	46	i 11 27	− 2	—	—	—	—	—
Tinemaha		80·9	45	i 11 29k	− 2	—	—	—	—	—
Tucson		83·6	52	e 11 44k	0	e 21 15	−16	13 51	pP	—
Butte		89·3	40	e 12 56	+44	e 22 15	− 9	e 19 7	sPP	—
Bozeman		90·1	41	e 12 5	−10	e 22 24	− 7	e 15 56	PP	—
Huancayo		98·2	106	—	—	e 22 32	−68	e 25 22	PS	—
Tchimkent		119·2	309	19 38	PP	—	—	—	—	—
Sverdlovsk		123·5	326	i 18 4	[− 6]	e 24 14	[−18]	e 19 55	PP	38·6
Baku		134·1	308	e 21 7	PP	e 25 13	[+15]	e 38 19	SS	e 47·6
Grozny		136·4	313	e 21 5	PP	—	—	—	—	—
Sotchi		140·4	316	e 21 2	PP	—	—	—	—	—
Copenhagen		143·8	351	i 18 42k	[− 4]	—	—	—	—	—
Cernauti		145·8	332	e 18 49	[0]	—	—	—	—	—
Ksara		146·4	301	i 18 51	[0]	—	—	e 21 13	pPKP	—
Jena		148·5	347	i 18 50	[− 5]	—	—	—	—	—
Uccle		149·6	358	i 18 58k	[+ 2]	—	—	—	—	—
Stuttgart		151·0	350	e 18 54	[− 4]	—	—	e 20 2	pPKP	—
Helwan	Z.	151·1	295	18 55	[− 3]	—	—	e 21 21	?	—
Strasbourg		151·4	351	e 19 4	[+ 6]	—	—	—	—	—
Basle		152·5	351	e 18 56	[− 4]	—	—	—	—	—
Zurich		152·5	351	i 18 54k	[− 6]	—	—	—	—	—
Chur		152·8	350	e 19 5	[+ 4]	—	—	—	—	—
Triest		152·8	342	e 18 54	[− 7]	—	—	e 20 41	pPKP	—
Neuchatel		153·1	352	e 18 57	[− 4]	—	—	—	—	—
Clermont-Ferrand		154·7	357	e 19 58	?	—	—	—	—	—
Toledo		160·2	11	e 19 6	[− 4]	—	—	—	—	—

For Notes see next page.

NOTES TO Nov. 17d. 18h. 39m. 26s.

Additional readings :—
Brisbane iN = +14m.52s. and +18m.52s.
Riverview iN = +15m.11s.
Pasadena eZ = +40m.45s.
Mount Wilson eZ = +40m.44s.
Tucson iP = +12m.1s., esP = +14m.50s., epPP = +16m.39s., eS = +21m.21s., eSP = +22m.21s., esPS = +25m.42s., esSS = +29m.55s., eSSS = +30m.40s.
Bozeman eP = +12m.11s. and +12m.26s., epPP = +17m.51s., eSS = +28m.7s., eSSS = +33m.53s.
Huancayo S = +23m.39s., epS = +26m.4s., ePS = +26m.19s.
Cernauti e = +18m.57s.
Ksara esPKP = +22m.6s., ePP = +22m.36s.
Jena iZ = +18m.54s., iN = +18m.57s.
Stuttgart iP = +19m.1s., iPZ = +19m.4s., i = +19m.12s.
Helwan iZ = +19m.2s.
Basle e = +19m.19s.
Zurich i = +20m.4s. and +20m.18s.
Triest e = +19m.20s., +19m.29s., and +19m.49s.
Clermont-Ferrand e = +20m.29s.
Toledo i = +19m.53s.
Long waves were recorded at Tacubaya.

Nov. 17d. 20h. 15m. 4s. Epicentre 47°·3N. 8°·0E.

Intensity V at Aarau, IV in Aargau, III at Zurich and Schaffhouse.

Radius of macroseismic area 40km.

E. Wanner.

Jahresbericht des Erdbebendienstes der Schweiz im Jahre, 1939; Zurich, 1940; p. 2. Macroseismic Chart.

$A = +\cdot6740$, $B = +\cdot0947$, $C = +\cdot7326$; $\delta = -5$; $h = -4$;
$D = +\cdot139$, $E = -\cdot990$; $G = +\cdot725$, $H = +\cdot102$, $K = -\cdot681$.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Basle	0·4	310	e 0 11	− 2	i 0 16	− 5	—	—	—
Zurich	0·4	80	i 0 8	P_g	i 0 12	S_g	—	—	—
Neuchatel	0·8	247	e 0 18	0	i 0 30	− 1	i 0 21	?	—
Chur	1·1	113	e 0 22	0	e 0 36	− 3	—	—	—
Ebingen	1·1	36	—	—	e 0 34	− 5	—	—	—
Ravensburg	1·2	66	—	—	i 0 38	− 3	—	—	—
Strasbourg	1·3	353	—	—	e 0 45	+ 1	—	—	—
Stuttgart	1·7	29	i 0 32	+ 1	i 0 52	− 2	e 0 46	?	—
Scoresby Sund	27·3	339	5 53	+ 5	—	—	—	—	—
Huancayo	94·3	257	e 18 0	PP	—	—	—	—	—

Long waves were also recorded at Baku and Sverdlovsk.

Nov. 17d. Readings also at 1h. (Columbia), 4h. (Clermont-Ferrand), 5h. (Pasadena and Mount Wilson), 7h. (Chur), 9h. (La Jolla, Haiwee, Mizusawa, Riverview, Manila, Brisbane, Pasadena, Mount Wilson, Sverdlovsk, Baku, Tucson, Tinemaha, Santa Barbara, and Riverside), 13h. (Zurich), 14h. (Moncalieri), 16h. (Tacubaya), 17h. (Tucson), 19h. (Santa Clara, Butte, Bozeman, Florissant, Ukiah, Tucson, Seattle, near Fordham (2), Berkeley, Salt Lake City, St. Louis, Chicago, Lincoln, Harvard, Haiwee, Riverside, Santa Barbara, Tinemaha, Mount Wilson, and Pasadena), 20h. (near Andijan), 21h. (near Harvard).

Nov. 18d. 0h. 13m. 32s. Epicentre 15°·0S. 175°·0E. (approximate).

A = −·9627, B = +·0842, C = −·2572; δ = +3; h = +6;
D = +·087, E = +·996; G = +·256, H = −·022, K = −·966.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Apia		12·9	86	e 2 59	− 8	—	—	e 3 33	PPP	e 5·5
Brisbane	E.	23·9	236	i 4 58	−18	i 9 16	−14	—	—	—
Wellington		26·2	181	5 51a	+13	10 18	+ 9	—	—	—
Christchurch		28·5	184	e 5 58a	− 1	e 10 47	+ 1	—	—	—
Riverview		28·6	225	e 9 2	?	e 10 28	−20	—	—	e 13·7
Melbourne		35·0	224	e 4 50	?	i 12 7	−21	e 8 38	PPP	—
Manila		61·0	297	e 10 18	0	18 57	+22	—	—	—
Pasadena		80·1	52	e 12 14	+ 1	—	—	—	—	e 36·9
Mount Wilson	Z.	80·2	52	i 12 15	+ 1	—	—	—	—	—
Riverside	Z.	80·7	52	e 12 18	+ 2	—	—	—	—	—
Haiwee		81·1	50	e 12 21	+ 3	—	—	—	—	—
Tinemaha		81·3	49	i 12 23	+ 3	—	—	—	—	—
Tucson		85·0	56	e 12 36	− 2	e 23 0	[− 1]	e 16 0	PP	e 37·1
Huancayo		105·4	106	—	—	e 26 48	PS	e 33 32	PSPS	e 48·7
Sverdlovsk		115·7	326	—	—	i 28 49	PS	—	—	44·5
Baku		126·2	310	—	—	e 37 37	SS	—	—	e 66·5
Ksara		138·6	304	e 22 30	PP	—	—	—	—	—
Helwan	Z.	143·5	300	e 19 28	[− 8]	—	—	—	—	—

Additional readings:—
Tucson eP = +13m.24s., ePPP = +18m.11s., ePS = +23m.41s., ePPS = +24m.32s., eSSS = +33m.19s.
Baku e = +40m.49s. and +47m.38s.
Helwan eZ = +20m.36s.
Long waves were also recorded at Arapuni and Salt Lake City.

Nov. 18d. 1h. 32m. 43s. Epicentre 51°·4N. 157°·7E.

A = −·5796, B = +·2377, C = +·7795; δ = +6; h = −6;
D = +·379, E = +·925; G = −·721, H = +·296, K = −·626.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Mizusawa		16·9	230	4 0	+ 1	6 54	−13	—	—	—
Vladivostok		19·3	254	e 4 26	− 3	i 8 22	SS	—	—	10·6
Osaka		23·1	232	5 9	+ 1	8 59	−17	—	—	—
College		30·6	42	e 6 32	+14	e 11 19	− 1	e 7 47	PP	—
Zi-ka-wei	Z.	33·4	247	i 6 41k	− 1	11 59	− 4	i 8 11	PP	19·0
Sitka		38·1	54	e 7 23	+ 1	i 13 24	+ 8	9 9	PP	16·3
Hong Kong		44·4	246	8 12	− 2	14 38	−11	17 26	SS	—
Honolulu		45·7	113	e 8 35	+11	e 14 59	− 9	e 10 23	PP	e 20·4
Manila		47·1	232	i 8 34a	− 1	15 24	− 4	—	—	22·8
Phu-Lien	N.	49·9	252	e 8 57	0	—	—	—	—	—
Sverdlovsk		52·5	317	i 9 15	− 2	e 16 30	−13	e 11 17	PP	25·3
Almata		52·7	295	e 9 19	+ 1	—	—	—	—	—
Frunse		54·3	296	e 9 42	+12	e 16 38	−29	—	—	27·8
Ukiah		54·4	69	—	—	e 17 10	+ 1	—	—	e 22·6
Berkeley		55·8	70	—	—	e 17 28	0	e 17 50	PS	e 26·0
Butte		55·9	56	e 9 44	+ 2	e 17 29	0	e 9 57	pP	—
Santa Clara		56·3	70	e 9 36	− 9	i 17 26	− 8	—	—	e 24·5
Andijan		56·9	295	9 49	0	—	—	e 15 8	?	28·3
Bozeman		56·9	56	9 56	+ 7	i 17 48	+ 6	e 12 17	PP	e 23·7
Tchimkent		57·5	299	e 9 53	0	—	—	—	—	—
Scoresby Sund		58·4	0	—	—	e 18 12	+10	e 18 54	PPS	e 25·0
Tinemaha		58·7	68	i 10 2a	0	—	—	—	—	—
Haiwee		59·5	68	i 10 7	0	—	—	—	—	—
Santa Barbara		59·6	71	i 10 8	0	—	—	—	—	—
Salt Lake City		59·8	61	e 10 8	− 1	i 18 22	+ 2	e 12 19	PP	e 24·6

Continued on next page,

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Calcutta		59·9	269	—	—	i 18 18	− 3	—	—	—
Pasadena		60·7	70	i 10 15a	0	i 18 31	− 1	e 39 31	P′P′	e 25·6
Mount Wilson		60·8	70	i 10 15a	− 1	—	—	e 39 18	P′P′	—
Pulkovo		61·3	333	10 21	+ 1	19 0	PS	—	—	32·8
Riverside		61·3	70	i 10 18a	− 2	—	—	—	—	—
La Jolla		62·2	71	i 10 26	0	—	—	—	—	—
Moscow		62·3	327	e 10 31	+ 5	e 19 15	PS	—	—	e 35·3
Agra	E.	63·0	280	i 10 27	− 4	—	—	—	—	—
Tucson		66·4	67	i 10 52a	− 1	e 19 50	+ 7	11 7	pP	e 27·8
Lincoln		67·7	51	e 11 3	+ 2	e 19 55	− 3	e 27 52	SSS	—
Grozny		68·8	313	e 11 10	+ 2	e 21 4	+53	—	—	41·8
Baku		69·1	309	11 11	+ 1	e 20 17	+ 2	i 15 57	PPP	35·3
Copenhagen		69·5	340	11 13	+ 2	20 19	− 1	25 17	SS	33·3
Sotchi		71·2	317	e 11 27	+ 4	—	—	—	—	—
Erevan		71·8	312	e 11 29	+ 3	—	—	—	—	45·3
Hamburg		72·0	341	e 11 28	0	—	—	—	—	e 34·3
Bombay		72·3	278	i 11 26	− 3	i 20 50	− 2	i 14 3	PP	39·9
Florissant		72·3	49	i 11 28	− 1	e 20 49	− 3	i 11 42	pP	34·1
St. Louis		72·5	49	e 11 28	− 2	e 20 53	− 1	—	—	e 32·2
Ottawa		73·1	36	i 11 32	− 2	(20 17?)	−44	—	—	20·3
Toronto		73·2	39	—	—	e 20 17	−45	—	—	36·3
Jena		74·1	338	e 11 17	−23	—	—	e 14 17	PP	e 38·3
Prague		74·2	337	—	—	e 26 35	SS	—	—	e 36·6
De Bilt		74·3	343	—	—	e 21 40	+25	—	—	26·3
Uccle		75·7	343	e 11 45	− 4	e 21 27	− 3	e 26 29	SS	e 34·3
Bucharest		75·8	327	13 17?	?	—	—	—	—	42·3
Kew		75·8	346	—	—	e 21 47	+16	—	—	e 37·3
Kodaikanal	E.	76·0	269	i 11 50a	− 1	—	—	—	—	—
Williamstown		76·3	36	i 11 52	0	—	—	—	—	—
East Machias		76·6	31	e 12 38	+44	e 21 37	− 3	e 15 57	PP	e 33·4
Stuttgart		76·6	339	e 11 54	0	—	—	—	—	e 45·3
Colombo	E.	77·1	265	11 51	− 6	21 36	−10	—	—	36·1
Strasbourg	Z.	77·1	340	e 11 58	+ 1	—	—	—	—	—
Belgrade		77·3	330	e 11 56k	− 2	e 21 40	− 8	—	—	e 48·1
Istanbul		77·6	323	e 5 40	?	—	—	—	—	e 46·1
Fordham		77·7	37	i 11 59	− 1	i 22 13	+21	—	—	e 38·1
Paris		77·9	344	i 12 2a	+ 1	e 22 15	+21	—	—	e 38·3
Zurich		78·1	340	e 12 2a	0	—	—	—	—	—
Basle		78·2	340	e 12 1	− 2	—	—	—	—	—
Chur		78·4	339	e 12 4	0	—	—	—	—	—
Triest		78·4	335	e 12 3a	− 1	21 57	− 3	14 53	PP	e 36·2
Neuchatel		78·8	340	e 12 6	0	—	—	—	—	—
Columbia		80·6	46	e 12 17	+ 1	e 22 17	− 6	—	—	e 34·4
Clermont-Ferrand		80·8	342	i 13 18	+61	—	—	—	—	—
Ksara		81·0	314	i 12 18a	0	e 22 34	+ 7	e 15 26	PP	46·3
Rome		82·3	335	i 12 25	0	22 58	+18	i 15 41	PP	41·8
Riverview	N.	85·1	185	—	—	e 22 57	[− 4]	—	—	e 39·9
Helwan		86·4	315	i 12 45k	0	23 27	+ 6	16 8	PP	—
Toledo		87·7	346	i 12 51	− 1	e 24 13	PS	—	—	—
Bermuda		88·6	34	—	—	e 23 41	− 1	—	—	—
Melbourne		89·6	190	17 17	PP	i 23 46	− 5	—	—	—
Granada		90·3	346	e 12 57	− 7	i 25 18	PS	—	—	46·7
San Fernando		91·4	347	—	—	e 23 45	[+ 4]	—	—	50·3
Wellington		93·5	167	—	—	i 23 39	[−14]	—	—	—
Christchurch		94·9	169	e 13 30a	+ 5	e 23 50	[−11]	25 38	PS	—
San Juan		100·6	41	e 19 7	PP	e 25 23	− 2	e 32 4	SS	e 52·5
Huancayo		122·0	66	e 20 37	PP	e 30 20	PS	e 20 59	pPP	—
La Paz	Z.	129·7	64	i 19 12	[+ 1]	—	—	21 28	PP	66·8

Additional readings :—
Mizusawa SN = +6m.58s.
Zi-ka-wei iZ = +6m.57s. and +15m.41s.
Sitka P_cP = +9m.31s., sS = +13m.38s.
Honolulu eP_cP = +9m.46s., iS = +15m.10s., eSSS = +19m.40s.
Sverdlovsk i = +9m.35s., e = +20m.17s.

Continued on next page.

Ukiah esS = +18m.9s.
Berkeley eZ = +18m.39s., eN = +23m.42s.
Bozeman ePPP = +13m.40s., eSS = +21m.45s.
Scoresby Sund eS = +18m.23s.
Salt Lake City eP_cP = +11m.7s., eS_cS = +19m.55s., eSS = +22m.38s.
Tucson ePP = +13m.21s., eSS = +24m.9s., eSSS = +27m.29s.
Lincoln eP = +12m.5s.
Copenhagen +21m.10s.
Baku e = +14m.2s., iPS = +21m.6s., SS = +25m.47s.
Bombay eE = +14m.7s., iEN = +21m.28s. and +21m.49s., eN = +26m.44s.
Florissant eEN = +21m.11s., isSE = +21m.13s.
Jena eE = +13m.17s.
Uccle eN = +17m.48s.
East Machias ePPP = +17m.27s., ePS = +23m.10s., eSS = +27m.15s., eSSS = +29m.54s.
Stuttgart eEN = +12m.25s.
Strasbourg eEN = +12m.2s.
Belgrade eZ = +12m.21s.
Paris e = +33m.3s.
Triest e = +12m.41s., +15m.46s., and +16m.9s., PPP = +16m.51s., ePS = +22m.43s., e = +23m.31s., SS = +26m.49s., SSS = +29m.46s.
Columbia eSKS = +22m.39s.
Ksara i = +12m.38s.
Rome PS = +23m.58s., S? = +34m.57s.
Helwan iZ = +13m.9s., SKSN = +23m.5s., eE = +24m.35s.
Wellington i = +24m.20s.
San Juan epS = +25m.51s., eSSS = +37m.28s.
Huancayo eSS = +36m.47s.
Long waves were also recorded at Heligoland, Cernauti, Stonyhurst, Harvard, Cape Town, Bergen, and Upsala.

Nov. 18d. Readings also at 0h. (Andijan), 1h. (Andijan and Tchimkent), 2h. (near Fordham and Harvard), 3h. (near Apia and near Andijan), 7h. (Pasadena, Mount Wilson, Riverside, Tinemaha, Andijan, Tucson, Huancayo, Frunse, La Paz, and Tchimkent), 8h. (Ksara), 12h. (Brisbane, Wellington, Christchurch, Ksara, Riverview, Haiwee, Sverdlovsk, Arapuni, Vladivostok, Tucson, Tinemaha, Riverside, Mount Wilson, and Pasadena), 13h. (La Paz and Baku), 14h. (Agra, Bombay, Colombo, and Kodaikanal), 15h. (Ksara), 20h. (Huancayo), 21h. (Stuttgart), 23h. (Tchimkent, Frunse, and near Andijan (2)).

Nov. 19d. Readings at 2h. (Stuttgart), 3h. (Tucson), 4h. (Ksara), 5h. (Agra, Bombay, and Andijan), 6h. (Rome, Calcutta, Kodaikanal, Sverdlovsk, and Baku), 8h. (Manila), 10h. (La Paz), 15h. (Bozeman), 17h. (Frunse, Bozeman, and near Andijan (2)), 19h. (Baku, Sverdlovsk, Tucson, Mount Wilson, Pasadena, Irkutsk, and Riverside), 23h. (near Zurich and Sion).

Nov. 20d. 6h. Undetermined shock.

Calcutta eN = 20m.35s., iN = 25m.12s.
Colombo eP?E = 21m.2s., LE = 25m.21s.
Kodaikanal eE = 22m.0s.
Phu-Lien e = 22m.28s. and 25m.56s.
Bombay eE = 23m.29s., iEN = 23m.54s. and 27m.20s., eEN = 31m.29s.
Agra eE = 23m.45s., SE = 28m.19s.
Hong Kong P? = 25m.10s., S = 28m.5s.
Manila PE = 28m.57s., SE = 31m.0s.
Sverdlovsk iP = 27m.58s., eS = 35m.37s., L = 44·0m.
Zi-ka-wei eZ = 32m.47s.
Baku e = 35m.0s., L = 44·4m.
Irkutsk e = 37m.0s., L = 45·0m.

Nov. 20d. Readings also at 1h. (Tucson), 2h. (Andijan and Samarkand), 3h. (Tchimkent), 6h. (near Mizusawa, Frunse (2), Agra, Tchimkent (2), Andijan (2), and Samarkand (2)), 7h. (near Triest), 8h. (Samarkand), 11h. (Jena (5)), 13h. (Riverview), 14h. (Mount Wilson, Tucson, and Pasadena), 18h. (Balboa Heights, Riverside, Pasadena, and Mount Wilson), 22h. (near Erevan (2)), 23h. (near Belgrade).

Nov. 21d. 8h. 48m. 52s. Epicentre 39°·7N. 39°·7E.

Much damage in the district of Karakulak, Hinziri, Agam-Cagam, Karadivan, Hinis, Miski-Karadogan, Mirzaoglu, Tabu, Hacibektas, Otlukbeli, Ergemen Köyleri (localities in the area of Tercan). Damage in the districts of Basköy and Mans.

Epicentre 39°·9N. 40°·1E. (Strasbourg).

Prof. Wilhelm Salomon-Calvi.

Untersuchungen "uber Erdbeben in der Turkei, Das Beber von Tercan-Erzincan vom 21 XI, 1939," "Meteae" Serie B, Abhandlungen No. 5, Ankara, 1940, p. 92 (résumé in German.

Turkiyedeki Zelzere Muteallik Etudler, Mader tektik ve arama enstitusir, Series B, No. 5 p. 5-21, Ankara, 1940.

Les tremblements de terre d'Erzincan du 21 Novembre et du 27 Decembre, 1939.

Revue pour l'Etude des Calamites, Tome 3, Nos. 10-11, 178-180, Geneva, May-Dec., 1940.

$A = +\cdot5936$, $B = +\cdot4928$, $C = +\cdot6362$; $\delta = -4$; $h = -2$;
$D = +\cdot639$, $E = -\cdot769$; $G = +\cdot490$, $H = +\cdot406$, $K = -\cdot772$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Erevan		3·7	80	1 8	P*	i 1 41	− 4	—	—	—
Grozny		5·8	49	1 35	+ 6	i 2 40	+ 2	e 1 41	P*	—
Ksara		6·6	209	i 1 48k	+ 7	3 3	+ 5	2 14	P_g	—
Baku		7·9	81	i 2 4	+ 5	i 3 37	+ 7	—	—	—
Istanbul		8·2	282	2 5	+ 2	3 32	− 6	2 46	P_g	—
Bucharest		11·1	299	e 2 50	+ 7	e 5 8	SS	—	—	6·0
Helwan		12·0	218	2 58	+ 3	i 5 47	SSS	3 16	PPP	e 7·3
Cernauti	N.	13·1	315	e 3 1	− 9	5 21	−17	i 3 23	PP	9·1
Belgrade		15·1	296	e 3 37k	+ 1	i 6 32	+ 7	i 3 48	PP	8·3
Szeged	E.	15·7	301	i 3 48	+ 4	e 7 5	SS	i 4 9	PPP	e 11·1
Moscow		16·1	356	e 3 42	− 7	6 40	− 9	—	—	9·4
Kecskemet	Z.	16·2	303	e 3 29	−21	i 6 19	−32	e 4 26	PPP	e 11·3
Triest		19·9	297	4 36k	0	8 21	+ 6	4 56	PP	e 11·1
Prague		20·6	310	4 42	− 1	e 8 40	+11	—	—	e 10·1
Rome		20·7	285	i 4 46k	+ 2	i 8 41	+10	i 5 6	PP	i 9·1
Pulkovo		20·9	348	i 4 43	− 3	i 8 25	−10	—	—	e 10·5
Samarkand		21·0	81	4 48	+ 1	—	—	—	—	—
Sverdlovsk		21·9	31	i 4 53	− 4	i 8 49	− 5	10 50	L_g	14·9
Jena		22·6	309	i 5 2	− 1	e 9 8	+ 1	—	—	e 11·1
Tchimkent		22·7	73	4 59	− 5	9 14	+ 5	—	—	—
Chur		23·0	300	e 5 7	0	—	—	—	—	—
Stuttgart		23·5	304	e 5 13	+ 1	e 9 32	+ 9	i 5 38	PP	e 12·4
Zurich		23·7	300	e 5 13a	− 1	e 9 30	+ 3	—	—	—
Copenhagen		24·1	322	i 5 18	0	i 9 40	+ 6	—	—	—
Moncalieri		24·1	295	e 4 41	−37	9 54	SS	—	—	e 14·3
Basle		24·4	300	e 5 18	− 3	e 9 41	+ 2	—	—	—
Strasbourg		24·4	303	e 5 24	+ 3	e 9 51	+12	—	—	15·1
Hamburg		24·5	315	i 5 23a	+ 1	e 9 44	+ 4	—	—	e 14·5
Upsala		24·5	333	i 5 20	− 2	e 9 34	− 6	i 6 16	PP	e 13·9
Neuchatel		24·8	299	e 5 23	− 2	e 9 48	+ 2	—	—	—
Andijan		24·9	77	5 24	− 2	—	—	—	—	—
Heligoland		25·8	317	e 5 34	0	e 10 11	+ 9	e 10 31	SS	e 15·6
Frunse		26·3	71	5 44	+ 5	10 24	+13	—	—	—
De Bilt		26·8	311	5 44	0	10 20	+ 1	—	—	13·1
Uccle		27·0	307	5 45	0	i 10 26	+ 4	—	—	e 12·1
Clermont-Ferrand		27·4	296	e 6 49	PP	—	—	—	—	—
Paris		27·9	302	e 7 11	PPP	e 11 0	SS	—	—	e 13·1
Almata		28·0	69	e 5 57	+ 2	—	—	—	—	—
Bergen		29·7	327	—	—	e 10 8?	−58	—	—	—
Kew		30·0	307	i 6 16	+ 4	i 11 10	0	i 17 0	S_gS	e 18·6

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Semipalatinsk		30·2	55	e 6 17	+ 3	—	—	—	—	—
Jersey		31·0	303	—	—	e 11 13	−13	—	—	14·1
Stonyhurst		31·6	312	—	—	i 12 10	SS	—	—	18·9
Dehra Dun	N.	32·6	94	e 7 14?	PP	e 12 46?	SS	—	—	e 19·7
Almeria		33·0	279	i 6 38	− 1	11 59	+ 2	7 38	PP	—
Toledo		33·4	285	i 6 39	− 3	e 12 6	+ 3	—	—	—
Granada		33·8	281	e 6 52k	+ 6	i 12 14	+ 4	—	—	16·0
Agra	E.	34·1	99	e 6 45	− 3	12 12	− 2	14 0	SS	16·9
Bombay		35·2	116	e 6 57	− 1	i 12 35	+ 4	e 8 29	PP	18·0
Calcutta	N.	44·5	97	e 8 41	+26	i 15 11	+20	e 10 17	PP	e 21·7
Kodaikanal	E.	44·6	120	—	—	e 14 50	− 2	—	—	—
Irkutsk		45·2	51	e 8 7	−13	14 59	− 2	18 14	SS	20·3
Colombo	E.	48·6	121	8 46	− 1	15 46	− 3	—	—	24·5
Phu-Lien		59·5	87	—	—	e 18 13	− 3	—	—	—
Hong Kong		64·4	81	19 19	S	(19 19)	+ 1	20 37	?	—
Zi-ka-wei	Z.	65·0	69	e 15 58	?	—	—	—	—	39·5
Vermont		76·7	317	—	—	e 22 33	PPS	—	—	e 42·4
Bozeman		91·0	340	e 13 4	− 3	e 23 40	[+ 1]	e 17 21	PP	e 38·6
Perth		100·3	123	—	—	i 24 41	[+13]	25 53	PS	34·3
Tucson		103·4	335	e 14 3	− 1	e 25 54	+ 5	e 18 18	PP	e 41·8
Mount Wilson		103·6	341	e 18 17	PP	—	—	—	—	—
Pasadena	Z.	103·7	341	e 18 18	PP	—	—	—	—	e 54·3
Huancayo		116·8	277	—	—	e 27 53	{+61}	e 29 16	PS	e 49·4

Additional readings :—
Erevan P_g = +1m.22s., i = +1m.29s., S_g = +2m.15s.
Grozny P_g = +1m.49s., i = +2m.2s., +2m.9s., and +2m.50s., S_g = +3m.3s.
Ksara i = +3m.44s.
Istanbul S_g = +4m.54s.
Bucharest eE = +3m.44s., SE = +5m.11s.
Helwan iZ = +4m.13s., S = +6m.20s., P_cPE = +7m.41s.
Cernauti iN = +3m.12s., +3m.27s., and +4m.6s., SSN = +5m.29s.
Szeged eE = +5m.33s., eSSE = +7m.23s., eP_cPE = +8m.31s.
Kecskemet eZ = +3m.58s. and +10m.42s.
Triest i = +4m.49s., PPP = +5m.2s., i = +8m.59s., iSS = +9m.5s.
Rome iEN = +4m.52s., iPPNZ = +5m.18s., iN = +5m.44s. and +8m.47s., iSEZ = +8m.54s., iEZ = +13m.48s.
Jena eN = +6m.59s., eSE = +9m.14s.
Stuttgart i = +5m.16s., eEN = +11m.24s.
Strasbourg e = +5m.30s.
Upsala iSN = +9m.44s., SSSN = +11m.8s.?
Uccle iSE = +10m.31s.
Kew eN = +14m.38s.
Almeria i = +7m.5s., P_cS = +13m.1s.
Agra eN = +12m.7s.
Bombay iEN = +12m.40s., eE = +14m.53s.
Calcutta iS_cSN = +18m.43s.
Hong Kong S? = +26m.18s.
Bozeman eS = +24m.25s., eSS = +30m.1s., ePSPS = +30m.57s.
Perth S = +25m.36s., i = +27m.45s., SS = +29m.28s.
Tucson ePPP = +20m.31s., eS = +26m.13s., ePS = +27m.21s., eSS = +32m.45s., eSSS = +37m.11s.
Long waves were also recorded at Cape Town, La Paz, Kobe, Koti, Fordham, and Edinburgh.

Nov. 21d. 11h. 1m. 44s. Epicentre 36°·3N. 71°·0E. (as on 1939 Feb. 6d.).

Intensity IX at Srinagar, Drosh, and Gilgit; VIII at Ravalpindi; VII at Jammu and Skardu; VI at Sommarg, Peshawar, and Kabul; V at Dera, Ismail Khan, and Dalhousie; IV at Cherat; III at Sialkot and Kargil.

Epicentre 36°·5N. 70°·5E.; *depth* = 200kms. (Bombay).

C. W. B. Normand.

Seismological Bulletin of the Meteorological Department of the Government of India, October-December, 1939, p. 92.

S. M. Mukherjee and A. R. Pillai.

The Hindu Kush Earthquake of Nov. 21, 1939. Science Notes, Meteorological Department, India, Vol. 8, No. 91, 85-90, Bombay, 1941.

$A = +\cdot2630$, $B = +\cdot7638$, $C = +\cdot5894$; $\delta = -5$; $h = 0$;
$D = +\cdot946$, $E = -\cdot326$; $G = +\cdot192$, $H = +\cdot557$, $K = -\cdot808$.

Tables for depth of focus 0·025 have been used.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Andijan		4·6	14	i 1 10	0	—	—	—	—	—
Tchimkent		6·1	351	i 1 28	− 1	—	—	—	—	—
Frunse		7·1	22	i 1 43	+ 1	—	—	—	—	—
Almata		8·3	32	i 1 59	+ 1	—	—	—	—	—
Dehra Dun	N.	8·4	133	i 2 11	+12	i 3 35	+ 2	—	—	—
Agra		10·9	145	i 2 31k	− 1	4 21	−10	i 2 38	pP	—
Semipalatinsk		15·6	22	i 3 29	− 2	i 6 22	+ 4	i 3 37	pP	—
Bombay		17·4	174	i 3 55a	+ 3	i 7 4	+ 6	e 4 20	pP	—
Calcutta		20·4	127	e 4 28k	+ 5	i 8 5	+ 9	i 5 30	pP	—
Grozny		20·6	299	i 4 30	+ 5	8 56	SS	5 9	pP	—
Erevan		21·1	288	4 36	+ 6	i 8 26	+17	5 32	pP	—
Sverdlovsk		21·7	345	i 4 37	+ 1	i 8 15	− 4	i 5 13	pP	11·5
Kodaikanal	E.	26·6	166	i 5 23	+ 1	i 9 40	− 1	i 6 2	pP	—
Irkutsk		28·4	44	i 5 37	− 2	10 2	− 8	—	—	11·7
Ksara		28·8	275	i 5 44a	+ 2	i 10 25	+ 9	i 6 29	PP	—
Moscow		29·8	321	i 5 52	+ 1	10 32	0	i 6 35	pP	13·8
Colombo	E.	30·4	163	5 55	− 1	10 46	+ 4	i 6 46	pP	—
Helwan		33·7	270	i 6 25k	0	i 11 29	− 4	7 9	pP	—
Phu-Lien		34·7	106	i 6 32	− 1	i 11 43	− 5	7 39	PPP	—
Bucharest		34·8	297	e 6 36	+ 2	11 44	− 6	i 7 24	pP	—
Cernauti	N.	34·9	305	e 6 31a	− 4	—	—	i 7 44	PP	13·8
Pulkovo		35·1	325	i 6 37	0	i 11 53	− 1	i 7 23	pP	e 15·3
Belgrade		38·8	298	i 7 8k	0	i 13 46	+55	i 7 56	pP	—
Szeged	E.	38·9	301	i 7 10	+ 2	i 14 23	sS	e 9 14	PP	e 17·8
Kecskemet		39·2	302	e 6 46	−25	—	—	e 7 44	pP	—
Budapest		39·6	303	7 3	−11	—	—	e 8 5	pP	—
Dairen		39·8	71	7 17	+ 1	12 58	− 7	—	—	—
Hong Kong		39·8	98	7 17k	+ 1	13 4	− 1	8 25	PP	—
Upsala		41·2	322	i 7 25	− 2	i 13 22	− 4	i 8 14	pP	—
Zi-ka-wei	Z.	41·9	81	i 7 33k	0	13 25	−11	8 37	PP	20·3
Prague		42·5	308	i 7 38	0	—	—	e 8 43	PP	—
Triest		43·3	301	i 7 44a	0	i 13 55	− 2	8 31	pP	19·8
Copenhagen		43·6	315	i 7 47	0	i 14 0	− 1	i 8 34	pP	—
Zinsen		44·0	71	7 48	− 2	14 2	− 5	—	—	—
Jena		44·2	308	i 7 50	− 2	e 13 51	−19	i 8 38	pP	17·3
Taihoku		44·4	90	7 57	+ 4	—	—	—	—	—
Hamburg		45·0	313	i 7 58a	0	i 15 47	sS	—	—	—
Rome		45·0	296	i 7 57a	− 1	i 15 41	sS	i 8 58	pP	—
Göttingen		45·2	310	i 7 59a	0	e 15 47	sS	i 8 46	P_cP	—
Stuttgart		46·0	306	e 8 4	− 2	e 14 36	+ 1	i 8 52	pP	—
Chur		46·1	304	i 8 5	− 2	—	—	—	—	—
Heligoland		46·2	314	i 8 7	0	i 16 1	PS	e 9 16	PP	—
Zurich		46·6	304	i 8 8a	− 2	—	—	e 9 11	pP	e 18·4
Strasbourg		47·0	306	i 8 14a	0	e 14 49	0	e 8 59	pP	—
Basle		47·3	304	e 8 15	− 1	—	—	i 9 3	pP	—

Continued on next page.

	△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Bergen	47·4	323	i 8 15	− 2	i 16 24	SS	i 11 12	PPP	—
Moncalieri	47·7	301	8 12	− 7	e 13 26	?	—	—	18·7
Neuchatel	47·8	304	e 8 19	− 1	—	—	—	—	—
Nagasaki	48·0	76	8 16	− 5	14 58	− 5	—	—	—
De Bilt	48·1	312	i 8 22a	0	i 15 7	+ 2	i 9 9	pP	—
Hukuoka	48·1	75	8 29	+ 7	15 11	+ 6	—	—	—
Besançon	48·4	304	e 8 25	+ 1	i 16 31	sS	i 9 56	sP	—
Uccle	48·8	310	i 8 27a	0	i 15 15	0	i 9 16	pP	—
Hamada	48·9	73	8 26	− 2	15 10	− 6	—	—	—
Manila	49·4	103	i 8 32a	0	15 26	+ 3	—	—	22·4
Miyazaki	49·5	77	8 31	− 2	15 24	0	—	—	—
Paris	50·4	307	i 8 38a	− 2	i 15 40	+ 3	i 9 26	pP	e 22·3
Koti	50·5	74	8 40	0	15 37	− 1	—	—	—
Clermont-Ferrand	50·7	303	(i 8 40)	− 2	(i 17 14)	sS	(i 9 28)	pP	—
Kew	51·6	312	i 8 46a	− 3	i 18 46	SS	i 9 28	pP	—
Osaka	51·6	71	i 8 47a	− 2	13 43	?	9 36	pP	—
Oxford	52·1	312	i 8 52a	0	i 15 58	− 2	i 9 42	pP	—
Edinburgh	52·3	317	8 37	−17	15 33	−30	9 26	pP	—
Stonyhurst	52·3	315	i 8 58	+ 4	i 17 15	sS	i 9 28	pP	—
Nagoya	52·6	70	8 56	0	—	—	—	—	—
Bidston	52·8	315	i 8 54	− 4	i 18 50	SS	i 9 21	pP	—
Nagano	53·0	68	8 58	− 1	16 10	− 2	—	—	—
Jersey	53·2	310	i 8 57	− 3	e 17 36	sS	e 9 46	pP	—
Akita	53·3	64	9 2	+ 1	16 49	+33	—	—	—
Algiers	53·5	292	e 9 2	− 1	e 15 19	−60	11 16	pP	26·3
Misima	54·1	70	9 7	0	16 29	+ 2	—	—	—
Morioka	54·1	63	9 8	+ 1	16 26	− 1	—	—	—
Mizusawa	54·3	64	i 9 7	− 1	16 26	− 3	—	—	—
Tokyo Cen. Met. Ob.	54·5	68	9 8	− 2	17 53	sS	—	—	—
Nemuro	56·0	57	9 19	− 2	—	—	—	—	—
Scoresby Sund	57·2	337	e 9 31	+ 2	i 17 4	− 4	i 10 36	sP	i 22·8
Toledo	57·5	298	i 9 30a	− 1	e 18 34	sS	i 10 21	pP	—
Almeria	57·6	294	i 9 29	− 3	i 18 11	sS	10 19	pP	—
Granada	58·3	295	i 9 0a	−37	e 17 5	−17	9 47	pP	30·5
Tananarive	59·2	206	e 9 44	+ 1	17 28	− 6	10 32	pP	23·9
San Fernando	60·5	295	e 9 49	− 3	18 56	sS	i 11 29	sP	31·3
Ivigtut	71·0	334	10 56	− 3	19 56	− 2	11 45	pP	—
Johannesburg	74·2	219	i 11 16	− 1	i 20 34	0	i 12 10	pP	—
College	74·7	16	11 19a	− 1	e 20 32	− 7	12 12	pP	—
Sitka	84·4	13	i 11 8	−64	22 16	− 4	15 31	PP	e 35·4
Cape Town	85·4	221	e 12 18	+ 1	22 21	[0]	e 15 34	PP	—
Halifax	89·6	329	e 12 34	− 3	e 23 10	+ 1	i 13 30	pP	—
Seven Falls	90·2	335	e 12 34	− 6	—	—	—	—	25·3
East Machias	90·9	332	e 12 41	− 2	e 23 22	+ 1	e 13 26	pP	e 36·8
Shawinigan Falls	91·3	336	e 12 46	+ 1	e 25 16?	PS	e 13 40	pP	—
Ottawa	93·3	336	i 12 54	0	e 23 46	+ 4	i 13 42	pP	33·3
Vermont	93·3	334	e 13 25	pP	i 25 7	PS	e 16 58	PP	—
Harvard	94·5	333	i 13 23a	+23	i 25 14	SP	i 14 18	pP	—
Adelaide	94·8	130	i 13 54	pP	i 24 47	sS	i 17 38	PP	—
Williamstown	94·9	334	i 13 1	0	i 26 19	PS	i 13 56	pP	—
Seattle	95·6	9	e 17 41	pPP	25 18	sS	18 24	sPP	e 39·9
Toronto	96·0	338	—	—	i 24 53	sS	i 26 29	PS	32·3
Fordham	96·7	333	i 13 9k	− 1	i 24 55	sS	i 14 5	pP	—
Butte	98·0	2	e 13 13	− 2	e 24 20	− 2	e 14 6	pP	e 41·7
Bozeman	98·4	1	e 13 18	+ 1	e 23 32	[− 3]	e 14 11	pP	e 39·5
Pittsburgh	99·1	338	i 13 18	− 2	i 25 11	pS	i 17 25	PP	—
Chicago	99·8	345	i 13 15	− 9	e 23 36	[− 5]	e 14 17	pP	e 41·4
Brisbane	99·9	117	e 17 10	PP	i 24 52	+15	e 17 40	PP	—
Bermuda	100·2	323	e 13 8	−17	e 23 29	[−15]	e 17 37	PP	i 42·4
Melbourne	100·6	129	e 14 16	pP	i 23 42	[− 4]	i 17 38	PP	—
Riverview	102·2	122	e 18 38	PP	e 23 49	[− 5]	e 27 46	PS	—
Sydney	102·3	122	—	—	e 23 28	[−26]	—	—	—
Lincoln	102·4	350	e 14 18	pP	e 23 51	[− 3]	e 17 46	PP	e 42·5
Florissant	103·3	345	i 13 38	− 1	e 24 1	[+ 3]	i 14 31	pP	—
Salt Lake City	103·3	3	e 13 25	−14	25 25	+19	17 57	PP	e 44·8

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
St. Louis	103·4	345	i 13 36	− 4	e 25 32	+25	e 17 11	?	—
Ukiah	103·8	11	e 17 42	PP	e 25 23	+13	32 23	SS	e 43·6
Cape Girardeau	104·6	344	e 12 31	?	e 24 31	[+26]	e 16 30	SKP	—
Berkeley	105·2	11	i 18 17	PP	—	—	—	—	—
Branner	105·6	11	—	—	e 27 58	PS	—	—	—
Columbia	105·4	335	e 14 42	pP	e 25 40	+17	i 32 42	SS	e 42·4
Santa Clara	105·7	10	e 14 26	pP	e 28 2	PPS	—	—	—
Lick	105·8	10	e 19 24	PPP	e 28 39	PPS	—	—	—
Tinemaha	106·5	7	e 13 52	P	—	—	i 18 11	PP	—
Fresno N.	106·6	8	e 18 22	PP	e 29 28	?	—	—	—
Haiwee	107·5	7	e 13 56	P	—	—	i 18 4	PP	—
Little Rock	107·6	345	e 19 6	?	i 30 6	?	i 20 44	PPP	—
Mount Wilson	109·3	7	e 14 5	P	e 27 32	PS	i 18 7	PKP	—
Pasadena	109·4	7	e 14 4	P	i 27 38	PS	e 18 7	PKP	—
Riverside	109·6	7	e 18 5	[−3]	—	—	i 18 44	PP	—
Tucson	111·8	1	i 14 18	P	e 26 21	SKKS	e 15 3	pP	e 46·1
San Juan	112·2	315	e 18 41	PP	e 26 20	SKKS	28 37	PS	e 45·6
Christchurch	121·5	123	21 5a	?	31 59	PPS	—	—	—
Rio de Janeiro	122·2	264	e 20 16	PP	—	—	—	—	—
Wellington	122·2	120	20 1	PP	31 17	PPS	—	—	—
La Paz	138·8	288	i 19 6a	[+3]	26 2	[+ 9]	i 20 4	pPKP	75·3
Huancayo	141·3	300	e 19 3	[−5]	39 57	SS	i 22 14	PP	e 57·2

Additional readings :—
Dehra Dun i?N = +2m.58s.
Agra sPN = +3m.18s.
Semipalatinsk i = +3m.41s., +3m.50s., +4m.23s., and +6m.41s.
Bombay iE = +4m.31s., isPEN = +4m.50s., iE = +8m.56s. and +23m.49s.
Calcutta iPN = +4m.41s., ipPN = +5m.43s., iSN = +8m.18s., eSSN = +9m.5s., isSN = +9m.18s.
Grozny i = +4m.40s., +4m.55s., +5m.20s., +5m.36s., +6m.9s., +6m.58s., and +9m.26s., esS = +10m.0s.
Erevan i = +9m.40s.
Kodaikanal eE = +5m.54s., iE = +6m.9s., and +6m.27s., isPE = +6m.34s.
Ksara PP = +6m.52s., sS = +11m.44s.
Colombo sSE = +11m.54s.
Helwan sPZ = +7m.34s., P_cPZ = +7m.52s., PPE = +8m.16s., PPPE = +9m.10s., iE = +9m.46s., SN = +12m.58s., sSN = +14m.16s.
Bucharest iN = +6m.55s., iE = +7m.48s., iN = +8m.21s., iE = +10m.17s., SEN = +13m.13s.?, iE = +13m.18s.
Cernauti iN = +6m.35s., +6m.50s., and +8m.8s.
Belgrade iP_cPNW = +8m.19s., iNW = +9m.38s. and +9m.50s., iSNW = +14m.22s., iS_cSNW = +17m.6s.
Szeged eP_cPE = +8m.29s., eE = +11m.5s., eP_cSE = +12m.33s., eS_cSE = +15m.49s., iSSE = +17m.19s.
Kecskemet ePE = +6m.49s., eZ = +7m.33s., iN = +9m.2s.
Budapest e = +7m.16s.
Hong Kong P_cP = +10m.1s., SS = +15m.16s., ? = +16m.21s.
Upsala isPE = +8m.33s., iE = +10m.7s., iN = +13m.25s. and +14m.38s., iE = +14m.50s., iN = +15m.45s., iE = +16m.20s.
Zi-ka-wei iZ = +8m.20s., iN = +8m.41s., iE = +8m.47s., iZ = +10m.25s. and +10m.55s., iE = +13m.35s., iZ = +13m.39s. and +15m.11s., iE = +15m.16s., SSZ = +16m.5s., SSSZ = +16m.51s., SSSSZ = +17m.13s., iZ = +18m.3s.
Prague e = +10m.26s., +15m.6s., and +17m.1s.
Triest ePP = +9m.11s., PPP = +9m.40s., e = +10m.37s., sS = +15m.20s., iSS = +17m.30s., iSSS = +18m.19s.
Copenhagen eN = +8m.7s., sP = +8m.56s., eN = +9m.18s., PP = +9m.36s., pPP = +10m.10s., sP_cP = +10m.33s., eN = +10m.56s., eEN = +15m.19s., sS = +15m.28s., S_cS = +17m.22s. and +17m.34s.
Jena iPN = +7m.55s., iN = +8m.41s., i = +9m.1s., e = +10m.16s., iE = +10m.43s., iZ = +10m.46s., eE = +12m.53s. and +13m.51s., iN = +15m.29s.
Hamburg eZ = iE = +10m.57s., eZ = +16m.39s., eE = +17m.47s.
Rome iP_cPZ = +8m.47s., iSPZ = +9m.35s., iPPZ = +10m.52s., iN = +12m.2s. and +14m.20s., iSZ = +15m.44s., isS = +18m.8s., iEN = +18m.22s., iN = +18m.59s. and +20m.38s., iSSN = +21m.6s., iN = +22m.7s.
Göttingen e = +10m.54s., eS_cS = +17m.54s.
Stuttgart ipPZ = +8m.55s., iSPE = +9m.16s., iPPE = +9m.58s., ipPPE = +10m.41s., iE = +11m.1s., +11m.18s., and +11m.50s., esSN = +15m.55s., isSEN = +15m.58s., eSSN = +18m.12s., isSSEN = +19m.15s.
Heligoland eE = +10m.46s. and +18m.17s.
Zurich e = +11m.22s.

Continued on next page.

Strasbourg iE = +9m.14s., isPZ = +9m.26s., iP$_c$PEZ = +9m.54s., iPPEZ = +10m.9s., epPPZ = +10m.45s., isPPEZ = +11m.10s., iE = +11m.20s. and +13m.16s., isSE = +16m.16s., eS$_c$SE = +17m.32s., iSSE = +18m.46s., iE = +19m.46s.
De Bilt iZ = +11m.23s., isSE = +16m.14s., iN = +16m.26s.
Besançon e = +19m.46s.
Uccle isP = +9m.35s., iPPE = +10m.25s., ipPP = +11m.7s., isPPZ = +11m.28s., iE = +13m.42s., iN = +16m.29s. and +16m.36s., isS = +16m.39s., i = +16m.55s., iS$_c$SE = +17m.48s., iSS = +19m.11s., iZ = +19m.34s., isSS = +20m.10s., iE = +20m.13s., iN = +20m.31s.
Paris iP$_c$P = +9m.48s., iPP = +10m.38s., iPPP = +11m.44s., sS = +16m.44s., PS = +17m.16s., sSS = +20m.19s.
Clermont-Ferrand PP = (+11m.4s.); all readings have been reduced by one minute.
Kew iEZ = +9m.8s., isPEZ = +9m.58s., ipPPEZ = +12m.37s., ipSEN = +19m.52s., iSPEN = +19m.58s., ePSN = +20m.22s., iZ = +20m.36s., iE = +20m.52s., iZ = +21m.12s. and +21m.32s., iSSNZ = +24m.12s., isSSN = +25m.8s., iSSSN = +28m.16s., ipSSSN = +29m.6s., isSSSN = +29m.21s., iZ = +34m.1s.
Oxford i = +10m.57s., +12m.30s., and +17m.16s.
Edinburgh P$_c$P = +9m.50s., PP = +10m.37s., PPP = +11m.43s., i = +12m.23s., P$_c$S = +13m.37s., PS = +16m.23s., PPS = +16m.30s., sS = +16m.59s., S$_c$S = +18m.1s., SS = +19m.8s., SSS = +20m.59s.
Stonyhurst isP = +10m.3s., iPP = +11m.48s., ipPP = +12m.36s., i = +12m.50s., +17m.28s., +20m.13s., +20m.49s., and +21m.5s.
Bidston i = +16m.6s., iPS? = +19m.56s., isSS = +24m.34s., iSSS = +28m.26s.
Jersey e = +9m.19s., +10m.10s., +12m.16s., +21m.26s., +22m.16s.?, and +23m.23s.
Algiers e = +10m.12s., +13m.35s., +17m.29s., +19m.9s., and +21m.29s.
Scoresby Sund isPP = +13m.8s., S$_c$P = +13m.42s., P$_c$S = +14m.7s., iS = +17m.15s., i = +17m.24s., sS = +18m.30s., eS$_c$S = +18m.49s., eSS = +21m.9s., iSS = +22m.0s.
Toledo i = +10m.41s., +10m.44s., +13m.38s., +18m.38s., and +20m.26s.
Almeria sP = +10m.36s., PP = +12m.1s., pPP = +12m.50s., sPP = +13m.10s., pPPP = +14m.30s., SS = +22m.36s., sSS = +23m.36s.
Granada pP$_c$P = +10m.13s., PP = +11m.57s., P$_c$S = +13m.35s., sS = +18m.14s., SS = +20m.49s., sSS = +22m.1s.
Tananarive sPEN = +10m.55s., PP = +11m.47s., pPP = +12m.5s., sPP = +13m.6s., EN = +16m.49s., S$_c$SEN = +19m.2s., SSE = +20m.47s.
Ivigtut +20m.52s. and +21m.27s.
Johannesburg eN = +12m.34s., +13m.34s., and +14m.40s., i?N = +15m.16s., e?N = +16m.4s., iSEN = +17m.4s.
College ePP = +14m.4s., esPP = +15m.17s., epPPP = +16m.34s., iS = +20m.36s., isS = +21m.41s., esPS = +22m.6s., SS = +25m.34s., eSSS = +28m.31s., iSSS = +29m.30s.
Sitka sPP = +16m.41s., eSP = +23m.8s., ipS = +23m.26s., SS = +27m.51s., esSS = +29m.25s., eSSS = +31m.50s.
Cape Town iN = +13m.9s., iE = +13m.12s., ePPP = +17m.29s., SKSE = +22m.25s., ePS?E = +23m.39s., iE = +24m.4s., eSSE = +28m.19s., eSSSE = +30m.56s.
Halifax i = +24m.45s.
East Machias iP = +12m.45s., pP = +13m.38s., epPP = +16m.56s., sPP = +17m.27s., pS = +24m.4s., eSP = +24m.23s., iSP = +24m.30s., isSP = +25m.53s., esSS = +30m.34s., SSS = +33m.22s.
Ottawa eN = +24m.40s. and +25m.46s., iN = +26m.22s.
Vermont epPP = +17m.21s., isPP = +18m.16s., esSP = +26m.21s., isSP = +26m.49s., i = +26m.53s., esSS = +31m.21s., eSSS = +34m.1s.
Harvard ePPNZ = +17m.9s., iNZ = +17m.16s., iEN = +27m.5s.
Adelaide i = +18m.4s. and +23m.9s.
Williamstown isP = +14m.28s., i = +16m.7s., iPKP = +16m.48s., iPP = +17m.58s., i = +19m.59s.
Seattle esPP = +18m.17s., esSP = +26m.47s.
Toronto iN = +25m.39s., iE = +26m.47s.
Fordham iNZ = +17m.5s., iZ = +20m.20s., iE = +25m.2s., iNZ = +26m.40s., iEN = +27m.5s.
Butte ePP = +17m.21s., epPPP = +20m.25s., eSKKS = +23m.41s., epS = +25m.6s., isS = +25m.46s., esSS = +31m.47s., eSSS = +35m.46s.
Bozeman esP = +14m.31s., ePP = +17m.19s., epPP = +18m.29s., ePPP = +19m.53s., eS = +24m.42s. and +25m.6s., PS = +25m.23s., pS = +25m.47s., eSP = +26m.25s., esSP = +27m.47s., eSS = +31m.11s., sSS = +32m.30s., eSSS = +35m.35s.
Pittsburgh iZ = +13m.55s. and +14m.14s., i = +25m.38s., +27m.0s., +27m.31s., and +27m.55s.
Chicago eP = +13m.23s., esP = +14m.32s., ePP = +17m.31s., ePPP = +19m.37s., eS = +24m.38s., S = +25m.16s., eSS = +31m.32s., eSSS = +35m.41s.
Bermuda S = +25m.16s., SPP = +27m.32s., SS = +31m.42s.
Melbourne i = +18m.48s., e = +22m.46s., i = +25m.23s., +26m.48s., +31m.58s., and +33m.8s.
Riverview eN = +19m.10s., eE = +19m.16s., eN = +23m.16s.
Lincoln ePPP = +20m.36s., eS = +24m.56s., epS = +26m.4s., ePPS = +28m.28s., eSS = +32m.37s., eSSS = +37m.23s.
Florissant eN = +17m.45s., eZ = +17m.51s., +19m.6s., and +20m.17s., iE = +25m.34s.
Salt Lake City esP = +14m.57s., epPP = +18m.42s., esPP = +19m.4s., pS = +26m.7s., ePPS = +28m.29s.
St. Louis eN = +19m.6s. and +27m.46s.

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Ukiah esPP = +19m.23s., pPPP = +21m.3s., eS = +25m.39s., eSPP = +27m.45s., ePPS = +28m.17s., ePKKP = +29m.48s., eSS = +32m.49s., eSSS = +36m.35s.
Cape Girardeau eN = +12m.36s., isSKPN = +17m.52s., iN = +18m.2s., iEN = +27m.15s.
Columbia esPP = +19m.22s., epPPP = +21m.34s., epS = +26m.18s., ePS = +27m.35s., PPS = +28m.27s., eSSS = +37m.12s.
Lick eE = +29m.20s.
Tinemaha iPKKPZ = +29m.22s., epPKKPZ = +30m.18s.
Fresno eN = +18m.26s. and +19m.43s.
Mount Wilson iPPEZ = +18m.45s., iZ = +24m.2s., iPKKPZ = +29m.13s., ipPKKPZ = +30m.11s.
Pasadena iPPZ = +18m.45s., isPPZ = +19m.52s., iZ = +24m.0s. and +28m.50s., iPKKPZ = +29m.12s., ipPKKPZ = +30m.10s., eSSZ = +33m.37s., iSSNZ = +34m.27s.
Riverside esPPZ = +19m.52s., eNZ = +28m.52s., iPKKPZ = +29m.11s., ipPKKPZ = +30m.10s.
Tucson esP = +15m.28s., ePKP = +18m.12s., ePP = +18m.56s., epPP = +19m.39s., SPP = +20m.0s., pPP = +21m.21s., epPPP = +22m.23s., eSKS = +24m.38s., eSKKS = +25m.9s., epS = +27m.19s., esS = +27m.38s., eSP = +28m.2s., SP = +28m.9s., ePS = +28m.43s., epPS = +28m.50s., isPS = +29m.14s., ePPS = +29m.21s., PPS = +29m.36s., eSS = +34m.18s., esSS = +35m.20s., ePKP,PKP = +38m.25s., eSSS = +38m.35s.
San Juan ePPP = +21m.23s., epPPP = +22m.33s., eS = +27m.0s., iPPS = +29m.43s., eSS = +33m.39s., eSSS = +38m.52s.
La Paz isPKPZ = +20m.58s., iPPZ = +21m.59s., ipPPZ = +22m.20s., ipPKS = +22m.48s., iZ = +23m.34s., SKKS = +28m.6s., SKSP = +31m.40s., PPS = +34m.4s.
Huancayo PKP = +19m.6s. and +19m.11s., SKP = +22m.20s., isPKS = +23m.46s., SKSP = +31m.43s., iPPS = +35m.0s., i = +35m.4s., +36m.0s., +36m.6s., and +42m.56s., eSSS = +45m.1s.

Nov. 21d. 21h. Undetermined shock.

Manila ePZ = 29m.1s., SEN = 34m.5s.
Brisbane ePEN = 29m.30s., eSE = 33m.54s., iSN = 34m.0s.
Adelaide eP = 30m.4s., e = 34m.35s., i = 35m.29s., 38m.24s., and 38m.39s.
Sendai S = 31m.26s.
Nagano P = 31m.31s.
Irkutsk eP = 34m.11s., eS = 42m.41s., eL = 55·0m.
Riverview ePEN? = 35m.16s., eN = 35m.27s., eE = 35m.35s., eSEN = 38m.59s., iN = 41m.6s., iE = 41m.10s. and 42m.17s., eLN = 43·4m.
Sydney e = 35m.30s. and 41m.18s., eL = 42·7m.
Andijan eP = 35m.34s.
Samarkand eP = 35m.38s.
Frunse eP = 35m.46s.
Melbourne iP = 36m.11s., e = 39m.9s., S? = 40m.50s., L = 43·1m.
Sverdlovsk eP = 36m.24s., S = 47m.2s., L = 60·0m.
Pasadena ePZ = 37m.33s., eLZ = 71·0m.
Mount Wilson ePZ = 37m.34s.
Riverside ePZ = 37m.36s.
Tinemaha ePZ = 37m.38s.
Calcutta eN = 39m.9s., iN = 41m.24s.
Ksara e = 40m.30s. and 51m.48s., L = 81·0m.
Moscow e = 41m.30s.
La Paz iPKPZ = 43m.25s.a, LZ = 99·0m.
Pulkovo e = 50m.28s., eL = 75·5m.
Long waves were also recorded at Baku, Kew, Uccle, Paris, De Bilt, and Huancayo.

Nov. 21d. Readings also at 1h. (Andijan and near Tchimkent), 3h. (near Almata and Andijan), 6h. (near Lick (2)), 8h. (Tucson and Colombo), 9h. (Huancayo), 11h. (near Mizusawa and La Paz), 13h. (near Tananarive, Frunse, Andijan, Tchimkent, and Samarkand (2)), 14h. (Andijan, Tchimkent, Sotchi, Samarkand, Grozny, Erevan, and Ksara), 20h. (near Lick, Tucson, San Francisco, Branner, and near Berkeley), 23h. (Bombay and Tucson).

Nov. 22d. Readings at 0h. (Andijan), 2h. (Sotchi), 3h. (San Juan, Ottawa, Fordham, Williamstown, Harvard, and Tucson), 4h. (Tchimkent and Andijan), 5h. (Andijan, Tucson, Mizusawa (2), Pasadena, Baku, Irkutsk, Mount Wilson, Riverside, Tinemaha, and Haiwee), 10h. (near Manila), 12h. (Andijan), 16h. (near Branner), 18h. (Andijan), 20h. (Erevan, Grozny, Ksara, and near Sotchi), 21h. (near Harvard and Strasbourg), 22h. (Oaxaca and Tucson).

Nov. 23d. 15h. 14m. 48s. Epicentre 38°·2N. 90°·1W.

Intensity V at Sparta (Illinois). Epicentre 38°13′N. 90°04′W. near Griggs (Illinois). Macroseismic area 150,000 sq. miles.

R. Bodle.

United States Earthquakes, 1939, Washington, 1941, p. 9, chart p. 62.

H. F. Birkenhauer.

The Illinois Basin Earthquake of November 23, 1939. Earthquake Notes, Sept., 1940, Vol. XII, p. 15. The Illinois Earthquake of November 23, 1939 (abstracts), Proceedings. Missouri Academy of Sciences, Vol. 6, No. 4, p. 91. Columbia, 1940.

$A = -\cdot0014$, $B = -\cdot7878$, $C = +\cdot6159$; $\delta = -4$; $h = -1$;
$D = -1\cdot000$, $E = +\cdot002$; $G = -\cdot001$, $H = -\cdot616$, $K = -\cdot788$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
St. Louis		0·4	347	i 0 12	− 1	i 0 18	− 3	—	—	—
Florissant		0·6	341	i 0 16	+ 1	i 0 24	− 2	—	—	i 0·4
Cape Girardeau		1·1	153	i 0 22	0	i 0 34	− 5	—	—	—
Little Rock		3·9	209	i 1 4	+ 2	i 1 47	− 3	i 2 0	S*	i 2·1
Chicago		4·2	27	e 1 12	+ 5	e 1 48	− 9	e 1 19	P*	i 2·2
Chicago (Loyola)		4·2	27	e 1 12	+ 5	i 1 59	+ 2	e 1 21	P_g	i 2·2
Cincinnati		4·5	77	i 1 21	P*	e 2 4	− 1	i 2 20	S*	—
Cleveland		7·4	61	—	—	e 3 0	−18	e 3 44	S*	e 3·9
Buffalo		9·8	58	—	—	i 4 54	S*	i 5 10	S_g	—
Pennsylvania		9·8	72	e 1 47	−37	e 4 29	+12	i 5 8	S*	—
Denver		11·7	283	—	—	i 5 16	SS	i 5 40	SSS	e 6·6
Philadelphia		11·7	77	—	—	e 5 2	− 2	e 5 22	SS	i 6·0
Fordham		12·8	73	i 3 3	− 3	—	—	—	—	e 7·0
Ottawa		12·9	52	i 3 2	− 5	i 5 26	− 7	—	—	i 6·7
Williamstown		13·6	65	i 3 12	− 5	i 5 49	− 1	i 3 27	PP	—
Harvard	z.	14·8	67	i 3 45	PPP	—	—	—	—	i 8·0
Weston		14·9	68	—	—	e 6 10	−10	—	—	i 7·8
Shawinigan Falls		15·3	51	—	—	e 5 54	−36	e 7 6	SSS	8·2
Tucson		17·9	257	e 4 11	− 1	e 7 25	− 5	e 4 31	PP	e 8·4

Additional readings:—
Florissant iE = +20s.
Cape Girardeau iE = +37s.
Buffalo e = +5m.6s.
Pennsylvania e = +1m.57s., i = +2m.48s.
Philadelphia eS = +5m.36s.
Williamstown i = +6m.16s., iS = +6m.48s.
Shawinigan Falls e = +6m.6s.

Nov. 23d. Readings also at 1h. (Frunse, Samarkand and Andijan (2)), 5h. (Riverside, Haiwee, Mount Wilson, Tinemaha, Pasadena, and Tucson), 6h. (Oaxaca), 7h. (Andijan, Tucson, Sverdlovsk, Ksara, Baku, Perth, Kodaikanal, and Riverview), 9h. (near Berkeley, Lick, and Branner), 12h. (near Manila), 15h. (Andijan, Samarkand, and Tchimkent), 16h. (Andijan, Samarkand, and Tchimkent), 17h. (near Mizusawa), 18h. (Andijan, Samarkand, and Huancayo).

Nov. 24d. 23h. 21m. 32s. Epicentre 17°·8S. 178°·8W.

$A = -\cdot 9526$, $B = -\cdot 0199$, $C = -\cdot 3038$; $\delta = +14$; $h = +5$;
$D = -\cdot 021$, $E = +1\cdot 000$; $G = +\cdot 304$, $H = +\cdot 006$, $K = -\cdot 953$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Apia		7·9	60	e 2 20	P*	i 4 23	S_g	—	—	e 8·0
Arapuni		20·8	192	—	—	8 28?	−5	—	—	—
Wellington		24·0	192	5 39	+22	11 25	SSS	—	—	—
Christchurch		26·7	193	6 51	PPP	i 11 1	SS	—	—	—
Brisbane		27·7	245	i 5 52	0	10 34	+ 1	i 6 40	PP	—
Riverview	N.	31·2	233	e 7 29	PP	e 11 34	+ 5	—	—	e 13·9
Sydney		31·2	233	e 7 16	PP	e 11 34	+ 5	—	—	e 14·3
Melbourne		37·4	230	e 8 50	PP	—	—	—	—	18·1
Honolulu		44·0	29	e 8 15	+ 4	—	—	—	—	e 17·3
Manila		67·5	295	e 11 1	+ 1	20 5	+ 9	—	—	33·5
Vladivostok		75·6	325	e 11 32	−16	e 30 56	SSS	e 15 28	PPP	e 33·9
Santa Barbara		76·5	47	e 11 53	− 1	—	—	—	—	—
Ukiah		76·8	42	—	—	e 28 41	?	—	—	e 29·9
La Jolla	E.N.	77·4	50	e 12 18	+20	—	—	—	—	—
Pasadena		77·4	48	i 11 58	0	—	—	—	—	e 34·5
Mount Wilson		77·5	48	i 11 59	0	—	—	—	—	—
Riverside		77·9	48	i 12 0	− 1	—	—	—	—	—
Haiwee		78·6	46	e 12 6	+ 1	—	—	—	—	—
Tinemaha		78·9	45	e 12 6	− 1	—	—	—	—	—
Tucson		81·9	52	e 12 24	+ 1	e 22 30	− 6	e 15 33	PP	e 33·6
College		85·7	12	—	—	e 22 57	S_eS	e 27 38	SS	e 34·8
Bozeman		87·9	40	—	—	e 32 30	SSS	—	—	—
Lincoln		95·6	49	e 18 3	PP	e 23 55	[− 9]	e 25 12	PS	e 37·0
Irkutsk		96·1	323	—	—	e 24 40	− 8	e 30 58	SS	e 43·5
Huancayo		98·9	105	—	—	e 25 0	−11	27 21	PS	47·6
Calcutta	N.	99·2	291	—	—	e 27 41	PS	—	—	—
Chicago		102·5	49	—	—	e 25 41	0	33 3	PSPS	e 41·2
Colombo	E.	102·8	273	—	—	e 24 58	[+18]	—	—	—
Columbia		106·0	58	—	—	e 25 8	[+13]	e 27 8	PS	e 44·9
Agra	E.	109·4	294	e 20 44	PPP	e 29 2	PS	e 33 42	SS	—
San Juan		116·4	76	e 19 57	PP	e 25 52	[+15]	e 36 17	PSPS	e 46·5
East Machias		117·5	47	e 19 36	PP	e 27 17	{+20}	e 29 44	PS	e 48·9
Sverdlovsk		121·3	326	e 20 1	PP	e 28 6	{+44}	—	—	47·5
Baku		132·6	309	e 18 37	[−40]	e 32 29	PS	e 39 41	SS	e 60·5
Moscow		133·2	333	—	—	e 44 36	SSS	—	—	73·3
Ksara		145·1	303	e 19 55	[+16]	29 58	{+ 7}	e 23 8	PP	68·5
Uccle		147·0	357	e 19 58	[+15]	e 41 34	SS	e 47 16	SSS	e 69·5
Paris		149·0	358	e 19 28?	[−18]	—	—	—	—	e 77·5
Helwan		150·0	299	e 20 6	PKP_2	e 26 58	[+ 4]	—	—	—
Triest		150·3	342	e 20 33	PKP_2	—	—	—	—	e 74·1
Clermont-Ferrand		152·1	356	e 21 17	?	—	—	—	—	—
Rome		154·1	340	i 20 18	PKP_2	i 30 47	{+61}	i 20 47	pPKP	e 78·8

Additional readings :—
Apia i = +6m.24s.
Pasadena iZ = +12m.35s.
Tucson eP = +12m.40s., ePPP = +17m.12s., sPPS = +23m.8s., eSS = +28m.0s., eSSS = +31m.13s.
Lincoln ePPS = +26m.14s.
Huancayo PSPS = +33m.0s.
Columbia ePPS = +28m.10s., ePSPS = +33m.53s.
San Juan eSSS = +40m.45s.
East Machias ePPS = +30m.40s.
Baku e = +23m.38s. and +44m.42s.
Moscow e = +67m.26s.
Ksara PPS = +36m.8s., SS = +42m.10s.
Helwan eZ = +20m.49s. and +21m.52s.
Triest e = +20m.52s.
Rome eZ = +23m.43s.
Long waves were also recorded at Berkeley, Scoresby Sund, Prague, Harvard, Bidston, Florissant, Kew, Pulkovo, Bombay, De Bilt, Fordham, St. Louis, and La Paz.

Nov. 24d. Readings also at 0h. (Riverside, Mount Wilson, Pasadena, Sverdlovsk, and Vladivostok), 1h. (Bombay, Pulkovo, Moscow, Rome, Triest, Ksara, Baku, Irkutsk, and Tucson), 2h. (Tucson), 3h. (Sverdlovsk and Vladivostok), 5h. (near Port au Prince and San Juan), 6h. (Andijan), 17h. (Ottawa), 18h. (Balboa Heights and Tucson), 22h. (Tucson), 23h. (Lincoln).

Nov. 25d. Readings at 0h. (near Branner), 1h. (Samarkand), 5h. (La Paz), 6h. (Manila), 7h. (Ksara, Riverview, Almata, and Andijan (2)), 13h. (La Paz), 17h. (Tchimkent, near La Paz, Andijan, and Samarkand), 19h. (Williamstown and Tucson), 23h. (Tucson, Honolulu, and Salt Lake City).

Nov. 26d. Readings at 3h. (Tchimkent), 6h. (Huancayo, San Juan, Tucson (2), Ukiah, Riverside, Pasadena, Fordham, Tinemaha, and Mount Wilson), 7h. (Clermont-Ferrand, near Istanbul, Baku, Triest, Ksara, Sverdlovsk, Grozny, Belgrade, Moscow, Jena, Bucharest, Stuttgart, and Helwan), 8h. (Tchimkent), 9h. (Andijan), 18h. (near Berkeley, Santa Clara, Lick, Branner, and San Francisco), 19h (Samarkand, Ottawa, Andijan, and Tchimkent).

Nov. 27d. Readings at 3h. (Melbourne, Colombo, and Riverview), 6h. (La Paz), 7h. (Tchimkent, Andijan, and Samarkand), 11h. (Erevan, Grozny, Almata, Bombay, Frunse, Agra, Calcutta, Irkutsk, Tchimkent, Andijan, Samarkand, Sverdlovsk, and Baku), 14h. (Pasadena, Branner, Andijan, Mount Wilson, Tucson, and Riverside), 15h. (Tchimkent, Andijan, Sverdlovsk, Baku, Vladivostok, near Mizusawa, and Osaka), 16h. (Agra), 17h. (Rome), 23h. (Mount Wilson, Riverside, and Tucson).

Nov. 28d. 2h. 10m. 12s. Epicentre 8°·7N. 78°·5W.

Mapa sismico y tectonico de Columbia (Banco de la Republica, Bol. grafico 7, febrero 1947). Epicentre 8°·7N. 78°·5W. Depth 80kms.

$A = +\cdot1971$, $B = -\cdot9688$, $C = +\cdot1503$; $\delta = +1$; $h = +7$;
$D = -\cdot980$, $E = -\cdot199$; $G = +\cdot030$, $H = -\cdot147$, $K = -\cdot989$.

Tables for depth of focus 0·030 have been used.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Balboa Heights		1·1	284	i 0 10	−23	i 0 21	−38	—	—	0·5
Port au Prince		11·5	31	i 2 27	−12	i 4 13	−31	—	—	—
San Juan		15·4	50	e 3 1	−26	—	—	—	—	i 6·1
Huancayo		20·8	172	e 4 31	+ 6	8 20	+21	e 4 48	PP	i 8·9
Columbia		25·3	355	e 5 8	0	e 9 9	− 6	e 5 27	PP	—
La Paz	Z.	27·1	157	5 25	+ 1	i 11 58	SS	—	—	16·5
St. Louis	E.	31·6	343	e 5 59	− 5	e 10 54	− 1	—	—	—
Fordham	E.	32·3	8	—	—	e 13 18	SS	—	—	—
Chicago		34·0	348	e 9 3	PcP	e 11 44	+12	e 11 56	sS	e 13·8
Ottawa		36·6	4	i 6 42	− 4	i 14 20	SS	—	—	18·8
Tucson		38·0	313	6 58a	0	—	—	e 8 46	PPP	e 15·2
La Jolla	N.	43·1	310	e 7 42	+ 2	—	—	—	—	—
Riverside	Z.	43·7	312	i 7 45	0	—	—	i 8 6	pP	—
Mount Wilson		44·3	312	i 7 50	+ 1	—	—	—	—	—
Pasadena		44·4	312	i 7 50a	0	—	—	i 8 7	pP	—
Haiwee		45·1	314	i 7 55	− 1	—	—	—	—	—
Santa Barbara		45·6	311	e 7 59	− 1	—	—	—	—	—
Tinemaha	Z.	45·7	314	e 8 1	+ 1	—	—	—	—	—

Additional readings:—
San Juan eP = +3m.9s.
Huancayo ePPP = +5m.18s.
Columbia eS = +9m.19s.
Tucson ePcP = +9m.16s.

Nov. 28d. 14h. 22m. 10s. Epicentre 32°·2N. 49°·3E.

$A = +\cdot5528$, $B = +\cdot6427$, $C = +\cdot5303$; $\delta = -13$; $h = +1$;
$D = +\cdot758$, $E = -\cdot652$; $G = +\cdot346$, $H = +\cdot402$, $K = -\cdot848$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Baku		8·2	3	2 19	P*	e 3 49	+11	e 4 20	S_g	—
Erevan		8·8	336	3 18	+67	5 8	?	—	—	—
Ksara		11·4	282	e 3 8?	+21	e 5 32?	+36	15 52	S_cS	—
Grozny		11·5	347	3 40	?	e 5 39	+40	—	—	—
Helwan		15·6	266	i 3 47a	+ 4	e 6 44	+ 7	4 5	PP	—
Samarkand		16·1	57	3 47	− 2	—	—	—	—	—
Istanbul		18·5	304	4 16	− 3	(7 58)	+14	—	—	(11·5)
Tchimkent		19·0	52	4 23	− 3	—	—	—	—	—
Andijan		20·4	59	e 4 39	− 2	—	—	—	—	—
Bucharest		21·8	312	e 5 0	+ 4	(8 53)	+ 1	9 36	SS	—
Frunse		22·6	55	5 8	+ 5	—	—	—	—	—
Cernauti		23·9	320	e 5 2	−14	9 18	−12	10 0	SS	—
Almata		24·4	54	5 24	+ 3	—	—	—	—	—
Moscow		24·9	346	5 28	+ 2	9 48	+ 1	—	—	16·3
Bombay		25·0	116	i 5 27	0	i 9 50	+ 1	—	—	—
Agra	E.	25·4	94	5 24	− 7	9 48	− 8	5 32	pP	—
Sverdlovsk		25·9	14	i 5 35	0	e 10 4	0	—	—	15·8
Pulkovo		30·3	342	e 6 26	+11	e 11 31	+16	—	—	17·3
Triest		30·5	307	e 6 40	+23	e 11 15	− 3	—	—	e 17·1
Rome		30·6	300	(i 6 28k)	+10	(i 10 41)	−39	—	—	—
Zurich		34·3	308	e 6 51	+ 1	—	—	—	—	—
Basle		35·0	308	e 7 9	+13	—	—	—	—	—
Calcutta	N.	35·8	95	e 8 16	PP	e 12 34	− 7	—	—	i 16·6
Uccle	Z.	37·8	313	e 7 31	+11	—	—	—	—	—
Colombo	E.	38·0	125	—	—	e 13 20	+ 6	—	—	—
Irkutsk		44·2	46	—	—	e 14 50	+ 4	—	—	20·8

Additional readings :—
Baku e = +5m.56s.
Ksara SS = +6m.52s.
Helwan eZ = +4m.32s. and +4m.50s., SE = +7m.10s., P_cPE = +8m.35s.
Istanbul readings are given respectively as P, PP, and S.
Bucharest ePEN = +5m.8s., SE = +9m.7s., SN = +9m.10s., S_cSN = +16m.3s.; S is given as P_cPN.
Bombay iEN = +5m.47s., iE = +10m.15s., eE = +10m.30s.
Agra sSE = +10m.6s.
Triest e = +14m.51s.
Rome readings have been diminished by 7m.
Long waves were also recorded at Hamburg, Scoresby Sund, La Paz, and Huancayo.

Nov. 28d. Readings also at 0h. (Frunse, near Andijan, Samarkand, and near Mizusawa), 1h. (Scoresby Sund), 2h. (Tucson, near Balboa Heights, and near Mizusawa), 3h. (Huancayo and near La Paz), 5h. (Rome), 11h. (Andijan), 14h. (Vladivostok), 16h. (Agra and Andijan), 20h. (near Samarkand), 22h. (Frunse, Samarkand, Tchimkent, Andijan, and near Almata).

Nov. 29d. 4h. Undetermined shock.

Tucson P = 32m.51s., iS = 34m.15s., iL = 35·2m.
Riverside eP = 33m.35s., iS = 35m.36s.
Pasadena ePZ = 33m.41s., eSNZ = 35m.46s.
Mount Wilson iP = 33m.43s., eSEN = 35m.52s.
Haiwee ePEN = 34m.5s.
Tinemaha iP = 34m.21s.
La Jolla eSEN = 35m.4s.
Lincoln eP = 35m.32s., eL = 40m.13s.
Bozeman eP = 35m.34s. and 35m.41s., eS = 39m.16s. and 39m.22s., eL = 41·3m.
Salt Lake City eS = 38m.22s., eL = 38·7m.
Chicago eP_cP = 39m.21s., eL = 43·0m.
Philadelphia eS_cS = 47m.51s.
East Machias eS_cS = 48m.44s., eL = 49·6m.
Long waves were also recorded at St. Louis, Ukiah, Seattle, Florissant, Santa Clara, Triest, Harvard, and Fordham.

Nov. 29d. 22h. 20m. 51s. Epicentre 36°·9N. 141°·3E. (as on 1939 Oct. 7d.).

Intensity II at Hukusima; I at Onahama, Mito, Kakioka, Utunomiya, Tukubasan, Sendai, Tokyo, Morioka, and Shirakawa. Epicentre 37°·0N. 141°·3E. Shallow.

See Seismological Bulletin of the Central Met., Obs., Japan, for the year 1939, Tokyo. 1949, p. 30.

$A = -\cdot6256$, $B = +\cdot5012$, $C = +\cdot5978$; $\delta = -6$; $h = -1$;
$D = +\cdot625$, $E = +\cdot780$; $G = -\cdot467$, $H = +\cdot374$, $K = -\cdot802$.

	△	Az.	P.	O−C.	S.	O−C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Onahama	0·3	276	0 11k	0	0 18	0	—
Mito	0·8	232	0 19k	+ 1	0 31	0	—
Hukusima	1·1	322	0 22k	0	0 35	− 4	—
Kakioka	1·1	233	0 22k	0	0 37	− 2	—
Tukubasan	1·2	235	0 24	0	0 41	0	—
Utunomiya	1·2	253	0 24	0	0 40	− 1	—
Sendai	1·4	347	0 25	− 2	0 41	− 5	—
Tokyo Cen. Met. Ob.	1·7	225	0 32	+ 1	0 55	+ 1	—
Kumagaya	1·7	244	0 31k	0	0 56	+ 2	—
Maebasi	1·8	254	0 34	+ 2	0 59	+ 3	—
Yokohama	2·0	222	0 36	+ 1	1 2	0	—
Mizusawa	2·2	357	0 37	− 1	1 3	− 3	—
Hunatu	2·5	236	0 44	+ 1	1 12	− 2	—
Nagano	2·5	265	0 49	P_g	1 20	S*	—
Misima	2·6	227	0 48	+ 4	1 18	+ 1	—
Aikawa	2·7	295	0 52	+ 7	1 26	+ 7	—
Miyako	2·8	11	0 44k	− 3	1 17	− 5	—
Akita	3·0	342	0 51k	+ 1	1 30	+ 3	—
Osima	3·2	216	0 44	− 8	1 17	−15	—
Wazima	3·5	281	1 8	P_g	1 58	S_g	—
Hatinohe	3·7	3	0 56	− 4	1 37	− 8	—
Aomori	3·9	354	1 5	+ 3	1 50	0	—
Gihu	4·0	250	1 4	0	1 51	− 1	—
Osaka	5·2	247	1 55	P_g	3 2	S_g	—
Mori	5·2	354	1 22	+ 1	2 23	+ 1	—
Nemuro	7·2	26	1 44	− 5	2 57	−16	—
Vladivostok	9·5	314	e 2 22	+ 2	e 4 34	S*	5·1
Sverdlovsk	55·2	319	i 9 43	+ 6	—	—	29·1

Long waves were also recorded at Baku.

Nov. 29d. Readings also at 3h. (Almata), 9h. (Spokane), 12h. (near Port au Prince, Tucson, Sverdlovsk, Tinemaha, Mount Wilson, Pasadena, and Riverside), 13h. (Baku), 14h. (near Mizusawa (2)), 15h. (Melbourne, Grozny, Fordham, and near Erevan), 16h. (near Erevan and Ksara), 17h. (Almata), 18h. (Tchimkent an Frunse), 19h. (near Harvard), 20h. (Tucson, Tacubaya, and Oaxaca), 21h. (Oaxaca (3), St. Louis. and Tacubaya (2)), 23h. (near Almata).

Nov. 30d. Readings at 2h. (Colombo), 5h. (Samarkand), 6h. (Triest and near Tucson), 7h. (Almata, Frunse, Ksara, Baku, and Sverdlovsk), 9h. (near Manila, Ksara, and Baku), 10h. (Sverdlovsk), 11h. (Sverdlovsk, Baku, and Irkutsk), 19h. (La Paz). 22h. (Rome, near St, Louis (3), Tucson, and near Florissant).

Dec. 1d. 6h. Undetermined shock, epicentre South Pacific.

Apia e =35m.19s., i =36m.53s., 38m.3s., 39m.23s., and 40m.26s., iZ =40m.30s.?, iE = 41m.35s., i =42m.31s. and 47m.34s.
Wellington P =38m.14s., S? =44m.27s., L_q =47m.5s.
Christchurch eP =39m.21s., iSE =44m.9s., eL_qN =44m.52s., LrEZ =46m.45s.
Brisbane iE =41m.30s., eN =45m.12s., eE =45m.18s.
Riverview ePE =42m.12s., eN =42m.30s., eLE =52m.6s.
Arapuni S? =42m.30s.
Mount Wilson ePZ =45m.21s., eZ =55m.38s.
Pasadena ePZ =45m.21s., eLEZ =68m.36s.
Riverside ePZ =45m.25s.
Tucson eP =45m.42s. and 46m.21s., ePP =49m.13s., ePPP =51m.3s., ePS =56m.19s., ePPS =56m.29s., eL =65m.16s.
Vladivostok eP =45m.48s., eS =56m.1s., L =74m.42s.
Santa Clara ePE =46m.28s., eLE =66m.20s.
Salt Lake City eP =46m.36s., ePPP =50m.44s., eS =56m.13s., eS_cS =56m.22s., eL = 66m.2s.
Sydney e =46m.42s., eL =52m.30s.
Melbourne e =46m.56s., i =47m.47s. and 52m.19s. eL =56m.37s.
Triest eP =48m.39s., ePKP =52m.3s., ePP =54m.1s., eS =61m.33s., ePS =64m.19s.?, SSS =76m.56s., eL =91m.36s.
Perth i =53m.0s., 64m.42s., and 67m.25s.
Adelaide e =53m.4s., and 54m.44s., i =55m.0s., eL =57m.2s.
Ksara ePKP =53m.43s., ePP =57m.7s., PPS =70m.5s.
Granada ePKP =54m.10s., PKP_2 =56m.3s., PP =60m.21s., SKKS =66m.17s., iN = 76m.33s., SS =82m.37s., SSP =84m.14s., SSS =90m.56s., L =109m.54s.
Huancayo e =54m.29s., i =57m.38s., 59m.29s., 64m.38s., and 64m.45s.
Sverdlovsk e =54m.51s. and 64m.31s., L =89m.
Baku e =55m.43s., 66m.56s., 75m.22s., and 79m.46s., L =98m.
College e =56m.17s.
Irkutsk e =58m.9s., 59m.11s., and 60m.37s., eL =84m.
St. Louis eN =58m.36s.
San Juan eSKS =58m.58s., eSSS =72m.11s.
Fordham eN =60m.26s., eLN =83m.42s.
Chicago e =61m.30s.
Ukiah e =66m.40s.
Berkeley iZ =66m.55s., eNZ =67m.20s.
Long waves were also recorded at La Paz, Philadelphia, Williamstown, Colombo, Paris, Rome, and Kew.

Dec. 1d. Readings also at 1h. (near Erevan), 2h. (near La Paz), 5h. (Tucson), 6h. (Ksara), 7h. (Huancayo and Ksara), 8h. and 11h. (Moncalieri), 13h. (Tucson, Berkeley, Branner, Lick, and near Fresno), 14h. (St. Louis and near Florissant), 15h. (Mount Wilson, Pasadena, and Stuttgart), 16h. (Bombay, Colombo, Calcutta, Baku, Tashkent, Ksara, Sverdlovsk, Perth, Adelaide, Melbourne, Brisbane, Christchurch, and Ottawa (2)), 17h. (Ksara, Granada, Irkutsk, and Huancayo), 18h. (near La Paz), 19h. (Ottawa (2) and near Harvard), 21h. (Ottawa (2), near Fordham, and Harvard), 22h. (Hukuoka).

Dec. 2d. Readings at 1h. (near Samarkand), 2h. (near Erevan (2) and Grozny (2)), 3h. (Haiwee, Mount Wilson, Pasadena, Riverside, Tucson, and Lincoln), 6h. (Lincoln), 10h. (La Paz), 11h. (Balboa Heights and Ksara), 13h. (Balboa Heights), 14h. (La Paz and near Triest), 16h. (Lincoln and Tucson (2)), 17h. (Tucson), 20h. (nr Ottawa), 21h. (Balboa Heights), 22h. and 23h. (Tucson).

Dec. 3d. Readings at 0h. (Ksara, Granada, Bermuda, San Juan, Huancayo, Fordham, Tucson, and near Wellington), 6h. (Mount Wilson and Tucson), 8h. and 11h. (Triest), 12h. (Baku, Erevan, Grozny, Sverdlovsk, Helwan, Ksara, and near Mizusawa), 14h. (Almata, Ksara, Huancayo, Triest, Belgrade, near Bucharest, and near Frunse), 15h. (Calcutta), 22h. (Tacubaya and Tucson), 23h. (Ksara).

Dec. 4d. 16h. 26m. 57s. Epicentre 18°·3N. 145°·2E.

$A = -\cdot7802$, $B = +\cdot5422$, $C = +\cdot3121$; $\delta = +10$; $h = +5$;
$D = +\cdot571$, $E = +\cdot821$; $G = -\cdot256$, $H = +\cdot178$, $K = -\cdot950$.

Tables for depth of focus 0·080 have been used.

		Δ	Az.	P.	O−C.	S.	O−C.
		°	°	m. s.	s.	m. s.	s.
Vladivostok		27·2	338	e 5 1k	− 1	e 8 56	− 8
Frunse		63·7	310	e 9 40	0	—	—
Andijan		65·4	308	e 9 53	+ 2	17 52	− 1
Tchimkent		67·4	310	e 10 5	+ 2	—	—
Samarkand		69·6	306	10 16	0	—	—
Sverdlovsk		71·9	326	i 10 29	− 1	e 19 2	− 6
Santa Barbara	z.	83·9	56	i 11 34k	0	—	—
Tinemaha	z.	84·2	53	i 11 36k	+ 1	—	—
Haiwee		84·7	54	i 11 38k	0	—	—
Pasadena		85·2	56	i 11 40k	0	—	—
Mount Wilson	z.	85·3	56	i 11 40k	− 1	e 21 21	− 4
Riverside		85·9	56	i 11 42k	− 2	—	—
La Jolla		86·4	57	e 11 46	0	—	—
Palomar	z.	86·5	56	i 11 46k	0	—	—
Tucson		91·6	55	e 12 11	+ 1	—	—
Huancayo		140·4	87	e 12 58	?	—	—
La Paz	z.	148·2	93	14 17	?	—	—

Additional readings:—
Huancayo i = +13m.35s. and +13m.45s.
La Paz i = +16m.42s.

Dec. 4d. 23h. 54m. 52s. Epicentre 41°·3N. 128°·8W.

$A = -\cdot4721$, $B = -\cdot5872$, $C = +\cdot6575$; $\delta = -1$; $h = -2$;
$D = -\cdot779$, $E = +\cdot627$; $G = -\cdot412$, $H = -\cdot512$, $K = -\cdot753$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Ferndale		3·5	101	e 0 54	− 3	i 2 2	S_g	—	—	—
Ukiah		4·8	114	e 1 18	+ 3	e 2 13	+ 1	e 1 41	PP	e 2·9
Berkeley		6·1	122	e 1 32	− 2	e 2 51	+ 6	—	—	—
Branner		6·4	125	i 1 37	− 1	—	—	i 2 44	PP	—
Santa Clara		6·6	125	i 1 36	− 5	i 2 51	− 7	—	—	—
Lick		6·8	123	i 1 44	0	e 3 49	S_g	—	—	—
Seattle		7·9	34	e 1 54	− 5	e 3 28	− 2	e 3 51	S*	e 4·2
Fresno	N.	8·4	120	e 2 6	0	—	—	—	—	e 5·1
Tinemaha		9·2	114	i 2 19	+ 3	—	—	—	—	—
Haiwee		9·9	118	i 2 26	+ 1	—	—	—	—	—
Mount Wilson		11·0	126	i 2 45	+ 3	—	—	—	—	—
Pasadena		11·0	127	e 2 43	+ 1	(i 4 57)	+10	—	—	i 4·9
Riverside		11·6	125	i 2 50	0	—	—	—	—	—
Palomar	z.	12·3	126	e 2 57	− 2	—	—	—	—	—
Butte		12·7	63	e 3 3	− 2	i 6 18	+50	—	—	—
Salt Lake City		12·8	87	3 1	− 5	e 5 34	+ 4	—	—	e 6·4
Bozeman		13·6	65	3 12	− 5	e 5 50	0	—	—	e 7·8
Tucson		17·0	116	4 2	+ 1	7 0	−10	4 22	PP	8·3
Denver		18·2	89	e 4 35	+19	—	—	—	—	—
Lincoln		24·1	80	e 5 21	+ 3	e 9 37	+ 3	e 6 32	PP	e 10·9
College		26·0	342	—	—	e 10 17	+11	e 6 25	PP	e 11·3
Florissant		29·4	82	e 6 7	0	e 10 58	− 3	—	—	15·9
St. Louis		29·5	82	e 6 14	+ 6	e 10 56	− 6	—	—	e 15·4
Chicago		30·6	75	6 33	+15	e 11 21	+ 1	e 7 34	PP	e 12·5
Columbia		38·1	84	—	—	e 13 21	+ 5	—	—	e 18·6
Ottawa		38·2	65	i 7 25	+ 2	e 13 8?	− 9	—	—	18·1
East Machias		44·1	64	e 8 17	+ 5	e 14 48	+ 3	—	—	e 20·4
San Juan		57·7	93	e 9 57	+ 2	e 17 59	+ 6	e 13 14	PPP	e 25·6
Irkutsk		76·1	330	—	—	e 22 8?	+33	—	—	e 39·1

For Notes see next page.

NOTES TO DEC. 4d. 23h. 54m. 52s.

Additional readings :—
Ukiah P = +1m.24s., S = +2m.19s.
Berkeley ePE = +1m.35s., eP = +1m.42s., iN = +2m.30s.
Branner iN = +4m.27s., iE = +6m.41s.
Pasadena iZ = +2m.52s.
Palomar iZ = +3m.3s.
Salt Lake City eS = +5m.51s.
Bozeman eS = +6m.11s.
Tucson PPP = +4m.52s.
Denver eN = +2m.4s., iE = +3m.18s., eN = +4m.40s.
College eS = +10m.33s.
Florissant iPE = +6m.13s., iE = +6m.20s. and +11m.6s.
Chicago eP_cP = +9m.2s.
Long waves were also recorded at San Francisco, Fordham, and Baku.

Dec. 4d. Readings also at 2h. (Oaxaca, Tacubaya, and Tucson), 4h. (Stuttgart, Neuchatel, and near Zurich), 7h. (Ksara), 10h. (La Paz), 19h. (Andijan, Samarkand, and Tchimkent), 22h. (Tucson), 23h. (Almata, Frunse, near Andijan (2), Samarkand (2), Tashkent, and Tchimkent (2)).

Dec. 5d. 8h. 30m. 6s. Epicentre 14°·3N. 91°·7W. (as on 1939, September 28d.).

Strongly felt in the Mexican state of Chiapas, at Las Casas, Tapachula, etc., and intensity VI at San Salvador.

Epicentre : 15° 20′N. 92° 36′W. (Tacubaya).
14°·7N. 91°·9W. (U.S.C.G.S.).

See Annales de l'Institut de Physique du Globe de Strasbourg, Seismologie, tome IV (1939), p. 83.

A = −·0288, B = −·9690, C = +·2454 ; δ = +1 ; h = +6 ;
D = −·999, E = +·030 ; G = −·007, H = −·245, K = −·969.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Oaxaca	N.	5·5	299	i 1 27	+ 2	—	—	—	—	—
Vera Cruz	N.	6·5	319	i 1 38	− 1	—	—	—	—	—
Merida	N.	6·9	17	i 1 58	P*	—	—	—	—	—
Puebla	N.	7·8	309	e 1 59	+ 1	—	—	—	—	—
Tacubaya	N.	8·8	306	i 2 12	+ 1	—	—	—	—	—
Guadalajara	N.	12·8	301	i 3 6	0	—	—	—	—	—
Balboa Heights		13·0	113	e 3 1	− 8	e 5 43	+ 8	—	—	8·2
Manzanillo	N.	13·0	294	e 3 11	+ 2	—	—	—	—	—
Mazatlan	N.	16·5	305	i 3 58	+ 4	—	—	—	—	—
Port au Prince		19·0	76	e 4 45	PP	i 8 19	SS	5 6	PPP	e 9·9
Little Rock		20·4	359	i 4 39	− 2	i 8 27	+ 2	e 4 52	pP	10·9
Columbia		21·9	23	4 59a	+ 2	e 8 57	+ 3	5 38	PP	i 10·7
Cape Girardeau		23·0	4	i 5 8	+ 1	e 9 19	+ 5	i 5 22	pP	e 11·2
St. Louis		24·3	3	i 5 21	+ 1	i 9 38	+ 1	i 5 35	pP	e 11·9
Florissant		24·4	3	i 5 21	0	i 9 38	− 1	i 5 37	pP	—
San Juan		24·9	76	i 5 26	0	9 55	+ 8	i 6 8	PP	i 11·8
Tucson		25·0	320	i 5 26a	− 1	i 9 49	0	5 57	PP	11·3
Lincoln		26·8	355	e 5 45	+ 1	10 16	− 3	e 6 25	PP	i 11·3
Chicago		27·7	6	i 5 51	− 1	e 10 17	−16	e 6 36	PP	i 11·2
Chicago Loyola		27·7	6	e 5 50	− 2	i 11 18	SS	i 7 15	PPP	—
Georgetown		27·7	28	i 5 55	+ 3	10 23	−10	i 9 41	pP_cP	—
Denver		27·8	339	e 5 57	+ 4	e 10 42	+ 7	e 6 12	pP	—
Pittsburgh		28·0	21	i 5 57	+ 2	i 10 40	+ 2	i 6 37	PP	—
Pennsylvania		29·0	23	i 5 57	− 7	i 11 16	+22	e 7 0	PP	e 18·5
Philadelphia		29·4	28	i 6 8	+ 1	i 10 40	−21	i 7 9	PP	i 12·9
La Jolla		29·7	314	i 6 10	0	—	—	i 9 20	P_cP	—
Palomar	Z.	29·7	315	i 6 8a	− 2	—	—	—	—	—
Bermuda		30·4	49	6 19	+ 3	e 10 56	−20	7 23	PP	12·4
Riverside		30·4	315	i 6 14	− 2	e 11 10	− 6	i 9 16	P_cP	—
Fordham		30·7	28	i 6 20a	+ 1	i 11 24	+ 3	i 7 31	PPP	i 15·4

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Huancayo		30·8	147	i 6 24a	+ 4	i 11 34	+11	7 13	PP	i 12·9
Mount Wilson		31·1	315	i 6 21a	− 1	i 11 27	− 1	i 9 17	PcP	—
Pasadena		31·1	315	i 6 22a	0	i 11 28	0	i 9 17	PcP	e 13·5
Toronto		31·1	18	6 22	0	11 26	− 2	7 30	PPP	13·9
Salt Lake City		31·7	330	i 6 23	− 4	i 11 33	− 4	e 7 34	PPP	e 18·1
Haiwee		32·0	320	i 6 30	0	e 11 45	+ 3	i 9 24	PcP	—
Santa Barbara		32·3	314	i 6 32	− 1	—	—	—	—	—
Williamstown		32·4	26	i 6 37	+ 3	i 12 7	+19	i 6 52	pP	—
Tinemaha		32·8	320	i 6 36	− 1	—	—	i 9 22	PcP	—
Harvard		33·0	28	i 6 40a	+ 1	i 11 43	−14	e 8 53	PcP	e 13·9
Weston		33·1	28	i 6 42	+ 2	i 11 44	−15	i 12 8	sS	i 16·3
Fresno	N.	33·6	318	e 6 44	0	e 11 56	−10	e 9 12	PcP	e 20·2
Ottawa		33·8	20	i 6 47	+ 1	i 12 11	+ 1	7 24	PP	12·9
Vermont		34·0	24	e 8 35	PcP	e 12 3	−10	—	—	e 13·5
Lick		35·1	317	e 6 57	0	e 14 31	SS	—	—	e 17·4
Bozeman		35·3	337	i 6 59a	0	i 12 32	− 1	8 29	PPP	14·2
Santa Clara		35·3	317	i 6 48	−11	—	—	i 12 21	PcS	e 18·7
Branner		35·5	317	e 7 0k	0	i 12 31	− 5	i 8 7	PP	e 17·0
Berkeley		35·8	317	e 7 3	0	e 12 39	− 2	i 8 33	PP	e 18·2
San Francisco		35·9	317	e 9 54?	?	—	—	—	—	—
Shawinigan Falls		35·9	22	7 5	+ 1	12 44	+ 2	—	—	17·4
Butte		36·2	338	i 7 6	0	e 12 44	− 3	e 8 22	PP	e 15·1
East Machias		36·7	29	7 14a	+ 4	i 12 57	+ 3	8 39	PP	i 15·7
Seven Falls		37·1	33	7 16	+ 2	13 2	+ 1	—	—	16·3
Ukiah		37·1	318	e 7 12	− 2	i 13 4	+ 3	e 8 34	PP	e 15·4
La Paz		38·4	141	7 28	+ 3	i 13 33	+13	9 1	PP	18·2
Halifax		38·5	33	i 7 28	+ 2	i 13 18	− 4	9 0	PP	17·9
Ferndale		38·6	322	i 7 32	+ 6	e 13 22	− 1	e 16 26	SSS	e 19·4
Spokane		39·5	333	i 7 33	− 1	e 13 27	−10	—	—	e 19·4
Saskatoon		39·6	347	e 9 30	PPP	e 13 36	− 2	—	—	15·9
Seattle		41·9	330	e 8 5	+11	—	—	e 9 20	PP	e 17·0
Victoria		42·9	330	7 54	− 8	14 18	− 9	9 18	PP	22·3
Sitka		53·9	333	e 9 22	− 5	i 16 58	− 4	—	—	e 23·9
Ivigtut		56·3	24	e 9 43	− 2	e 17 28	− 6	e 11 57	PcP	e 22·6
La Plata		58·5	147	9 59	− 1	18 1	− 2	—	—	23·9
Rio de Janeiro		60·2	126	i 10 12	0	i 18 25	0	i 22 27	SS	i 29·4
Honolulu		63·0	287	10 27	− 4	i 19 1	0	e 12 49	PP	i 26·2
College		63·1	337	10 33a	+ 1	i 19 1	− 1	e 12 40	PP	25·1
Scoresby Sund		69·9	19	11 14	− 1	e 19 56	−28	e 14 3	PP	e 28·2
Edinburgh		77·5	35	12 6	+ 7	22 0	+10	15 7	PP	—
Bidston		77·9	37	—	—	e 27 28	SS	—	—	e 33·9
Stonyhurst		78·2	37	i 12 9	+ 6	i 21 54	− 3	e 31 54	L_q	36·9
Jersey		79·1	41	e 12 54?	+46	e 22 54?	+47	—	—	35·9
Toledo		79·2	52	e 12 12	+ 4	e 22 8	0	e 28 46	?	—
Kew		79·8	39	i 12 12	0	i 22 11	− 3	i 12 17	PcP	e 36·9
Granada		80·0	54	i 12 16a	+ 3	i 23 15	PS	16 17	PP	i 38·0
Bergen		81·1	30	e 12 18	0	e 22 29	+ 1	—	—	37·9
Paris		82·1	42	12 25	+ 1	22 32	− 6	—	—	e 37·9
Uccle		82·8	40	i 12 28a	+ 1	e 22 43	− 2	e 24 30	PPS	e 37·9
De Bilt		83·0	38	i 12 29a	+ 1	22 47	0	i 28 34	SS	42·2
Clermont-Ferrand		83·2	45	e 13 31	+62	—	—	—	—	—
Heligoland		84·0	36	e 18 32	?	e 22 54	− 3	—	—	e 36·3
Hamburg		85·4	36	i 12 41a	+ 1	23 5	[+ 1]	e 29 8	SS	e 36·9
Neuchatel		85·5	42	e 12 42	+ 1	—	—	—	—	—
Strasbourg		85·5	41	e 12 43	+ 2	e 23 13	+ 1	—	—	39·9
Basle		85·7	42	e 12 42	0	e 23 6	[0]	—	—	—
Copenhagen		86·1	33	i 12 45a	+ 1	23 4	[− 4]	28 54	SS	36·9
Stuttgart		86·4	40	e 12 46	+ 1	e 23 14	[+ 4]	e 16 11	PP	e 37·9
Zurich		86·4	43	e 12 47a	+ 2	e 23 18	− 3	e 16 10	PP	—
Moncalieri		86·5	45	e 12 11	−35	23 8	[− 3]	—	—	41·9
Upsala		87·0	29	e 12 54?	+ 6	e 23 10	[− 4]	18 40	PPP	e 38·9
Chur		87·2	43	e 12 52	+ 3	—	—	—	—	e 45·2
Jena		87·2	39	i 12 47	− 2	e 23 11	[− 4]	e 16 11	PP	e 34·9
Prague		89·2	38	e 12 54	− 5	e 23 24	[− 4]	e 29 24	SS	e 32·9
Triest		90·4	43	e 12 54a	−10	e 23 37	[+ 2]	13 10	pP	e 38·7

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Rome		90·8	46	i 13 8	+ 2	i 23 38	[0]	i 16 59	PP	i 30·7
Pulkovo		92·8	26	13 17	+ 1	i 23 48	[− 1]	e 16 56	PP	e 43·4
Belgrade		95·0	42	e 27 17	PPS	—	—	—	—	e 66·6
Cernauti	N.	96·7	37	e 24 13	SKS	(e 24 13)	[+ 3]	e 24 31	S	43·9
Moscow		98·3	26	13 41	0	23 54	[−24]	17 41	PP	32·9
Bucharest		98·8	40	17 2	PP	24 20	[− 1]	e 19 54	PPP	39·9
Arapuni		100·7	233	—	—	24 24	[− 6]	32 42	SS	46·9
Wellington		101·9	231	13 54	− 3	24 41	[+ 5]	18 27	PP	46·9
Istanbul		102·4	41	e 12 54?	−65	—	—	—	—	—
Christchurch		103·8	229	e 14 16	+11	i 24 48	[+ 3]	i 18 22	PP	48·2
Sverdlovsk		105·5	15	i 14 13	P	i 24 54	[+ 1]	i 18 34	PP	47·9
Helwan		109·7	51	e 17 59	PKP	28 29	PS	1 19 9	PP	—
Grozny		110·7	32	e 19 54	PP	—	—	—	—	50·2
Ksara		110·9	46	e 15 9	P	i 29 4	PS	i 19 31	PP	—
Erevan		112·2	34	e 20 29	?	—	—	—	—	—
Irkutsk		112·3	350	18 18	[−20]	25 11	[−10]	i 19 23	PP	61·9
Cape Town		114·5	121	i 19 42	PP	e 26 52	{+16}	e 29 26	PS	57·9
Baku		115·0	32	19 2	[+19]	26 48	{+ 8}	19 42	PP	61·9
Brisbane		118·7	247	—	—	e 25 48	[+ 3]	i 30 6	PS	—
Riverview	E.	120·3	239	—	—	e 27 24	{+ 8}	e 30 18	PS	e 56·1
Tchimkent		121·1	15	e 18 59	[+ 4]	—	—	—	—	69·9
Frunse		121·7	11	e 19 0	[+ 4]	—	—	—	—	—
Tashkent		121·9	16	19 2	[+ 6]	25 58	[+ 2]	20 6	PP	e 68·4
Samarkand		122·8	20	18 9	[−49]	—	—	—	—	—
Andijan		123·3	14	e 19 4	[+ 5]	—	—	—	—	56·9
Zi-ka-wei	Z.	124·7	325	e 19 2	[+ 1]	—	—	i 20 50	PP	69·0
Melbourne		124·9	234	i 21 17	PP	i 26 12	[+ 7]	i 30 58	PS	58·1
Hong Kong		135·7	325	22 58	PKS	32 10	PS	—	—	—
Agra	E.	137·6	13	e 19 28	[+ 2]	—	—	23 1	PKS	63·6
Calcutta	N.	143·4	0	i 19 44	[+ 8]	e 42 37	SS	i 23 56	PKS	e 73·1
Bombay		143·7	26	i 19 38	[+ 1]	i 29 47	{+ 5}	i 23 31	PKS	—
Hyderabad	N.	147·0	17	19 42	[− 1]	29 59	{− 3}	23 17	PP	49·2
Kodaikanal	E.	153·4	24	i 20 4	[+12]	i 30 40	{+ 3}	i 23 47	PP	—
Colombo	E.	157·3	23	19 58	[0]	—	—	—	—	71·0

Additional readings :—

Port au Prince SS = +8m.59s.
Little Rock isS = +8m.54s.
Columbia iP = +5m.26s., iS = +9m.2s.
Cape Girardeau iE = +6m.43s., iSE = +9m.23s., isSE = +9m.47s.
St. Louis iN = +5m.54s., iPPN = +6m.4s., ipPP = +6m.18s., iEN = +9m.49s., isS = +10m.0s., iE = +10m.6s., iE = +10m.19s.
Florissant iSN = +9m.45s., isSZ = +10m.6s., isSE = +10m.14s.
Tucson iS = +10m.7s.
Lincoln P_cP = +8m.48s.
Chicago iS = +10m.31s. and +10m.49s.
Chicago Loyola isSS = +13m.11s.
Denver iN = +6m.2s., isPE = +6m.28s., eE = +8m.4s., eEN = +10m.20s., iN = +10m.32s., iSN = +10m.50s., isSE = +11m.20s., iN = +11m.41s.
Pittsburgh e? = +10m.22s.
Pennsylvania e = +6m.19s., ePPP = +7m.36s., iP_cP = +7m.59s., e = +9m.12s., i = +10m.4s., +10m.58s., and +11m.27s., iSSS = +13m.51s.
Philadelphia iS = +11m.2s. and +11m. 6s.
Bermuda P_cP = +8m.45s., iS = +11m.50s.
Fordham iPPPNZ = +7m.45s.
Huancayo iPPP = +7m.44s., iP_cP = +8m.29s., iS = +11m.39s.
Salt Lake City eP_cP = +9m.2s.
Williamstown isP = +7m.0s., PP = +7m.51s., P_cP = +9m.21s., iSS = +14m.23s.
Harvard iZ = +9m.41s., iE = +11m.55s.
Lick eSE = +14m.34s.
Bozeman P_cP = +9m.21s.
Berkeley eSZ = +12m.46s., eN = +17m.19s.
Butte ePPP = +8m.37s., eS = +13m.2s.
Ukiah eP = +7m.20s., ePPP = +9m.4s., eP_cP = +9m.19s.
La Paz SSN = +16m.2s.
Victoria SSS = +18m.6s.
Sitka P = +9m.28s., iS = +17m.5s.
Ivigtut eP = +9m.53s., eP_cP = +10m.37s., ePPP = +13m.9s., iS = +17m.41s., eSS = +21m.11s.

Continued on next page.

Honolulu PP = +13m.11s., ePPP = +14m.22s., SS = +23m.19s., eSSS = +24m.44s., SSS = +25m.17s.
College ePPP = +14m.18s., S_cS = +20m.25s., eSS = +23m.9s.
Scoresby Sund PPP = +15m.34s., S = +20m.25s., S_cS = +21m.31s., SS = +24m.46s.
Edinburgh SKS = +22m.14s., PS = +22m.47s., PPS = +23m.6s., SS = +27m.8s.
Jersey e = +28m.4s.
Kew ePPZ = +15m.5s., iSKSEZ = +22m.30s., eSSE = +27m.10s., eSSSE = +31m.25s., eL_qN = +33·9m.
Granada SSZ = +30m.8s., SSSZ = +33m.1s.
Uccle iE = +12m.35s., eE = +24m.45s. and +28m.31s.
De Bilt PE = +12m.33s.a, iE = +32m.18s.
Hamburg eSSSE = +33m.6s.
Copenhagen +16m.4s., S = +23m.22s., SSS = +33m.0s.
Stuttgart ePPPEN = +17m.59s., eSSN = +28m.49s., eSSSE = +32m.44s.
Upsala eSS = +29m.6s., eSSSE = +32m.54s. ?
Jena iPN = +12m.53s., eN = +16m.7s., +23m.21s. and +28m.54s.
Triest ePP = +16m.35s., ePPP = +18m.19s., eSKS = +23m.8s., i = +23m.57s., isS = +24m.10s., ePS = +24m.42s., ePPS = +25m.12s.?, eSS = +29m.21s., eSSS = +33m.12s?
Rome eZ = +14m.5s., iE = +14m.28s., eZ = +16m.16s., e = +18m.11s., eZ = +20m.54s., eE = +23m.3s., iE = +23m.53s., iSE = +24m.12s., iPSE = +25m.8s., eSSE = +29m.58s., eSSS = +33m.41s.
Pulkovo ePPP = +19m.2s., S = +24m.10s., ePPS = +25m.38s., eSS = +30m.30s., eSSS = +34m.30s.
Moscow iS = +24m.39s., PS = +26m.9s., PPS = +26m.39s., SS = +30m.42s.
Bucharest eN = +20m.0s.
Arapuni S_cSP? = +28m.24s.
Wellington S_cSPZ = +27m.9s., SS = +32m.24s., L_q = +42m.54s.?
Christchurch PS = +27m.28s., SS = +33m.10s., iE = +33m.34s.
Sverdlovsk PPP = +20m.49s., i = +27m.50s. and +29m.8s.
Helwan PPPE = +25m.14s., iE = +29m.8s.
Ksara eSS = +40m.59s.
Irkutsk eS = +26m.23s., SS = +34m.42s., SSS = +39m.6s.
Cape Town +26m.5s., eSSE = +35m.32s., eSSN = +35m.42s.
Baku PS = +29m.39s., PPS = +30m.50s.
Brisbane iSKKSE = +27m.12s., eSSE = +36m.6s., eSSSE = +40m.54s.
Riverview eE = +37m.18s.
Tashkent PPP = +22m.43s., SKKS = +26m.55s.
Zi-ka-wei iZ = +23m.50s. and +46m.46s.
Melbourne +32m.19s. and +37m.51s., e = +42m.34s.
Agra P?E = +19m.38s.
Calcutta N. $iPKP_3$ = +19m.59s., iPP = +23m.30s., ePSKS = +33m.42s., ePPS = +36m.49s., eSS = +42m.37s.
Bombay eE = +20m.11s., eN = +20m.38s., iE = +20m.46s., iN = +22m.58s., iPPEN = +23m.53s., iE = +24m.18s., eE = +28m.42s., +31m.48s., and +34m.25s., iEN = +38m.35s., iE = +38m.57s., eN = +42m.52s.
Hyderabad iN = +35m.59s.
Long waves were also recorded at Phu-Lien, Sydney, Apia, and Tananarive.

Dec. 5d. 17h. 51m. 42s. Epicentre 12°·6N. 89°·3W. (as on 1938 Sept. 1d.).

A = +·0119, B = −·9761, C = +·2168; δ = −8; h = +6;
D = −1·000, E = −·012; G = +·003, H = −·217, K = −·976.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Merida	N.	8·3	357	i 2 1	− 3	—	—	—	—	—
Tacubaya	N.	11·7	307	i 2 59	+ 8	—	—	—	—	—
San Juan		23·1	73	e 5 10	+ 2	e 9 10	− 6	e 5 44	PP	e 11·3
St. Louis	N.	25·9	358	e 5 33	− 2	e 10 14	+10	—	—	e 19·0
Tucson		27·8	319	e 5 52	− 1	—	—	e 8 19	P_cP	e 14·4
Huancayo		28·1	151	e 5 54	− 1	e 10 46	+ 6	e 8 39	P_cP	12·4
Palomar	Z.	32·5	315	i 6 35k	+ 1	—	—	—	—	—
Riverside	Z.	33·3	315	e 6 41	0	—	—	—	—	—
Mount Wilson		33·9	315	i 6 46	− 1	—	—	—	—	—
Pasadena		33·9	315	i 6 46k	− 1	—	—	—	—	—
Ottawa		34·7	17	i 6 50	− 4	—	—	—	—	e 18·8

Additional readings :—
Tucson eP = +6m.3s.
Ottawa eN = +11m.18s.?
Long waves were also recorded at Fordham.

Dec. 5d. Readings also at 0h. (Tucson), 1h. (Rome), 5h. (near Zurich, Chur, Basle, Stuttgart, and Neuchatel), 6h. (near Andijan and Samarkand), 8h. (Adelaide, Oaxaca (2), Vera Cruz (2), Puebla, and Tacubaya (2)), 10h. (Huancayo), 11h. (Frunse, Triest (2), Andijan, and Samarkand), 13h. (near Tananarive and Samarkand (2)), 14h. (Mizusawa), 15h. (Palomar, Riverside, Tucson, Mount Wilson, and Haiwee), 17h. (Tucson and near Mizusawa), 18h. (near Branner, Mount Wilson, Haiwee, Pasadena, and Tucson), 20h. (Grozny and near Erevan), 22h. (Tucson).

Dec. 6d. 18h. 0m. 5s. Epicentre 37°·7N. 141°·8E. (as on 1939 Aug. 22d.).

Intensity II at Hukusima, Sendai, and Mito ; I at Shirakawa, Onahama, Miyako, Morioka, Tukubasan, Utunomiya, Mizusawa, and Kakioka.

Epicentre 37°·7N. 141°·8E. Shallow.

See Seismological Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo, 1949, p. 31.

$A = -\cdot6234$, $B = +\cdot4905$, $C = +\cdot6090$; $\delta = +10$; $h = -1$;
$D = +\cdot618$, $E = +\cdot786$; $G = -\cdot479$, $H = +\cdot377$, $K = -\cdot793$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sendai		0·9	309	0 17k	− 3	0 32	− 2	—	—	—
Hukusima		1·1	273	0 22k	0	0 39	0	—	—	—
Onahama		1·1	223	0 23k	+ 1	0 30	− 9	—	—	—
Mizusawa		1·5	343	i 0 26	− 2	0 47	− 2	—	—	—
Mito		1·7	219	0 28k	− 3	0 47	− 7	—	—	—
Kakioka		1·9	221	0 33	− 1	0 58	− 1	—	—	—
Miyako		1·9	4	0 27a	− 7	0 51	− 8	—	—	—
Utunomiya		1·9	233	0 37a	+ 3	1 1	+ 2	—	—	—
Tukubasan		2·0	222	0 35	0	1 2	0	—	—	—
Tyosi		2·1	201	0 26	−11	0 55	− 9	—	—	—
Akita		2·4	326	0 43	+ 2	1 22	S_g	—	—	—
Maebasi		2·6	239	0 46a	+ 2	1 20	+ 3	—	—	—
Tokyo Cen. Met. Ob.		2·6	219	0 40	− 4	1 16	− 1	—	—	—
Yokohama		2·8	217	0 47	0	1 22	0	—	—	—
Hatinohe		2·8	356	0 43k	− 4	1 17	− 5	—	—	—
Aikawa		2·8	276	0 50	+ 3	1 35	S_g	—	—	—
Nagano		3·0	247	0 53	+ 3	1 40	S_g	—	—	—
Aomori		3·2	346	0 51	− 1	1 33	+ 1	—	—	—
Mera		3·2	210	0 50	− 2	1 42	S*	—	—	—
Hunatu		3·3	228	0 54	+ 1	1 38	+ 3	—	—	—
Misima		3·5	223	0 57	0	1 43	+ 3	—	—	—
Toyama		3·8	256	1 9	P*	1 45	− 2	—	—	—
Nagoya		4·7	237	1 15a	+ 1	2 9	− 1	—	—	—
Sapporo		5·3	356	1 22	0	2 39	S*	—	—	—
Osaka		5·9	241	1 35	+ 4	2 57	S*	—	—	—
Nemuro		6·3	26	1 26k	−10	2 32	−18	—	—	—
Koti		7·9	241	2 3	+ 4	2 43	?	—	—	—
Vladivostok		9·3	308	e 2 18	+ 1	e 4 14	+ 9	—	—	e 4·7
Irkutsk		29·9	313	—	—	e 10 55?	−14	—	—	15·9
Andijan		52·6	297	e 9 20	+ 2	—	—	—	—	—
Tashkent		54·5	298	—	—	e 17 13	+ 3	—	—	e 25·4
Sverdlovsk		54·9	319	10 28	+53	18 8	+52	—	—	26·9
Haiwee		75·9	55	e 11 41	− 9	—	—	—	—	—
Mount Wilson	z.	77·0	56	i 11 46	−10	—	—	—	—	—
Pasadena	z.	77·0	56	i 11 46	−10	—	—	—	—	—
Riverside	z.	77·6	56	e 11 50	−10	—	—	—	—	—
Ksara		81·0	305	e 17 46	PPP	e 28 7	SS	—	—	49·9
Tucson		82·9	54	e 12 20	− 8	—	—	—	—	—
Balboa Heights		119·6	48	—	—	e 28 48	?	—	—	—
La Paz	z.	146·2	59	19 38	[− 3]	—	—	—	—	—

Additional readings :—
Tucson eP = +12m.59s.
Long waves were also recorded at Baku.

Dec. 6d. Readings also at 1h. (La Paz and Mizusawa), 6h. (Samarkand), 7h. (near Basle), 8h. (Irkutsk, Sverdlovsk, Mount Wilson, Pasadena, Ksara, Riverside, Tucson, and Baku), 13h. (Samarkand, Frunse, Andijan, and Almata), 14h. (near Tananarive), 17h. (Andijan, near Wellington, and New Plymouth), 19h. (Apia, Tucson, Ksara, and Mount Wilson), 20h. (Tchimkent, Tashkent(2), Tucson, Ksara, Mount Wilson, Andijan, Almata, Frunse, Samarkand, Baku, Riverside, Sverdlovsk (3), Irkutsk, Vladivostok, and near Zurich), 21h. (Baku), 22h. (Neuchatel, Zurich, Pasadena, Riverside, Mount Wilson, Tucson (2), Haiwee, and Tinemaha), 23h. (Tucson, Vladivostok, and Sverdlovsk).

Dec. 7d. 11h. 16m. 19s. Epicentre 51°·7N. 178°·5W. (as on 1939 July 2d.).

$A = -\cdot6221$, $B = -\cdot0163$, $C = +\cdot7828$; $\delta = +5$; $h = -6$;
$D = -\cdot026$, $E = +1\cdot000$; $G = -\cdot782$, $H = -\cdot020$, $K = -\cdot622$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
College		20·6	38	e 4 47	+ 4	e 8 29	0	e 4 57	pP	e 10·4
Sitka		25·3	60	—	—	e 16 35	S_cS	—	—	—
Mizusawa	E.	30·6	262	(e 6 30)	+12	e 6 30	P	—	—	—
Vladivostok		34·1	276	e 6 51	+ 3	e 12 26	+12	—	—	18·5
Honolulu		34·3	144	—	—	(i 14 14)	SS	—	—	i 14·4
Victoria		34·9	73	4 45	?	13 9	+42	e 14 29	SS	—
Spokane		38·7	72	i 6 21	−66	e 12 15	−70	—	—	—
Ukiah		39·8	87	e 8 3	pP	e 13 46	+ 4	—	—	e 16·5
Bozeman		43·5	70	e 8 1	− 6	e 14 22	−14	—	—	e 18·4
Tinemaha		44·2	84	i 8 10	− 2	—	—	i 9 57	P_cP	—
Haiwee		45·0	85	i 8 15a	− 4	—	—	i 9 59	P_cP	—
Santa Barbara	Z.	45·0	88	i 8 15	− 4	—	—	—	—	—
Irkutsk		45·4	304	e 7 41?	−41	e 18 41?	SS	e 9 41?	PP	23·7
Salt Lake City		45·8	77	e 8 23	− 2	i 15 0	− 9	e 18 26	SS	—
Pasadena		46·1	87	i 8 25a	− 3	—	—	—	—	e 21·0
Mount Wilson		46·2	87	i 8 24a	− 4	—	—	—	—	—
Riverside		46·7	87	i 8 27a	− 5	—	—	—	—	—
La Jolla		47·6	88	e 8 34	− 5	—	—	—	—	—
Zi-ka-wei	Z.	48·0	270	e 8 51	+ 8	—	—	—	—	—
Tucson		52·0	84	i 9 9a	− 4	e 16 53	+17	e 11 16	PP	e 22·8
Lincoln		54·7	67	e 9 30	− 3	e 16 58	−15	e 19 13	S_cS	e 22·1
Scoresby Sund		56·9	9	—	—	e 18 14	PPS	—	—	e 28·0
Chicago		59·1	61	e 9 58	− 6	e 18 1	−10	e 10 42	P_cP	e 24·1
Florissant		59·7	65	i 10 4	− 5	e 18 6	−13	—	—	30·6
St. Louis		59·9	65	e 10 6	− 4	e 18 10	−11	e 22 17	SS	—
Sverdlovsk		61·4	328	i 10 24	+ 4	18 47	+ 7	—	—	31·7
Ottawa		62·7	50	e 10 25	− 4	—	—	e 12 41?	PP	23·7
Pittsburgh	Z.	64·2	57	i 10 37	− 2	—	—	—	—	—
Pennsylvania		65·0	56	—	—	e 19 7	−19	—	—	—
Williamstown		65·9	51	i 10 47	− 3	—	—	—	—	—
Pulkovo		66·4	345	e 10 53	0	e 19 43	0	—	—	37·6
Frunse		66·6	310	e 10 55	+ 1	—	—	—	—	—
Harvard		66·9	50	i 10 52a	− 4	—	—	—	—	e 40·7
Fordham		67·0	53	i 10 54	− 3	e 20 46	+56	—	—	e 32·2
Philadelphia		67·0	55	e 13 56	sPP	e 19 24	−26	e 27 31	SSS	e 28·7
Columbia		68·4	62	—	—	e 19 59	− 8	e 27 55	SSS	e 31·9
Moscow		68·8	339	11 11	+ 3	20 14	+ 3	—	—	—
Tchimkent		69·3	313	e 11 15	+ 4	—	—	—	—	—
Tashkent		70·3	312	14 2	PP	e 20 32	+ 3	15 48	PPP	e 37·2
Copenhagen		72·6	355	i 11 34	+ 3	i 20 57	+ 1	—	—	34·7
De Bilt		76·5	358	e 11 56a	+ 2	—	—	—	—	e 36·7
Jena	N.	77·4	353	e 12 1	+ 3	—	—	—	—	—
Uccle		77·8	359	e 12 5	+ 4	e 21 53	0	—	—	e 36·7
Baku		79·1	325	12 17	+ 9	e 22 30	+23	—	—	42·3
Brisbane		82·7	206	—	—	i 22 47	+ 3	e 27 29	SS	—
San Juan		88·8	61	e 13 18	pP	e 23 16	[− 9]	e 18 56	PP	e 42·4
Riverview	N.	89·2	205	—	—	e 23 29	[+ 1]	—	—	e 27·6
Sydney		89·3	205	—	—	e 23 41	− 7	—	—	e 27·5
Ksara		89·7	332	e 13 5	+ 4	e 23 58	+ 6	25 27	PPS	44·7
Adelaide		94·1	214	—	—	e 29 46	?	e 30 49	SS	31·5

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Melbourne	94·7	208	e 21 47	?	e 24 41	+ 5	—	—	26·8
Perth	101·2	233	—	—	i 26 41	PS	i 32 29	SS	i 34·7
Huancayo	107·5	87	—	—	e 24 44	[−17]	e 29 13	PPS	e 44·2

Additional readings :—
College ePP = +5m.31s., S = +8m.48s., eSS = +9m.46s.
Victoria SS = +17m.11s.
Spokane iN = +6m.27s.
Haiwee eS$_c$PZ = +13m.47s.
Irkutsk e = +13m.41s.?
Tucson iP = +9m.24s., ePPP = +12m.42s., esS = +17m.11s., eSS = +20m.33s., esSS = +20m.55s.
Lincoln S = +17m.2s., eSS = +21m.11s.
Chicago ePPP = +13m.13s., esS = +18m.26s., eSS = +21m.46s.
Florissant eE = +19m.46s., iN = +19m.49s.
Pennsylvania i = +19m.18s.
Harvard eN = +37m.41s.?
Fordham iZ = +11m.15s.
Tashkent e = +21m.4s., +23m.19s., and +29m.5s.
Brisbane eN = +21m.29s. and +22m.29s., iN = +27m.35s., eE = +30m.23s.
San Juan S = +23m.36s., eSS = +29m.32s.
Ksara SS = +30m.13s.
Perth i = +27m.33s., iS = +29m.44s.
Huancayo eSS = +34m.6s., eSSS = +37m.51s.
Long waves were also recorded at Cape Town, Upsala, East Machias, Grozny, and Arapuni.

Dec. 7d. Readings also at 1h. (Zurich), 2h. (near Mizusawa), 5h. (near Mizusawa), 8h. (Triest), 10h. (Bucharest), 11h. (Tinemaha, Haiwee, Santa Barbara, Irkutsk, Pasadena, Mount Wilson, Triest, Riverside, La Jolla, Tchimkent, Tashkent, Helwan, Wellington, Christchurch, La Paz, Rome, Ksara (2), Baku, Sverdlovsk, and Tucson), 12h. (Uccle and Rome), 13h. (De Bilt, near Mizusawa, and Columbia), 14h. (La Plata, Columbia, and La Paz), 16h. (Mizusawa), 17h. (near Manila, Baku, Sverdlovsk, and Vladivostok), 18h. (Andijan, Samarkand, Frunse, Vladivostok, and Baku), 19h. (near Mizusawa), 20h. (Zurich (2), Stuttgart, near Chur, Neuchatel, Basle, and Huancayo), 22h. (near Erevan, Grozny, and Tucson).

Dec. 8d. Readings at 0h. (Riverside, Vladivostok, Mount Wilson, Palomar, Pasadena, Tucson, Andijan, Sverdlovsk, and Baku), 1h. (Ottawa, Seven Falls, Shawinigan Falls, Bucharest, and Ksara), 4h. (near Tananarive (2) and Andijan), 6h. (Sverdlovsk and Baku), 7h. (Ksara), 8h. (Erevan, Grozny, Ksara, Sverlovsk, Baku, Tucson, and Sotchi), 10h. (Tacubaya), 12h. (Tucson), 13h. (Andijan), 16h. (Andijan), 19h. (near Osaka (2) and near Mizusawa), 22h. (near Sotchi and Balboa Heights), 23h. (Tucson).

Dec. 9d. 19h. 20m. 39s. Epicentre 3°·2S. 143°·7E. (as on 1938, August 30d.).

A = −·8047, B = +·5911, C = −·0555; δ = +2; h = +7;
D = +·592, E = +·806; G = +·045, H = −·033, K = −·998.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Riverview	N.	31·3	168	—	—	e 10 51	−40	—	—	e 16·9
Irkutsk		64·5	335	—	—	e 19 21?	+ 2	—	—	—
Frunse		77·1	316	e 11 58	+ 1	—	—	—	—	—
Andijan		78·1	313	12 3	+ 1	22 2	+ 6	—	—	—
Tchimkent		80·5	314	12 15	0	i 22 24	+ 2	—	—	—
Samarkand		81·9	310	12 8	−15	—	—	—	—	—
Sverdlovsk		88·9	327	i 12 54	− 4	e 23 18	[− 8]	—	—	45·3
Baku		95·0	309	—	—	e 26 11	PS	—	—	36·9
Pasadena	z.	98·5	56	e 13 28	−14	—	—	—	—	—
Mount Wilson	z.	98·6	56	e 13 28	−14	—	—	—	—	—
Riverside	z.	99·2	312	e 13 31	−14	—	—	—	—	—
Tucson		104·8	58	e 18 16	PP	—	—	—	—	—

Long waves were recorded at Adelaide.

Dec. 9d. 20h. Undetermined shock.

Mizusawa SE =20m.46s.
Vladivostok e =21m.50s. and 22m.1s.
Irkutsk e =23m.0s., 31m.58s., and 32m.42s.
Adelaide iP =24m.4s., iS =29m.30s., SS =31m.30s., L =32·3m.
Andijan P =24m.44s.
Tchimkent P =24m.45s.
Frunse P =24m.47s.
Melbourne i =24m.49s. and 27m.22s., L =30m.37s.
Tashkent e =24m.54s., 25m.21s., 34m.35s., and 35m.37s.
Samarkand P =25m.0s.
Riverview eE =25m.7s., eN =27m.25s.
Sverdlovsk P =25m.36s., S =35m.15s., L =55·0m.
Bucharest eSEN =27m.33s.
Tucson eP =31m.50s.
La Paz PZ =32m.12s.
Bozeman e =35m.2s.
Baku e =38m.2s., L =52·0m.

Dec. 9d. Readings also at 2h. (Bozeman), 3h. (De Bilt, San Juan, Tucson, and Sverdlovsk), 4h. (near Mizusawa), 6h. (Tchimkent (4)), 12h. (near Apia), 15h. (Moncalieri), 18h. (Bunnythorp, Christchurch, and Wellington), 22h. (Basle).

Dec. 10d. 20h. Undetermined shock.

Bucharest eEN =19m.0s., eN =19m.15s., iN =19m.31s., SEN =19m.58s., iN =20m.20s.
Cernauti ePN =19m.52s., eE =22m.26s., eN =22m.33s., LE =25m.
Helwan eZ =19m.54s. and 22m.18s.
Belgrade eP =20m.11s., e =20m.25s., iZ =21m.6s., iNE =21m.25s., iZ =21m.37s.
Szeged ePE =20m.30s., eN =21m.13s., eE =21m.16s., eN =22m.11s., 22m.38s., eL = 23·4m.
Pulkovo eP =21m.34s., eS =26m.4s., L =28·6m.
Moscow P =21m.43s., S =26m.56s., L =28·7m.
Ksara e =21m.48s. and 23m.42s.
Grozny e =21m.16s.
Sotchi e =23m.2s.
Sverdlovsk eP =23m.24s., e =28m.29s., L =35·5m.
Triest eP_g =23m.28s., i =23m.32s., S_g =23m.48s.
Baku eP =24m.9s., e =26m.10s., eL =27·9m.
Rome e =24m.15s., 25m.28s., and 26m.0s.
Erevan e =25m.25s.
Long waves were also recorded at Prague, Uccle, and De Bilt.

Dec. 10d. Readings also at 3h. (Palomar, Haiwee, Tinemaha, Apia, Mount Wilson, Riverside, Pasadena, and Tucson), 5h. (Huancayo and Tucson (3)), 6h. (Tucson), 10h. (Mount Wilson, Riverside, and Pasadena), 11h. (Tucson), 12h. (Stuttgart, near Neuchatel, Basle, and Zurich), 13h. (Ksara), 15h. (near Istanbul, La Paz, Tacubaya, and Stuttgart), 16h. (Tucson), 17h. (Tucson), 18h. (Tucson and Tacubaya), 19h. (Rome), 20h. (Bucharest).

Dec. 11d. Readings at 0h. (Tucson), 1h. (Tucson, Sverdlovsk, and near Irkutsk), 2h. (Harvard, Fordham, Salt Lake City, Chicago, Bermuda, Tucson (2), San Juan, and near Port au Prince), 3h. (Ukiah, Tucson, and Samarkand (2)), 5h. (Samarkand), 7h. (Tucson, Mount Wilson, Riverside, La Paz, Huancayo, La Plata, Sverdlovsk, and Ksara), 10h. (Pasadena, Huancayo, near La Paz, Riverside, Mount Wilson, Tucson (2), and Bozeman), 11h. (Rome and Samarkand), 13h. (Bozeman, Jena (5), and near Apia), 15h. (La Paz), 17h. (San Juan and near Port au Prince), 18h. (Tashkent, Andijan, Frunse, Tchimkent, Almata, Sverdlovsk, and Samarkand (2)), 19h. (near Apia), 22h. (near La Paz and Huancayo).

Dec. 12d. 2h. 50m. 9s. Epicentre 15°·5N. 91°·7W.

$A = -\cdot0286$, $B = -\cdot9637$, $C = +\cdot2656$; $\delta = +8$; $h = +6$;
$D = -1\cdot000$, $E = +\cdot030$; $G = -008$, $H = -265$, $K = -\cdot964$.

Tables for depth of focus 0·020 have been used.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Oaxaca	N.	5·1	289	1 18	+ 2	—	—	—	—	—
Vera Cruz	N.	5·6	312	1 22	0	—	—	—	—	—
Merida	N.	5·8	21	1 35	+10	—	—	—	—	—
Tacubaya	N.	8·1	300	i 2 0	+ 4	—	—	—	—	—
Columbia		20·8	26	e 4 30	0	e 8 11	+ 3	e 5 58	sP	—
Cape Girardeau		21·8	5	i 4 42	+ 2	i 8 29	+ 3	i 4 40	pP	—
St. Louis	N.	23·1	3	i 4 52	0	—	—	i 5 47	PP	—
Florissant		23·2	3	i 4 54	+ 1	—	—	i 5 49	PP	—
Tucson		24·1	318	e 5 2	0	—	—	i 5 50	pP	—
Palomar	Z.	28·9	314	i 5 45	− 1	—	—	i 6 30	pP	—
Riverside		29·6	314	i 5 52	0	—	—	i 6 37	pP	—
Mount Wilson		30·2	314	i 5 56k	− 2	—	—	i 6 42	pP	—
Pasadena		30·2	314	i 5 57	− 1	—	—	i 6 42	pP	—
Haiwee		31·2	317	i 6 5	− 1	—	—	i 6 54	pP	—
Huancayo		31·8	148	e 6 13	+ 2	11 9	0	—	—	e 13·5
Tinemaha		31·9	318	e 6 13	+ 1	—	—	i 7 5	pP	—
La Paz	Z.	39·4	143	e 7 13	− 3	—	—	—	—	—

Tucson also gives eP = +5m.16s., i = +5m.38s. and +5m.46s., esP = +6m.24s.

Dec. 12d. Readings also at 2h. (Oaxaca), 3h. (Tashkent, Tchimkent, Sverdlovsk, Andijan, and Samarkand), 4h. (Colombo), 5h. (Vladivostok, Adelaide, Riverview, Tchimkent, Andijan, and Sverdlovsk), 9h. (Jena and Tucson), 11h. (Tchimkent and Samarkand), 13h. (Tucson), 15h. (Tucson), 16h. (Tucson), 17h. (Wellington, Harvard, and Triest), 18h. (La Paz), 23h. (Andijan).

Dec. 13d. Readings at 0h. (Tchimkent), 2h. (Vladivostok and Sverdlovsk), 3h. (Baku), 4h. (near Tananarive, Basle, Strasbourg, and near Clermont-Ferrand), 5h. (Frunse, Andijan, and Tchimkent), 8h. (Andijan), 12h. (Bozeman, Tucson, Palomar, Mount Wilson, Riverside, and Pasadena), 13h. (Lincoln and Sverdlovsk), 14h. (Ksara, Wellington, and Baku), 15h. (Tinemaha, Haiwee, Baku, La Jolla, Tashkent, Irkutsk, Santa Barbara, Andijan, Ksara, Sverdlovsk, Palomar, Mount Wilson, Riverside, Pasadena, and Tucson), 17h. (Williamstown), 18h. (La Plata, San Juan, Toledo, Tucson, Pasadena, Riverside, Palomar, Mount Wilson, Huancayo, and near La Paz), 20h. (Lincoln), 22h. (Rome and near Andijan).

Dec. 14d. 20h. 18m. 36s. Epicentre 47°·3N. 11°·3E.

Intensity IV in the area of Wetterstein.

Epicentre 47°20′N. 11°18′E. (Stuttgart)

See Annales de l'Institut de Physique du Globe de Strasbourg, Seismologie, tome IV (1939), p. 83.

$A = +\cdot6674$, $B = +\cdot1334$, $C = +\cdot7326$; $\delta = -8$; $h = -4$;
$D = +\cdot196$, $E = -\cdot981$; $G = +\cdot718$, $H = +\cdot144$, $K = -\cdot681$.

	△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Ravensburg	1·2	293	e 0 23	− 1	e 0 39	− 2	—	—	—
Chur	1·3	249	e 0 25	0	e 0 44	0	—	—	—
Zurich	1·9	272	e 0 37	P_g	e 1 2	S_g	—	—	—
Stuttgart	2·0	316	e 0 36	+ 1	i 0 57	− 5	e 0 38	P*	—
Triest	2·4	134	—	—	e 1 14	+ 2	—	—	—
Basle	2·5	275	e 0 49	P_g	e 1 20	S_g	—	—	—
Strasbourg	2·7	298	—	—	e 1 29	S_g	—	—	—
Neuchatel	3·0	264	e 0 49	− 1	e 1 34	S*	—	—	—
Jena	3·6	1	—	—	e 1 30	−12	e 1 50	S*	—

Additional readings:—
Stuttgart iS* = +1m.4s., iS_gEN = +1m.8s.
Triest e = +1m.27s. and +1m.32s.
Jena eN = +1m.34s.

Dec. 14d. Readings also at 0h. (near Grozny), 1h. (Mount Wilson, Brisbane, Ksara, Riverside, Tucson, and Sverdlovsk), 2h. (near Samarkand and Baku), 4h. (Tucson (2)), 5h. (Mizusawa), 7h. (Adelaide), 9h. (Bozeman (2), Salt Lake City, Tucson (3), and Huancayo), 12h. (Tucson), 13h. (near Mizusawa and Tucson), 17h. (Tucson (2)), 18h. (near Mizusawa, Apia, Tucson, and Wellington), 20h. (near Mizusawa and Rome), 21h., 22h. (2), and 23h. (Rome).

Dec. 15d. Readings at 0h. (Melbourne, near Triest, Riverview, and Rome), 1h. (Rome (2) and Triest (2)), 2h. (Triest), 3h. (Rome, Andijan, and Samarkand), 4h. (Rome), 6h. (San Juan, Port au Prince, and Ksara), 11h. (Huancayo, Tucson, and La Paz), 12h. (Andijan), 13h. (Jena (3) and Samarkand), 14h. (La Paz), 15h. (Tucson), 17h. (Riverside, Mount Wilson, Palomar, Bozeman, and Tucson), 18h. (Tucson and Triest), 19h. (near Erevan and Tucson), 20h. (Tucson and Ksara), 21h. (La Paz and Ksara), 22h. (Baku and Sverdlovsk).

Dec. 16d. 10h. 46m. 33s. Epicentre 43°·7N. 147°·6E. (as on 1939, July 12d.).

Intensity IV at Nemuro ; III at Abashiri, Kushiro, Obihiro, Urakawa ; II at Hatinohe, Miyako, Aomori, Morioka, Mizusawa, and Hakodate ; I at Mori, Hukusima, Mito, Tukubasan, Kakioka, and Utunomiya.

Epicentre 43°·7N. 147°·2E. Depth 120km.

See Seismological Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo 1949, p. 32.

$A = -\cdot6124$, $B = +\cdot3886$, $C = +\cdot6884$; $\delta = -6$; $h = -3$;
$D = +\cdot536$, $E = +\cdot844$; $G = -\cdot581$, $H = +\cdot369$, $K = -\cdot725$.

Tables for depth of focus 0·005 have been used.

	△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Nemuro	1·4	256	0 28	+ 4	0 48	+ 5	—	—	—
Sapporo	4·6	264	1 11	+ 2	1 57	− 5	—	—	—
Mori	5·4	253	1 22k	+ 2	2 25	+ 3	—	—	—
Hatinohe	5·6	236	1 21k	− 2	2 17	−10	—	—	—
Aomori	5·8	242	1 27a	+ 2	2 30	− 2	—	—	—
Miyako	5·8	228	1 24k	− 1	2 25	− 7	—	—	—
Mizusawa	6·7	229	i 1 36	− 2	i 2 44	−10	—	—	—
Akita	6·8	237	1 42	+ 3	2 57	+ 1	—	—	—
Sendai	7·4	225	1 45a	− 3	3 4	− 7	—	—	—
Hukusima	8·0	225	1 54k	− 2	3 20	− 6	—	—	—
Onahama	8·5	219	2 3	0	3 25	−13	—	—	—
Aikawa	9·0	234	2 11k	+ 1	3 44	− 7	—	—	—
Mito	9·1	219	2 9	− 2	3 45	− 8	—	—	—
Kakioka	9·4	220	2 12	− 3	3 51	− 9	—	—	—
Tyosi	9·5	215	2 13	− 4	3 52	−11	—	—	—
Kumagaya	9·8	223	2 23	+ 2	4 2	− 8	—	—	—
Maebasi	9·8	225	2 19	− 2	3 34	−36	—	—	—
Nagano	10·0	229	2 23	0	4 10	− 5	—	—	—
Tokyo Cen. Met. Ob.	10·0	220	2 22	− 1	3 47	−28	—	—	—
Wazima	10·3	236	2 27	0	4 17	− 5	—	—	—
Yokohama	10·3	219	2 28a	+ 1	4 14	− 8	—	—	—
Hunatu	10·6	223	2 30	− 1	4 25	− 4	—	—	—
Mera	10·6	217	2 33	+ 2	4 32	+ 3	—	—	—
Nagoya	11·8	227	2 48	0	4 35	−23	—	—	—
Hamamatu	11·8	223	2 55	+ 7	4 52	− 6	—	—	—
Toyooka	12·8	235	3 1a	0	5 13	− 9	—	—	—
Osaka	13·0	229	i 3 6a	+ 2	5 36	+ 9	—	—	—
Hamada	14·9	239	3 37	+ 9	6 7	− 5	—	—	—
Koti	14·9	232	3 32	+ 4	6 22	+10	—	—	—
Hirosima	15·0	237	3 38	+ 8	6 26	+12	—	—	—
Simidu	15·8	231	3 43	+ 3	6 54	+21	—	—	—
Izuka	16·6	238	3 53	+ 3	7 6	+15	—	—	—
Taikyu	16·6	248	3 47	− 3	6 51	0	—	—	—
Hukuoka	16·8	239	e 3 54	+ 2	7 9	+13	—	—	—
Kumamoto	17·1	236	3 58a	+ 2	7 17	+14	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Zinsen		17·1	255	3 57	+ 1	7 10	+ 7	—	—	—
Kagosima		18·1	233	4 15	+ 7	7 41	+16	—	—	—
Dairen		20·0	264	4 32	+ 2	8 15	+ 9	—	—	—
Zi-ka-wei		24·1	247	i 5 13k	+ 3	9 27	+ 6	i 5 31	pP	14·1
Miyakozima		26·3	232	4 41	−50	9 35	−22	—	—	—
Hong Kong		34·9	242	6 48	+ 1	12 17	+ 4	7 3	pP	—
Manila		36·9	225	i 7 8k	+ 4	12 51	+ 7	—	—	17·8
Phu-Lien		40·9	248	e 7 41	+ 4	i 13 49	+ 5	—	—	—
College		40·9	35	e 7 38a	+ 1	e 13 41	− 3	e 8 4	pP	e 17·0
Semipalatinsk		45·0	304	8 9	− 2	e 13 43	−61	—	—	—
Sitka		48·3	45	e 8 35	− 2	15 33	+ 2	10 33	PP	e 23·2
Almata		49·8	296	8 51	+ 3	—	—	—	—	—
Honolulu		50·2	97	e 8 42	− 9	e 16 0	+ 3	e 8 57	pP	i 20·0
Frunse		51·5	296	9 2	+ 1	16 20	+ 5	—	—	26·9
Calcutta	N.	52·8	266	i 9 2a	− 9	i 16 25	− 8	e 9 14	pP	—
Sverdlovsk		53·4	318	i 9 14	− 1	i 16 37	− 4	i 9 36	pP	31·3
Andijan		54·0	295	9 20	0	16 55	+ 6	—	—	—
Tchimkent		55·0	297	9 27	0	i 17 5	+ 3	—	—	—
Dehra Dun	N.	55·6	282	e 9 46	+15	e 17 20	+10	—	—	e 28·9
Tashkent		55·7	297	i 9 31	− 1	e 17 12	0	e 9 56	pP	—
Agra	E.	57·5	278	i 8 43a	−62	i 17 33	− 3	9 58	pP	—
Samarkand		58·1	296	e 9 55	+ 6	—	—	—	—	—
Victoria		58·6	52	—	—	e 24 27	SSS	—	—	e 32·4
Ferndale		62·4	59	e 10 39	+21	—	—	i 11 2	pP	—
Hyderabad		63·2	268	10 22	− 2	18 46	− 3	10 40	PcP	30·1
Ukiah		63·8	60	e 12 37	PP	e 18 37	−19	e 19 33	sS	e 26·3
Moscow		64·7	324	10 34	+ 1	19 6	− 1	10 56	pP	34·5
Pulkovo		64·8	331	i 10 31	− 3	i 19 2	− 6	10 55	pP	30·8
Scoresby Sund		65·1	357	10 40	+ 4	19 23	+11	20 3	sS	27·7
Berkeley		65·2	61	e 10 45	+ 8	—	—	e 11 27	pP	—
Lick		65·9	61	e 10 41	0	—	—	—	—	—
Butte		66·0	47	e 10 38	− 4	e 19 23	0	e 12 54	PP	e 27·2
Bombay		66·3	273	i 10 45	+ 1	i 19 27	0	i 20 42	SS	i 36·8
Bozeman		67·0	48	e 10 46	− 2	19 38	+ 3	e 11 11	pP	—
Fresno	N.	67·5	61	e 10 27?	−24	e 19 27?	−14	—	—	—
Tinemaha		68·2	59	i 10 56	0	e 19 54	+ 5	e 39 15	P'P'	—
Baku		68·3	306	i 10 59	+ 3	i 19 54	+ 3	—	—	33·4
Kodaikanal	E.	68·7	263	i 11 0a	+ 1	i 19 59	+ 4	i 20 13	PS	33·7
Grozny		68·8	309	i 11 6	+ 7	i 20 3	+ 6	—	—	29·0
Santa Barbara		68·9	62	i 11 1	+ 1	e 20 0	+ 2	—	—	—
Haiwee		69·0	59	i 11 0	− 1	e 19 58	− 1	e 39 12	P'P'	—
Upsala		69·0	335	i 10 57	− 4	e 19 49	−10	—	—	e 32·4
Colombo	E.	69·2	260	11 1	− 1	20 2	+ 1	—	—	33·8
Salt Lake City		69·7	53	11 3	− 2	i 20 8	+ 1	e 15 45	PPP	e 28·5
Piatigorsk		69·8	312	e 10 35	−30	i 20 7	− 1	—	—	—
Mount Wilson		70·1	61	i 11 7a	0	e 20 15	+ 3	i 11 30	pP	—
Pasadena		70·1	61	i 11 7a	0	i 20 13	+ 1	i 11 24	pP	e 28·1
Riverside		70·7	61	i 11 10	− 1	e 20 18	− 1	i 11 33	pP	—
Palomar		71·4	62	i 11 15a	0	—	—	i 11 33	pP	—
Erevan		71·5	308	i 11 22	+ 6	20 40	+12	—	—	—
La Jolla		71·5	61	e 11 15	− 1	e 20 31	+ 3	—	—	—
Bergen		71·8	342	e 10 27?	−51	e 19 27?	−65	—	—	e 31·4
Sotchi		71·9	314	11 19	+ 1	20 35	+ 2	—	—	39·4
Copenhagen		74·0	335	i 11 30a	0	i 20 55	− 1	i 22 7	PS	33·4
Cernauti		75·0	325	i 11 27?	− 9	20 57	−11	—	—	40·4
Tucson		76·0	58	i 11 42	0	21 16	− 3	i 12 3	pP	e 31·7
Hamburg		76·5	335	i 11 46a	+ 1	i 21 25	+ 1	—	—	e 30·4
Heligoland		76·6	339	e 11 44a	− 1	e 21 27	+ 2	—	—	e 36·4
Riverview		77·2	177	e 12 0	+11	i 21 39	+ 7	i 22 0	PS	e 35·6
Sydney		77·3	177	—	—	e 21 39	+ 6	e 26 45	SS	e 32·3

Continued on next page.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Edinburgh	77·7	344	e 11 46	− 5	—	—	—	—	—
Lincoln	77·9	44	11 45	− 7	i 21 27	−12	e 15 9	PP	e 33·6
Bucharest	78·0	321	i 11 55a	+ 2	21 43	+ 3	e 14 25	PP	—
Prague	78·1	332	i 11 55a	+ 1	i 21 42	+ 1	e 22 3	PS	36·4
Jena	78·2	332	e 11 54	0	i 21 43	+ 1	i 22 12	PS	e 35·4
Budapest	78·5	326	i 11 57	+ 1	i 21 49	+ 4	e 13 17	pP	e 34·0
Istanbul	79·1	319	11 52	− 7	21 57	+ 5	—	—	e 50·4
Szeged	79·1	327	i 12 1	+ 2	e 21 54	+ 2	i 12 16	P_cP	e 27·4
De Bilt	79·2	337	i 12 0a	0	i 21 53	0	i 12 16	pP	35·4
Stonyhurst	79·5	343	e 12 2	+ 1	i 21 57	+ 1	—	—	40·4
Belgrade	80·1	324	i 12 4k	0	i 22 2	0	—	—	e 36·4
Bidston	80·1	343	i 12 0	− 4	i 22 5	+ 3	i 22 52	PPS	e 41·4
Uccle	80·6	338	i 12 7a	0	i 22 7	− 1	i 12 23	pP	e 36·4
Ksara	80·9	307	i 12 10a	+ 1	i 22 22	+11	i 12 26	pP	—
Stuttgart	80·9	333	e 12 8a	− 1	i 22 11	0	i 12 30	pP	e 38·4
Kew	81·2	340	i 12 11a	+ 1	i 22 15	+ 1	i 12 26	P_cP	e 42·0
Oxford	81·2	342	i 12 12	+ 2	i 22 11	− 3	—	—	e 35·4
Chicago	81·4	39	e 12 10	− 1	i 22 16	0	e 12 40	pP	e 33·7
Strasbourg	81·6	334	e 12 12	0	i 22 13	− 5	e 12 21	pP	41·4
Triest	82·1	330	12 16a	+ 1	i 22 21	− 2	12 31	pP	38·4
Zurich	82·4	333	e 12 16	0	e 22 24	− 2	—	—	—
Basle	82·5	334	e 12 17	0	e 22 29	+ 2	e 12 39	pP	—
Chur	82·5	333	e 12 18	+ 1	e 22 30	+ 3	—	—	—
Florissant	82·6	41	e 12 22	+ 5	e 22 32	+ 4	i 12 39	pP	42·6
Paris	82·9	337	i 12 20a	+ 1	i 22 30	− 1	23 25	PS	e 39·5
Neuchatel	83·2	334	e 12 20	− 1	e 22 27	− 7	—	—	—
Besançon	83·3	335	e 12 26	+ 5	i 22 40	+ 5	—	—	—
Ottawa	83·3	29	i 12 20	− 1	i 22 34	− 1	i 15 26	PP	37·4
Shawinigan Falls	83·3	27	12 22	+ 1	22 36	+ 1	—	—	—
Toronto	83·4	32	i 12 21	− 1	i 22 36	0	15 33	PP	36·4
Jersey	83·8	342	e 12 23	− 1	e 22 39	− 1	e 23 34	sS	40·4
Cape Girardeau	84·2	42	i 12 23	− 3	e 22 43	− 1	i 12 39	pP	—
Little Rock	84·7	46	e 12 30	+ 2	i 22 50	+ 1	—	—	—
Moncalieri	84·8	334	—	—	i 32 45	SSS	—	—	52·4
Arapuni	85·3	158	—	—	21 27?	?	—	—	41·5
Clermont-Ferrand	85·3	336	i 13 35	pP	—	—	—	—	e 49·7
Rome	85·7	327	i 12 33a	0	e 22 55	− 4	i 13 42	pP	e 40·3
Pittsburgh	85·9	34	i 12 34	0	i 23 1	0	i 15 57	PP	—
Helwan	86·4	309	i 12 39k	+ 3	23 0	− 5	13 17	pP	—
Williamstown	86·5	28	i 12 40	+ 3	i 24 16	PS	i 12 55	pP	e 40·8
East Machias	86·6	23	12 37	0	e 22 50	[− 6]	16 25	PP	e 38·8
Harvard	87·3	27	i 12 41a	0	e 23 16	+ 2	i 16 4	PP	e 42·5
Weston	87·5	27	i 12 42	0	i 23 6	[+ 5]	16 9	PP	—
Halifax	87·8	22	—	—	23 12	[+ 9]	—	—	43·4
Fordham	87·9	29	i 12 43a	− 1	e 23 5	[+ 1]	i 13 3	pP	—
Wellington	88·1	160	12 55	+10	23 4	[− 1]	16 4	PP	40·4
Philadelphia	88·2	32	e 12 46	+ 1	e 23 11	[+ 5]	e 24 20	SP	e 41·9
Georgetown	88·4	33	i 12 48	+ 2	i 23 27	+ 3	—	—	—
Christchurch	89·7	162	i 13 10	+18	e 23 25	[+10]	37 37	L_g	41·7
Columbia	90·9	39	e 13 32	pP	e 23 47	0	e 16 36	PP	e 37·6
Toledo	93·0	339	i 13 7	− 1	e 24 10	+ 5	i 13 23	pP	—
Granada	95·4	338	i 13 21a	+ 3	i 23 47	[+ 1]	i 17 11	PP	46·2
San Fernando	96·7	340	—	—	24 5	[+11]	—	—	48·4
Bermuda	98·7	27	e 13 46	+13	e 24 1	[− 3]	e 17 37	PP	e 47·1
San Juan	110·9	33	e 19 2	PP	e 25 19	SKKS	e 28 9	SP	e 45·3
Huancayo	131·5	62	e 16 9	P	e 25 51	[−16]	e 20 55	PP	e 53·9
La Paz	139·4	59	i 19 25a	[+5]	i 22 59	SKP	i 22 19	PP	67·4
Rio de Janeiro	157·4	27	e 23 56	PP	—	—	—	—	e 44·0

Additional readings :—
Zi-ka-wei iZ = +5m.41s. and +5m.53s., iN = +5m.57s., iZ = +6m.17s., +7m.1s., and +9m.41s., iN = +10m.5s., SSZ = +10m.35s., SSSZ = +10m.55s., SSSSZ = +11m.21s., iZ = +12m.19s.
Hong Kong PP = +7m.48s., ? = +12m.42s.

Continued on next page.

College esP = +8m.13s., PP = +9m.18s., ePPP = +9m.53s., S = +13m.46s., esS = +14m.8s., eSS = +16m.43s.
Sitka isS = +16m.4s., eSS = +18m.37s.
Honolulu eP_cP = +10m.5s., pPP = +10m.55s., iS = +16m.5s., isS = +16m.32s., iS_cS = +18m.42s.
Calcutta eP_cPN = +10m.22s., ePPN = +10m.45s., isSN = +16m.49s., eS_cSN = +18m.57s.
Sverdlovsk L_g = +23m.9s.
Agra PPE = +11m.58s., sSE = +18m.2s., SSE = +21m.25s.
Victoria e = +28m.51s.
Hyderabad PSE = +19m.11s., S_cSN = +20m.6s., SSE = +22m.32s.
Ukiah ePPP = +14m.0s., eS_cS = +19m.55s., eSS = +22m.53s.
Scoresby Sund P = +10m.48s., i = +21m.10s.
Butte ePPP = +14m.44s., eSS = +23m.30s., eSSS = +26m.33s.
Bombay iE = +13m.55s. and +14m.19s., iEN = +21m.0s. and +23m.42s.
Bozeman ePP = +13m.7s., esPP = +13m.49s., PPP = +15m.3s., esS = +20m.7s., eSSS = +27m.17s.
Kodaikanal iSSE = +24m.22s.
Salt Lake City esPP = +14m.13s., sS = +20m.37s., iPS = +21m.0s., eSS = +24m.3s.
Mount Wilson iPKP,PKPZ = +39m.6s.
Pasadena iN = +20m.43s., iPKP,PKPZ = +39m.6s.
Riverside ePKP,PKPZ = +29m.1s.
Palomar ePKP,PKPZ = +39m.0s.
Tucson isP = +12m.15s., PP = +14m.43s., pPP = +15m.5s., sPP = +15m.23s., ePPP = +16m.36s., epPPP = +16m.49s., epS = +21m.35s., sS = +21m.50s., PS = +22m.4s., esPS = +22m.35s., SS = +26m.16s., esSS = +27m.3s., eSSS = +29m.57s., ePKP,PKP = +38m.56s.
Heligoland eN = +30m.45s.
Riverview iPN = +12m.4s., iE = +22m.13s., eSSN = +26m.49s.
Lincoln ePKP = +18m.39s., epPKP = +19m.24s., epS = +21m.56s., eSS = +26m.39s., eSSS = +30m.4s.
Bucharest PSEN = +22m.23s.
Jena e = +11m.57s., iN = +21m.47s.
Budapest iSE = +21m.59s.
Istanbul PPP = +18m.5s.
Szeged eE = +13m.52s., eN = +14m.6s., ePPN = +15m.2s., eN = +15m.56s., eSN = +22m.0s., eSKS = +22m.14s., ePSN = +22m.44s., ePSE = +23m.1s., eSSN = +26m.46s., eSSE = +27m.16s.
Bidston e = +24m.2s., eSS = +27m.19s., e = +32m.7s.
Ksara PP = +15m.14s., sS = +22m.45s.
Stuttgart iZ = +12m.11s.
Kew eZ = +13m.19s. and +13m.59s., ePPZ = +15m.19s., ePPPZ = +17m.31s., iSKSN = +22m.24s., ePS = +22m.39s., iPPSEN = +22m.51s., eZ = +23m.21s., eN = +24m.7s., eSSN = +27m.28s., eN = +32m.57s.?
Chicago ePP = +15m.20s., esPP = +16m.10s., eSP = +23m.10s., eSS = +27m.47s.
Strasbourg PN = +12m.15s., eE = +16m.35s.
Triest i = +15m.20s., ePP = +15m.34s., PPP = +17m.21s., e = +19m.25s., sS = +22m.45s., SS = +27m.44s., SSS = +30m.56s.
Florissant iN = +13m.8s., eN = +15m.33s., eSSN = +27m.55s.
Ottawa SSSE = +31m.27s.?
Toronto SSN = +27m.33s., SSSN = +30m.51s.
Cape Girardeau eSEN = +23m.9s.
Rome i = +13m.57s., iZ = +14m.54s., iPP = +16m.12s., iZ = +23m.56s., iNZ = +26m.31s., iN = +30m.8s. ? and +33m.33s., iZ = +35m.11s.
Pittsburgh i?Z = +12m.57s., isS = +23m.31s.
Helwan P_cPZ = +12m.54s., sPZ = +13m.37s., iZ = +14m.9s. and +15m.58s., PPZ = +16m.21s., SE = +23m.18s., pSE = +24m.3s., sSE = +24m.30s., PSE = +24m.35s. pPSE = +25m.3s., sPSE = +25m.24s.
Williamstown iPP = +16m.0s.
East Machias eP_cP = +12m.44s., ePPP = +18m.9s., S = +23m.1s., iS = +23m.8s., pS = +23m.41s., ePS = +24m.37s.
Weston SS = +29m.10s.
Fordham iPPZ = +16m.9s., iSEN = +23m.18s., isSEN = +23m.46s., iZ = +24m.46s.
Wellington iS = +23m.10s., iS_cS = +23m.32s., e = +26m.27s.?
Philadelphia iP = +13m.0s., iS = +23m.23s. and +23m.39s., eSS = +28m.58s., eSSS = +32m.52s.
Christchurch i = +23m.50s.
Columbia ePPP = +18m.44s., eSP = +24m.51s., eSS = +30m.1s., eSSS = +33m.17s.
Granada iPPS = +26m.2s., SS = +32m.13s.
Bermuda SP = +26m.21s., eS = +24m.59s., SSS = +37m.19s.
San Juan esPP = +19m.50s., eS = +26m.30s., pS = +27m.3s., SS = +34m.27s., eSSS = +38m.41s.
Huancayo ePKS = +22m.22s., isPKS = +23m.4s., PPP = +24m.31s., eSKKS = +27m.19s., ePS = +31m.47s., eSS = +38m.52s., eSSS = +43m.58s.
Long waves were also recorded at Ivigtut.

Dec. 16d. 17h. 55m. 47s. Epicentre 24°·5N. 109°·0W.

A = − ·2966, B = − ·8614, C = + ·4124 ; δ = +6 ; h = +3 ;
D = − ·946, E = + ·326 ; G = − ·133, H = − ·390, K = − ·911.

		△	Az.	P.	O − C.	S.	O − C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tucson		7·8	350	e 1 58	0	i 3 29	+ 1	i 2 19	PP	i 4·4
La Jolla		11·0	320	—	—	e 4 41	− 6	—	—	—
Palomar		11·2	324	e 2 49	+ 5	e 4 54	+ 2	—	—	—
Riverside	Z.	11·9	325	e 2 53	− 1	e 5 7	− 2	—	—	—
Mount Wilson	Z.	12·5	324	e 3 2	0	i 5 28	+ 5	—	—	—
Pasadena		12·5	324	e 2 58	− 4	e 5 29	+ 6	—	—	—
Salt Lake City		16·4	353	e 4 16	PPP	e 7 56	SSS	—	—	8·8
Lincoln		19·2	32	e 4 27	− 1	e 7 57	− 2	e 4 57	PP	e 10·4
Chicago		24·8	40	e 5 40	+15	e 9 40	− 6	—	—	e 12·3
Toronto		30·8	44	i 7 51	PPP	—	—	—	—	22·2
Philadelphia		32·3	54	—	—	e 17 7	S_cS	—	—	e 18·1
Ottawa		34·0	44	i 7 26	PP	e 12 13	0	—	—	18·2
East Machias		39·2	48	—	—	e 17 31	S_cS	—	—	22·0

Additional readings :—
Tucson i = +3m.22s., iS = +4m.2s.
Lincoln eS = +8m.13s.
Long waves were also recorded at Sverdlovsk, Bozeman, Baku, Fordham, and Harvard.

Dec. 16d. Readings also at 3h. (Tinemaha, Haiwee (2), Tucson (2), Palomar (2), Riverside (2), Mount Wilson (2), and Pasadena), 5h. (Samarkand and Andijan), 8h. (Melbourne), 11h. (Tucson), 12h. (Tucson), 14h. (Tucson, Pasadena, Mount Wilson, Riverside, Palomar, and Mizusawa), 17h. (Columbia, Samarkand, and Tucson), 18h. (Samarkand and Tucson (2)), 19h. (Samarkand, Tucson (2), Andijan, Frunse, and Tchimkent), 20h. (Tucson), 23h. (Tucson).

Dec. 17d. 7h. 48m. 49s. Epicentre 9°·2S. 123°·0E. (as on 1938, October 20d.).

A = − ·5377, B = + ·8280, C = − ·1589 ; δ = −5 ; h = +7 ;
D = + ·839, E = + ·545 ; G = + ·087, H = − ·133, K = − ·987.

Depth of focus 0·010 on October 20d. is retained.

		△	Az.	P.	O − C.	S.	O − C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Manila		23·7	356	i 5 6	+ 2	9 50	SS	—	—	—
Hong Kong		32·5	345	7 40	PP	11 31	+ 1	—	—	—
Brisbane	N.	33·7	125	—	—	e 12 23	sS	e 13 53	SS	—
Wellington		55·6	134	—	—	e 23 11?	SSS	—	—	—
Irkutsk		63·3	347	e 10 29	+ 8	e 18 27	−17	—	—	—
Almata		66·9	325	10 45	+ 1	—	—	—	—	—
Andijan		68·1	320	10 47	− 4	19 44	+ 2	—	—	—
Tchimkent		70·7	322	11 0	− 7	e 20 11	− 1	—	—	—
Samarkand		71·0	317	e 11 8	− 1	—	—	—	—	—
Sverdlovsk		83·2	331	e 12 16	− 1	e 22 44	+17	—	—	24·2
Baku		83·3	313	—	—	e 22 27	− 1	—	—	e 33·2
Grozny		87·1	314	e 12 40	+ 4	e 22 50	[− 1]	—	—	—
Ksara		92·7	303	e 14 49	?	e 24 43	PS	—	—	—
Haiwee	Z.	118·8	54	i 18 40	[+ 3]	—	—	—	—	—
Pasadena	Z.	118·9	56	i 18 40	[+ 3]	—	—	i 19 2	PP	—
Mount Wilson		119·0	56	i 18 40	[+ 2]	—	—	i 19 3	PP	—
Riverside	Z.	119·6	56	e 18 41	[+ 2]	—	—	i 19 3	PP	—
Tucson		125·3	56	e 18 53	[+ 4]	—	—	—	—	—
Fordham	Z.	145·1	21	i 19 30	[+ 4]	—	—	i 19 48	pPKP	—

Additional readings :—
Brisbane eN = +15m.35s.
Pasadena iZ = +22m.8s.
Mount Wilson iZ = +22m.8s.
Long waves were recorded at Riverview.

Dec. 17d. Readings also at 0h. (La Plata, La Paz, Manila, Tucson, Huancayo, and Granada), 1h. (Ksara and Huancayo), 4h. (Ukiah, Tucson, and Ksara), 7h. (Tinemaha, St. Louis, Palomar, Fordham, Riverside, College, Mount Wilson, Pasadena, Haiwee, and Tucson (2)), 11h. (Melbourne and Tucson (2)), 17h., 18h., 19h. (2), and 20h. (Tucson), 23h. (Granada and Ksara).

Dec. 18d. 6h. 26m. 19s. Epicentre 15°·0S. 168°·5E. (as on 1938, April 9d.).

$A = -\cdot 9470$, $B = +\cdot 1927$, $C = -\cdot 2572$; $\delta = +9$; $h = +6$;
$D = +\cdot 199$, $E = +\cdot 980$; $G = +\cdot 252$, $H = -\cdot 051$, $K = -\cdot 966$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Brisbane		19·0	227	i 4 23	− 3	i 7 47	− 8	—	—	—
Arapuni		23·8	167	e 6 59	?	10 41	SSS	—	—	—
Riverview		24·4	216	i 5 18k	− 3	e 9 36	− 3	5 47	PP	—
Sydney		24·4	216	—	—	e 9 35	− 4	—	—	—
Wellington		26·7	170	5 44	+ 1	10 26	+ 9	—	—	15·7
Christchurch		28·6	174	5 56	− 4	11 6	+18	12 51	L_q	e 15·0
Melbourne		30·8	218	i 8 9	PPP	i 11 24	+ 1	e 12 56	SS	—
Perth		50·7	241	i 13 43	?	i 16 16	− 2	i 19 56	SS	25·1
Vladivostok		66·7	332	i 10 57	+ 2	i 19 54	+ 8	—	—	32·3
Pasadena		85·1	53	i 12 40	+ 1	—	—	e 15 59	PP	—
Mount Wilson		85·2	53	i 12 43	+ 4	—	—	—	—	—
La Jolla	Z.	85·3	54	e 12 43	+ 3	—	—	—	—	—
Riverside		85·6	53	i 12 44	+ 3	—	—	—	—	—
Palomar	Z.	85·8	54	i 12 46	+ 4	—	—	—	—	—
Haiwee		86·0	51	e 12 46	+ 3	—	—	—	—	—
Tinemaha		86·1	50	e 12 47	+ 3	—	—	—	—	—
Irkutsk		86·8	327	e 13 4	+17	e 23 15	[+ 2]	—	—	—
Tucson		90·2	57	i 13 7	+ 3	e 23 44	−12	e 18 57	PPP	e 38·8
Colombo	E.	90·4	277	e 19 11	PPP	—	—	—	—	—
Agra	E.	97·1	296	—	—	i 24 9	[− 3]	—	—	—
Ottawa		118·6	46	i 18 50	[0]	—	—	—	—	57·7
San Juan		127·7	77	e 22 28	PKS	—	—	—	—	—
Ksara		133·7	303	e 19 20	[+ 1]	32 3	PS	e 21 49	PP	—
Triest		142·8	331	e 19 5	[−30]	—	—	—	—	e 56·9
Rome		146·1	327	e 19 41	[0]	i 23 1	PP	—	—	—
Clermont-Ferrand		147·0	342	e 20 43	[+60]	—	—	—	—	—
Granada		156·8	344	19 59k	[+ 2]	e 28 21	?	24 12	PP	—

Additional readings :—
Brisbane iSN = +7m.53s.
Riverview SSN = +10m.12s.
Melbourne i = +14m.43s.
Perth i = +15m.6s., +18m.9s., and +20m.59s.
Tucson eP = +16m.46s., eS = +24m.15s., eS_cS = +24m.21s., ePPS = +25m.49s., ePSPS = +30m.46s., eSSS = +34m.45s.
Ksara PPS = +34m.1s.
Rome iZ = +19m.45s.
Granada iSSN = +45m.21s., eSSPN = +47m.47s., SSSN = +51m.50s.
Long waves were also recorded at Harvard, Sverdlovsk, and East Machias.

Dec. 18d. 10h. Undetermined shock. Epicentre probably New Britain.
Palau P = 25m.18s., S = 28m.42s.
Brisbane iPEN = 26m.6s., iPPN = 26m.30s., iSEN = 29m.54s.
Riverview iPN = 27m.56s., iSE = 31m.31s., iN = 31m.38s.
Perth i = 27m.58s. and 30m.5s., S = 31m.45s., P_cS = 32m.0s., i = 33m.5s. and 33m.36s., SS = 34m.27s., SSS = 34m.52s., SSSS = 35m.20s., L = 36m.45s.
Manila P?EZ = +28m.22s., S?N = 33m.51s.
Zi-ka-wei eZ = 28m.36s., iZ = 31m.40s. and 42m.48s.
Misima P = 28m.50s.
Mito P = 28m.54s., S = 35m.7s.
Sydney e = 28m.54s. and 31m.12s.
Nagano P = 29m.2s., S = 35m.14s.
Christchurch eP = 29m.21s., iS = 35m.25s., eL_q = 38m.15s., eL = 41·3m.
Hong Kong P = 29m.32s., PP = 30m.33s., S? = 34m.50s., ? = 35m.14s., SS = 36m.20s., L = 38·8m.
Wellington P_cP? = 31m.28s., iS? = 35m.15s., SS? = 38m.39s., L = 41·0m.
Colombo eE = 31m.30s.
Irkutsk eP = 32m.17s., iS = 40m.51s., L = 53·0m.

Continued on next page.

Melbourne i = 32m.35s., 33m.22s., 35m.12s., 36m.55s., and 38m.20s.
Kodaikanal eE = 33m.0s.?
Agra eE = 33m.23s., iE = 43m.8s.
Almata eP = 33m.28s., e = 42m.58s.
Andijan P = 33m.29s., iS = 43m.23s.
Bombay eE = 33m.35s. and 36m.8s., eEN = 42m.27s., iEN = 43m.48s.
Tchimkent eP = 33m.37s., S = 43m.44s.
Tashkent eP = 34m.14s., eS = 44m.41s.
Tinemaha ePZ = 34m.28s.
Pasadena iPNZ = 34m.29s.
Haiwee ePZ = 34m.31s.
Mount Wilson iP = 34m.31s., ePPZ = 38m.20s.
Riverside iPZ = 34m.32s.
Palomar iPZ = 34m.36s.
Tucson eP = 34m.59s., PP = 39m.6s., epPP = 40m.43s., eS = 46m.6s., eSSS = 56m.21s., eL = 59·7m.
Arapuni S? = 35m.6s., SS? = 38m.36s.
Calcutta eN = 37m.37s., iN = 41m.22s.
College ePPP = 38m.41s., eS = 43m.40s., eSP = 44m.36s., esSP = 47m.7s., eSS = 49m.27s., eSSS = 53m.29s., eL = 55m.46s.
Fordham eZ = 40m.5s., iZ = 43m.11s.
Williamstown iP = 40m.6s., e = 43m.49s.
Ksara ePP = 41m.1s., ePS = 50m.44s., SS = 57m.6s.
Helwan eZ = 41m.32s.
La Paz PZ = 43m.19s.
Granada ePKPZ = 43m.39s.k, PPZ = 47m.2s., L = 98m.
Sverdlovsk SKS = 44m.58s., ePS = 46m.13s., e = 52m.24s., L = 59·0m.
Long waves were also recorded at De Bilt.

Dec. 18d. Readings also at 2h. (Sverdlovsk, Almata, Andijan, Tchimkent, near Mizusawa, Frunse, and Semipalatinsk), 5h. (Balboa Heights), 6h. (Ukiah), 7h. (Triest, near Granada, and Ksara), 9h. (Huancayo, Bozeman, and Mizusawa), 11h. (near Mizusawa), 12h. (Ottawa), 15h. (De Bilt and Andijan), 16h. (Helwan, Ksara, and La Paz), 17h. (near Branner, near Frunse, and Almata), 18h. (Almata, near Semipalatinsk, near Tchimkent, and near Cape Girardeau), 20h. (La Paz), 23h. (Tucson).

Dec. 19d. 0h. 2m. 25s. Epicentre 36°·3N. 71°·0E. (as on 1939, November 21d.).

Intensity VI at Kabul and Drosh ; V at Srinagar and Peshawar ; IV at Parachinar.

C. W. B. Normand.

Seismological Bulletin of the Meteorological Department of the Government of India, October-December, 1939, p. 92.

$$A = +\cdot2630,\ B = +\cdot7638,\ C = +\cdot5894\ ;\quad \delta = -5\ ;\quad h = 0\ ;$$
$$D = +\cdot946,\ E = -\cdot326\ ;\quad G = +\cdot192,\ H = +\cdot557,\ K = -\cdot808.$$

Tables for depth of focus 0·025 have been used.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tchimkent		6·1	351	i 1 28	− 1	—	—	—	—	—
Frunse		7·1	22	i 1 41	− 1	i 3 1	− 1	i 1 54	pP	—
Almata		8·3	31	i 2 0	+ 2	i 3 33	+ 3	i 2 14	pP	—
Dehra Dun	N.	8·4	133	—	—	e 3 25?	− 8	e 3 51	sS	—
Agra	E.	10·9	145	e 2 31	− 1	4 24	− 7	—	—	—
Semipalatinsk		15·6	22	3 29	− 2	—	—	—	—	—
Baku		17·0	290	—	—	e 6 52	+ 3	—	—	—
Bombay		17·4	174	i 3 55	+ 3	i 7 5	+ 7	e 5 2	sP	—
Hyderabad	E.	19·9	159	—	—	7 56	+ 9	—	—	—
Calcutta	N.	20·4	127	e 4 30	+ 7	i 8 7	+11	e 5 33	sP	—
Grozny		20·6	299	4 26	+ 1	e 8 13	+14	—	—	—
Erevan		21·1	288	e 3 38	−52	—	—	—	—	—
Sverdlovsk		21·7	345	i 4 34	− 2	i 8 21	+ 2	—	—	—
Kodaikanal	E.	26·6	166	e 7 13	?	e 9 45	+ 4	—	—	i 12·5
Irkutsk		28·4	44	e 6 24	PP	—	—	e 6 56	PPP	11·9
Ksara		28·8	275	i 6 23	PP	i 11 55	SS	—	—	—
Tucson		111·8	1	e 18 11	[− 1]	—	—	—	—	—

Additional readings :—
Frunse $iP_g = +1m.59s.$, S = +2m.33s., S* = +2m.45s., i = +2m.52s.
Almata i = +2m.17s., $iP_g = +2m.22s.$, iPP = +2m.26s., iS = +3m.11s.
Bombay iEN = +7m.17s. and +9m.6s.
Calcutta $eP_cPN = +8m.54s.$, esSN = +9m.6s.
Irkutsk e = +7m.34s.

Dec. 19d. 19h. 49m. 25s. Epicentre 12°·5N. 86°·8W. (as on 1939, July 8d.).

$A = +\cdot0545$, $B = -\cdot9751$, $C = +\cdot2151$; $\delta = +6$; $h = +6$;
$D = -\cdot998$, $E = -\cdot056$; $G = +\cdot011$, $H = -\cdot215$, $K = -\cdot977$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Balboa Heights		7·9	115	e 2 7	+ 8	—	—	—	—	—
Merida	N.	8·8	342	i 2 40	P*	—	—	—	—	—
Tacubaya	N.	13·7	301	e 3 23	+ 5	—	—	—	—	—
Columbia		22·0	12	e 5 2	+ 4	e 8 56	0	—	—	—
Huancayo		26·9	154	e 5 48	+ 3	e 10 22	+ 2	e 8 5	P_cP	11·8
Tucson		29·5	314	e 6 2	− 6	e 10 42	−20	e 6 45	PP	e 12·1
Williamstown		32·3	20	i 6 35	+ 2	—	—	—	—	e 20·3
Riverside	Z.	35·1	313	e 6 51	− 6	—	—	i 9 27	P_cP	—
Mount Wilson	Z.	35·7	313	i 6 58	− 4	—	—	i 9 25	P_cP	—
Pasadena		35·7	313	e 6 58	− 4	—	—	i 9 26	P_cP	—
Tinemaha		37·3	317	e 7 13	− 3	—	—	i 9 32	P_cP	—
Bozeman		38·9	333	e 7 26	− 3	e 13 6	−22	—	—	e 19·2
Ksara		108·7	49	e 21 11	PPP	—	—	—	—	—

Additional readings :—
Huancayo eP = +6m.45s.
Tucson P = +6m.8s. and +6m.16s., P_cP = +9m.10s.
Williamstown i = +6m.50s.
Long waves were also recorded at Fresno, Fordham, Harvard, Philadelphia, Baku, and Sverdlovsk.

Dec. 19d. Readings also at 2h. (near Mizusawa), 9h. (Tucson and Chicago), 11h. (Frunse and Almata), 12h. (Rome (2)), 13h. (Ksara), 15h. (near Harvard, Tucson, and near Fordham), 16h. (Huancayo), 18h. (Hong Kong, Vladivostok, Zi-ka-wei, Irkutsk, Calcutta, Tashkent, near Taityu, Sintiku, Arisan, Fordham, Sverdlovsk, Columbia, and Chicago (2)), 19h. (Tucson, Fordham, and De Bilt), 20h. (Tucson), 21h. (Tucson, Lincoln, Ukiah, and near Manila), 23h. (near Rome).

December 20d. 13h. Undetermined shock. Probably in the East Indies.

Calcutta eN = 6m.51s., iN = 16m.51s.
Kodaikanal eE = 12m.13s.
Agra iE = 12m.29s., iSE = 19m.12s., SSE = 22m.42s.
Colombo eE = 13m.0s.
Irkutsk eP = 13m.20s., iS = 20m.52s.
Bombay iP = 13m.37s., eEN = 14m.37s., iSEN = 19m.19s., eEN = 21m.58s.
Almata P = 13m.44s.
Andijan P = 13m.51s., iS = 21m.44s.
Sverdlovsk iP = 15m.14s., eS = 24m.26s., L = 42·0m.
Brisbane iN = 15m.18s., iE = 15m.24s., iN = 18m.30s., iE = 18m.36s.
Baku eP = 15m.25s., iS = 24m.32s., eL = 38·0m.
Riverview iN = 15m.54s., eEN = 19m.12s. and 19m.33s.
Ksara eP = 16m.1s., ePP = 19m.14s., ePS = 27m.15s.
Vladivostok i = 18m.43s., and 20m.56s., e = 22m.37s. and 25m.17s.
Tucson epP = 21m.2s., ePKP = 22m.1s., ePP = 23m.56s., epPKP = 24m.15s., eSPP = 27m.9s., eS = 30m.43s., ePS = 34m.21s., eSS = 40m.23s., eSSS = 45m.11s., eL = 54·4m.
Haiwee iPKPZ = 21m.47s.a.
Tinemaha iPKPZ = 21m.47s.
Mount Wilson iPKP = 21m.48s.a, iZ = 24m.18s.
Pasadena iPKP = 21m.48s.a, iZ = 24m.18s.
Riverside iPKPZ = 21m.48s.a, iZ = 24m.22s.
Palomar iPKPZ = 21m.50s.
Williamstown iP = 22m.27s., i = 25m.7s.
Fordham iP = 22m.31s., i = 22m.36s.
La Paz PZ = +23m.9s.
Harvard i = 23m.30s., iZ = 25m.10s.
Helwan eE = 27m.38s., iEN = 30m,30s,

Dec. 20d. 18h. 14m. 59s. Epicentre 38°·8N. 142°·0E. (as on 1937, January 7d.).

Intensity II at Sendai, Miyako, Mizusawa, Morioka, Hukusima; I at Hatinohe, Onahama, Aomori, Utunomiya, and Shirakawa.

Epicentre 38°·9N. 142°·1E. Shallow.

See Seismolgical Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo 1949, p. 33.

$A = -\cdot6157$, $B = +\cdot4811$, $C = +\cdot6240$; $\delta = -8$; $h = -1$;
$D = +\cdot616$, $E = +\cdot788$; $G = -\cdot492$, $H = +\cdot384$, $K = -\cdot781$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Miyako		0·8	0	0 17k	− 1	0 29	− 2	—	—	—
Mizusawa		0·8	296	i 0 21	+ 3	i 0 33	+ 2	—	—	—
Hukusima		1·6	229	0 31k	+ 1	0 55	+ 4	—	—	—
Akita		1·7	301	0 37a	P_g	1 1	S_g	—	—	—
Hatinohe		1·8	348	0 34k	+ 2	0 58	S*	—	—	—
Onahama		2·1	205	0 40	+ 3	1 1	− 3	—	—	—
Aomori		2·2	335	0 43	P_g	1 13	S_g	—	—	—
Mito		2·7	207	0 43a	− 2	1 11	− 8	—	—	—
Utunomiya		2·8	217	0 52	P*	1 23	+ 1	—	—	—
Kakioka		3·0	209	0 49	− 1	1 14	−13	—	—	—
Aikawa		3·1	255	0 55	+ 4	1 41	S_g	—	—	—
Tyosi		3·2	196	0 55	+ 3	1 26	− 6	—	—	—
Tokyo, Cen. Met. Ob.		3·6	210	1 1	+ 3	1 41	− 1	—	—	—
Nagano		3·7	236	1 4	P*	1 36	− 9	—	—	—
Yokohama		3·9	210	1 4	+ 2	1 50	0	—	—	—
Hunatu		4·2	218	1 10	+ 3	2 0	+ 3	—	—	—
Mera		4·2	204	1 11	+ 4	2 22	S_g	—	—	—
Wazima		4·2	252	1 12	P*	2 10	S*	—	—	—
Sapporo		4·3	353	1 32	P_g	2 5	+ 5	—	—	—
Misima		4·4	214	1 14	+ 4	2 8	+ 6	—	—	—
Nemuro		5·3	31	1 22	0	2 13	−12	—	—	—
Nagoya		5·4	229	1 27	+ 3	2 37	S*	—	—	—
Osaka		6·6	233	e 1 41	0	3 15	S*	—	—	—
Kobe		6·9	235	1 47	+ 2	3 7	+ 2	—	—	—
Vladivostok		8·8	303	i 2 13	+ 2	i 3 59	+ 6	—	—	4·8
Hirosima		8·9	243	2 19	+ 7	4 10	+15	—	—	—
Hukuoka		10·7	244	0 1?	?	—	—	—	—	—
Irkutsk		29·3	311	—	—	e 10 48	−11	—	—	15·0
Almata		48·2	298	9 1	+17	—	—	—	—	—
Andijan		52·2	296	9 14	− 1	—	—	—	—	—
Sverdlovsk		54·1	318	i 9 27	− 2	e 17 4	− 1	—	—	25·0
Haiwee	z.	75·2	55	e 11 57	+11	—	—	—	—	—
Mount Wilson	z.	76·3	57	e 11 48	− 4	—	—	—	—	—
Pasadena	z.	76·3	57	e 11 48	− 4	—	—	—	—	—
Ksara		80·5	306	e 12 14	− 1	—	—	—	—	47·0
Tucson		82·8	55	e 12 21	− 6	—	—	—	—	—
Basle		84·9	331	e 12 35	− 3	—	—	—	—	—
La Paz	z.	145·5	58	19 44	[+ 4]	—	—	—	—	—

Additional readings:—
Mount Wilson iZ = +12m.2s.
Tucson eP = +12m.34s.
Long waves were also recorded at Baku and Rome.

Dec. 20d. Readings also at 0h. (Triest), 1h. (Tucson (3)), 3h. (Samarkand and Almata), 8h. (Fresno, Lick, near Branner, and near Berkeley), 10h. (near Mizusawa, Zurich (3), and near Tananarive), 11h. (Ukiah), 12h. (Perth and Andijan), 13h. (Prague), 17h. (Andijan, Tucson, Erevan, Grozny, Tchimkent, and near Baku), 18h. (near Tananarive), 20h. (Manila), 21h. (Tucson, Huancayo, La Paz, Riverside, Pasadena, and Mount Wilson).

Dec. 21d. 1h. 45m. 40s. Epicentre 3°·0S. 15°·5W.

$A = +·9623$, $B = -·2669$, $C = -·0520$; $\delta = -4$; $h = +7$;
$D = -·267$, $E = -·964$; $G = -·050$, $H = +·014$, $K = -·999$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Rio de Janeiro		33·3	231	e 8 3	PP	—	—	—	—	15·3
Granada		41·5	14	i 7 50a	0	i 14 3	− 4	i 9 18	PP	19·9
Toledo		44·0	12	e 8 6	− 5	e 14 40	− 3	e 9 54	PP	—
Rome		51·4	27	9 8	− 1	i 16 24	− 4	11 29	PP	25·8
La Paz	Z.	53·4	252	9 37	+13	—	—	—	—	27·3
Basle		54·2	19	e 9 25	− 4	—	—	—	—	—
San Juan		54·2	296	e 9 29	0	e 16 58	− 8	e 20 33	SS	e 24·9
Triest		55·0	25	i 9 32	− 3	e 17 1	−16	e 22 10	SSS	—
Helwan		55·4	50	9 41	+ 3	e 17 26	+ 4	—	—	—
Ksara		60·7	49	i 10 18	+ 3	e 18 46	+14	e 22 54	SS	31·3
Sverdlovsk		84·9	32	12 40	+ 2	23 54	PS	—	—	40·3
Tucson		96·1	302	e 13 29	− 2	—	—	—	—	—

Additional readings :—
Granada SSSZ = +17m.21s.
Rome iSS = +19m.44s. and +20m.13s.
Helwan eZ = +9m.53s.

Long waves were also recorded at Baku, Huancayo, Paris, and De Bilt.

Dec. 21d. 20h. 54m. 45s. Epicentre 9°·7N. 83°·7W. (as on 1939, June 18d.).

Damage at Costa Rica.

Epicentre : 9°·7N. 85°·2W. (U.S.C.G.S.).
9°52′N. 83°0′W. (Tacubaya).

See Annales de l'Institut de Physique du Glove de Strasbourg, Seismologie, tome IV, p. 84.

$A = +·1082$, $B = -·9799$, $C = +·1674$; $\delta = -7$; $h = -7$;
$D = -·994$, $E = -·110$; $G = +·018$, $H = -·166$, $K = -·986$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Balboa Heights		4·2	100	i 1 24	P_g	e 2 30	S_g	—	—	2·6
Merida	N.	12·6	334	i 2 55	− 8	—	—	—	—	—
Port au Prince		14·1	51	i 3 50	PPP	i 6 47	SSS	—	—	8·3
Vera Cruz	N.	15·3	310	i 3 28	−11	—	—	—	—	—
Tacubaya	N.	17·8	304	i 4 5	− 6	—	—	—	—	—
San Juan		19·1	61	i 4 38	PP	i 8 11	+14	i 8 40	SSS	—
Guadalajara	N.	21·8	303	e 4 46	−10	—	—	—	—	—
Manzanillo	E.	22·0	299	e 4 57	− 1	—	—	—	—	—
Huancayo		23·1	158	i 5 20k	+12	i 9 10	− 6	i 9 42	SS	—
Columbia		24·3	6	i 5 21	+ 1	9 28	− 9	5 59	PP	10·8
Little Rock		26·2	343	e 5 33	− 5	e 10 16	+ 7	—	—	—
Bermuda		28·5	36	e 6 2	+ 3	i 11 6	+20	e 6 51	PP	i 13·2
St. Louis		29·4	350	i 6 3	− 4	i 11 0	− 1	i 12 3	SS	—
Florissant		29·6	350	i 6 5	− 4	i 11 16	+12	i 7 1	PP	—
Georgetown		29·7	11	i 6 11	+ 1	i 11 4	− 2	—	—	—
La Paz		30·3	148	i 6 26k	+11	i 10 30	−45	11 56	SS	15·1
Pittsburgh		30·8	5	i 6 21	+ 1	i 11 19	− 4	i 7 27	PP	—
Philadelphia		31·1	14	i 6 25a	+ 3	e 11 19	− 9	i 7 29	PP	i 13·6
Pennsylvania		31·4	18	e 6 23	− 2	e 11 29	− 3	i 7 29	PP	e 17·6
Fordham		32·2	16	i 6 33a	+ 1	i 11 44	− 1	i 7 48	PP	—
Chicago		32·3	355	i 6 29	− 4	e 11 32	−14	i 7 32	PP	e 12·9
Chicago Loyola		32·3	355	i 6 33	0	e 12 4	+18	i 7 46	PPP	—
Ann Arbor		32·5	0	i 6 39	+ 5	i 11 45	− 4	7 39	PP	e 15·7
Lincoln		33·1	344	e 6 32	− 8	i 11 59	0	e 7 30	PP	13·3
Tucson		33·7	317	i 6 38a	− 7	i 11 45	−23	i 7 36	PP	i 13·1
Toronto		34·0	7	6 46	− 2	12 4	− 9	7 56	PP	16·7
Williamstown		34·2	15	i 6 51	+ 2	i 12 44	+28	i 8 5	PP	—
Weston		34·3	17	i 6 52	+ 2	—	—	7 39	PP	e 15·8
Harvard		34·4	17	i 6 53	+ 2	e 12 20	+ 1	i 8 7	PP	e 16·2
Montezuma		35·3	155	—	—	13 15	+42	—	—	e 15·6

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Denver		35·4	331	e 6 55	− 5	e 12 29	− 5	i 7 51	PP	e 16·0
Vermont		35·8	13	i 8 2	PP	i 12 45	+ 4	—	—	e 15·6
Ottawa		36·2	10	i 7 7	+ 1	i 12 49	+ 2	8 45	PPP	17·2
East Machias		37·7	19	i 7 26a	+ 7	i 13 17	+ 7	8 46	PP	e 16·1
Shawinigan Falls		37·9	12	7 22	+ 2	13 11	− 2	8 56	PPP	19·2
La Jolla		38·6	313	e 7 21	− 5	—	—	—	—	—
Halifax		38·9	23	i 7 35	+ 6	13 55	+27	9 4	PP	19·2
Seven Falls		38·9	14	7 30	+ 1	13 26	− 2	9 8	PP	18·2
Riverside		39·2	314	i 7 26a	− 5	e 13 25	− 7	—	—	—
Salt Lake City		39·7	327	7 31a	− 5	13 34	− 6	i 9 14	PP	i 18·0
Mount Wilson		39·8	314	i 7 31	− 5	—	—	—	—	—
Pasadena		39·9	314	i 7 31a	− 6	i 13 35	− 8	—	—	e 15·9
Haiwee		40·7	317	e 7 38	− 6	—	—	—	—	—
Santa Barbara		41·1	314	e 7 40	− 7	—	—	—	—	—
Tinemaha		41·4	318	i 7 46	− 4	—	—	—	—	—
Fresno	N.	42·3	316	e 7 57	0	e 17 58	SSS	—	—	e 21·1
Bozeman		42·8	332	e 7 57a	− 4	i 14 34	+ 8	e 9 21	PP	16·3
Butte		43·8	333	e 8 2	− 7	—	—	e 9 43	PP	e 17·4
Lick		43·9	316	e 8 7	− 3	e 14 37	− 5	—	—	—
Santa Clara	Z.	44·1	316	i 8 4	− 8	—	—	e 13 47	PcS	—
Branner		44·3	316	e 8 8	− 5	e 14 42	− 6	e 9 14	PP	—
Berkeley		44·6	316	i 8 11	− 5	—	—	—	—	e 48·9
San Francisco		44·7	316	e 10 15?	PPP	e 17 15?	SS	—	—	e 26·2
Ukiah		45·8	317	e 8 22	− 3	e 14 50	−19	15 11	PS	e 17·5
Saskatoon		46·2	341	e 8 15	−13	—	—	e 10 15?	PP	15·2
Ferndale		47·2	319	e 8 15	−21	—	—	—	—	—
Spokane		47·3	330	e 8 26	−11	e 15 24	− 7	e 15 59	PS	e 23·2
Seattle		49·9	327	e 10 5	PcP	e 15 42	−25	—	—	e 19·4
La Plata		50·6	153	9 12	+10	16 21	+ 4	—	—	25·3
Victoria		50·9	328	9 3	− 2	16 27	+ 6	10 57	PP	24·2
Rio de Janeiro		51·2	129	i 9 13	+ 6	i 16 34	+ 9	i 20 37	SS	i 24·9
Sitka		61·7	332	10 22	0	18 44	0	e 12 39	PP	i 24·7
College		70·4	337	e 11 15	− 3	20 25	− 5	e 13 41	PP	29·0
Scoresby Sund		71·7	18	11 25	− 1	i 20 43	− 2	e 14 0	PP	28·8
Honolulu		71·8	290	e 11 18	− 8	i 20 17	−29	15 38	PPP	—
San Fernando		74·3	55	i 11 49	+ 8	i 21 31	+16	—	—	—
Toledo		75·9	51	i 11 55	+ 5	i 21 45	+13	e 14 52	PP	—
Granada		76·3	54	i 11 58k	+ 6	i 21 54	+17	i 12 18	PcP	37·0
Bidston		76·7	37	i 12 30	PcP	i 22 23	PS	i 26 36	SS	e 35·2
Edinburgh		76·7	35	11 53	− 2	21 51	+10	14 55	PP	—
Stonyhurst		77·1	37	i 11 59	+ 2	i 22 2	+16	i 14 52	PP	35·2
Jersey		77·2	42	e 12 0	+ 3	i 21 55	+ 8	i 29 47	SSS	e 36·2
Oxford		77·8	39	i 12 5a	+ 4	—	—	i 15 1	PP	—
Kew		78·4	39	i 12 6a	+ 2	i 21 58	− 2	e 14 50	PP	e 35·2
Paris		80·3	42	i 12 17a	+ 3	22 21	+ 1	e 15 33	PP	e 33·2
Clermont-Ferrand		80·9	45	e 9 9	?	21 11	?	e 17 2	PPP	—
Uccle		81·3	40	i 12 22a	+ 2	22 37	+ 7	i 15 31	PP	—
De Bilt		81·7	38	i 12 25a	+ 3	22 41	+ 7	15 36	PP	—
Heligoland	N.	83·1	37	e 12 49	+20	e 23 58	PS	e 30 19	SSS	e 53·6
Neuchatel		83·4	44	e 12 33	+ 3	—	—	—	—	—
Basle		83·8	43	e 12 35	+ 3	—	—	—	—	—
Strasbourg		83·8	42	e 12 34	+ 2	i 22 56	+ 1	e 16 2	PP	—
Moncalieri		84·2	46	e 13 18	+44	i 24 10	PS	—	—	34·6
Hamburg		84·5	37	e 12 38a	+ 2	e 23 59	PS	e 31 23	SSS	e 38·7
Zurich		84·5	43	e 12 41	+ 5	e 24 5	PS	—	—	—
Stuttgart		84·7	42	e 12 28	− 9	e 23 0	− 4	e 15 49	PP	e 39·2
Göttingen		84·8	38	e 11 41	−56	e 22 5	−60	i 29 46	SS	e 40·2
Chur		85·2	43	e 12 53	+14	—	—	—	—	—
Copenhagen		85·5	34	e 12 39	− 2	—	—	—	—	—
Jena		85·9	40	e 12 45	+ 2	e 23 15	− 1	e 24 21	PS	e 38·2
Prague		87·8	39	e 12 54	+ 2	e 23 25	[+ 6]	e 16 45	PP	e 50·2
Rome		88·2	48	i 13 2a	+ 8	i 23 28	[+ 6]	i 16 49	PP	i 42·5
Triest		88·3	44	i 12 58a	+ 3	23 39	0	e 16 45	PP	39·0
Belgrade		93·1	44	e 13 19a	+ 2	i 23 34	[−17]	e 17 3	PP	e 47·8
Istanbul		100·3	45	16 41	?	—	—	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Helwan	z.	106·2	56	e 14 21	P	—	—	—	—	—
Ksara		108·2	50	e 14 31	P	—	—	e 17 51	PKP	—

Additional readings :—
Port au Prince i = +4m.2s., SS = +7m.22s.
San Juan i = +7m.6s.
Huancayo i = +7m.32s., iS = +9m.29s.
Columbia ePcP = +8m.44s., iPcP = +8m.48s., S = +9m.45s., iS = +9m.55s.
Little Rock eP = +5m.38s., iS = +10m.28s.
Bermuda P = +6m.10s., PcP = +9m.31s., iS = +11m.25s.
St. Louis ePE = +6m.6s., eN = +11m.8s.
Florissant iPPPN = +7m.10s.
Pittsburgh eZ = +7m.9s., iS = +11m.25s.
Philadelphia iPPP = +7m.38s., iS = +11m.52s.
Pennsylvania i = +6m.30s. and +7m.51s., e = +11m.51s. and +14m.30s.
Fordham iEZ = +12m.16s.
Chicago ePPP = +7m.50s., iS = +12m.2s.
Chicago Loyola i = +13m.40s.
Ann Arbor SS = +13m.33s.
Lincoln ePPP = +7m.52s.
Tucson iP = +7m.20s., iPPP = +8m.9s., PcP = +9m.26s.
Toronto i = +10m.24s., SS = +13m.51s.
Williamstown iSS = +14m.53s.
Weston i = +11m.45s., ScP = +13m.33s.
Denver iE = +7m.10s., iPPEN = +8m.5s., eE = +11m.59s. and +15m.17s.
East Machias iPP = +9m.3s., i = +11m.47s., iS = +13m.33s.
Halifax PPP = +9m.29s., SSS = +17m.3s.
Seven Falls SSS = +16m.22s.
Bozeman ePcP = +9m.45s., PPP = +9m.55s.
Lick eSE = +14m.49s., eN = +18m.8s.
Branner ePN = +8m.12s.
Spokane ePE = +8m.33s., eSSEN = +18m.19s., eSSSEN = +20m.7s.
Victoria i = +12m.27s.
Sitka ePPP = +14m.0s., S = +19m.2s., SS = +23m.0s.
College SS = +24m.7s., eSSS = +27m.38s.
Scoresby Sund iP = +11m.33s., PP = +14m.15s., PPP = +15m.58s., iS = +21m.11s., iPS = +21m.26s., i = +22m.56s., i = +24m.25s., +24m.31s., and +24m.46s., iSS = +25m.40s., iSSS = +28m.5s.
Honolulu i = +19m.9s., iS = +20m.35s., i = +20m.47s. and +27m.52s., iSSS = +27m.59s.
Granada PPE = +14m.55s., SPE = +22m.21s., SSE = +27m.7s., eSSSE = +30m.5s.
Bidston iPS = +22m.40s., iSKS = +27m.16s., i = +27m.51s., eSS = +29m.48s.
Edinburgh i = +21m.0s., ScS = +22m.25s., PS = +22m.39s., i = +25m.18s. and +25m.49s., SS = +27m.1s.
Stonyhurst i = +21m.7s.
Jersey e = +23m.35s., i = +25m.30s. and +25m.50s., e = +27m.45s., i = +32m.5s.
Kew iPcPEZ = +12m.12s., iPZ = +15m.2s., iZ = +15m.58s., i = +17m.8s., iSKSN = +22m.18s., iPSEN = +22m.32s., iSZ = +24m.52s., iZ = +26m.20s., iSSN = +26m.40s., iSKSNZ = +27m.14s., iPSE = +27m.26s., iEN = +27m.48s., iZ = +28m.18s., eSSEN = +29m.42s.
Paris ePP = +14m.56s., e = +24m.39s.
Uccle PSN = +23m.29s., SS = +28m.18s.
Heligoland eN = +39m.9s. and +42m.57s.
Strasbourg eSEN = +23m.18s., ePSE = +23m.47s.
Hamburg eZ = +19m.43s., eN = +30m.21s.
Stuttgart iSSE = +28m.41s.
Göttingen e = +18m.49s., iPS = +23m.9s.
Jena ePN = +12m.51s., eN = +23m.31s., eE = +24m.31s. and +29m.15s.
Prague ePPS = +24m.51s., eSS = +29m.51s., eSSS = +34m.9s.
Rome iE = +13m.37s., i = +14m.18s., iE = +15m.39s., iEZ = +17m.56s., iN = +18m.14s.,iE = +19m.31s.,iNZ = +19m.38s.,iPKP = +20m.11s.,iEN = +21m.41s., iEZ = +22m.42s., iSE = +23m.40s., iN = +24m.3s., iZ = +24m.13s., iPSEZ = +24m.39s., iPPSEZ = +24m.55s., iN = +25m.6s., iZ = +29m.20s., iSSE = +29m.52s., iN = +32m.6s., iE = +34m.18s., iN = +35m.8s.
Triest e = +16m.7s. and +17m.46s., PPP = +18m.36s., eSKS = +23m.3s., e = +25m.51s. and +27m.20s., SSS = +31m.38s., e = +32m.41s.
Belgrade eZ = +13m.38s., iZ = +19m.50s., iPPSNW = +33m.50s., iNW = +38m.48s.

Dec. 21d. 21h. 0m. 39s. Epicentre 0°·1N. 122°·7E.

Intensity IV-V in Jalo; slight in Zamboanga and Davao. Strong earth shocks in the province of Menado (northern part of Celebes).

W. C. Repetti.

Seismological Bulletin for 1939, Manila Central Observatory, Manila, 1940, p. 61.

Seismological Notes, Seismological Society of America, vol. 30, 1940, p. 89.

$A = -\cdot5402$, $B = +\cdot8415$, $C = +\cdot0017$; $\delta = -6$; $h = +7$;
$D = +\cdot842$, $E = +\cdot540$; $G = -\cdot001$, $H = +\cdot001$, $K = -1\cdot000$.

Tables for depth of focus 0·010 have been used.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Palau		13·8	58	3 12	0	5 44	0	—	—	—
Manila		14·5	353	i 3 24k	+ 2	6 14	+14	—	—	—
Hong Kong		23·6	340	5 1a	− 2	9 20	+13	5 6	pP	—
Taihoku		24·8	357	5 19	+ 5	10 0	sS	—	—	—
Phu-Lien		25·9	324	e 5 24	− 1	10 20	SS	—	—	—
Zi-ka-wei		31·0	359	i 6 13	+ 3	11 11	+ 4	7 13	PP	21·1
Perth		32·6	190	(6 26)	+ 2	(11 28)	− 4	(7 26)	PP	(14·5)
Miyazaki		32·7	15	6 26	+ 1	12 37	sS	—	—	—
Kumamoto		33·4	13	6 33	+ 2	12 49	sS	—	—	—
Hukuoka		34·1	13	6 40	+ 3	11 57	+ 2	—	—	18·2
Osaka		36·4	18	6 55	− 2	12 31	+ 1	8 29	pP	—
Toyooka		37·0	17	7 4	+ 2	12 49	+ 9	—	—	—
Nagoya		37·3	20	7 0	− 4	12 45	+ 1	—	—	—
Zinsen		37·4	4	6 56	− 9	13 52	+66	—	—	—
Adelaide		37·9	159	i 7 8	− 1	12 41	−12	i 7 26	pP	19·6
Dairen		38·6	358	7 17	+ 2	13 6	+ 2	—	—	—
Tokyo, Cen. Met. Ob.		38·8	23	7 17	0	—	—	—	—	—
Nagano		39·1	20	7 14	− 5	13 12	+ 1	—	—	—
Mito		39·7	23	7 22	− 2	13 15	− 5	—	—	—
Brisbane		40·0	136	i 7 27	0	i 13 15	−10	—	—	—
Calcutta		40·2	307	i 7 30a	+ 2	i 13 26	− 2	i 8 55	PP	i 18·9
Sendai		41·5	22	7 36	− 3	13 48	+ 1	—	—	—
Mizusawa		42·4	21	i 7 47	+ 1	i 13 57	− 3	—	—	—
Akita		42·5	20	7 50	+ 3	14 47	sS	—	—	—
Melbourne		43·0	154	e 7 54	+ 3	14 11	+ 2	—	—	23·3
Riverview		43·1	144	i 7 53k	+ 1	i 14 6	− 4	9 14	PP	e 19·6
Sydney		43·1	144	i 7 54	+ 2	i 14 6	− 4	i 9 9	PP	20·6
Colombo	E.	43·3	280	7 54	0	14 3	−10	—	—	—
Vladivostok		43·6	10	i 7 56	0	e 14 29	+11	i 10 42	PPP	—
Sapporo		45·9	19	8 15	+ 1	14 57	+ 6	—	—	—
Kodaikanal	E.	46·1	285	i 8 17a	+ 1	i 14 46	− 8	9 36	pP	21·4
Hyderabad		46·8	295	8 21	− 1	14 53	−11	10 21	PP	22·6
Nemuro		47·7	22	8 28	− 1	15 5	−11	—	—	—
Agra		50·6	307	i 8 51a	0	i 15 54	− 3	9 9	pP	—
Dehra Dun	N.	52·0	310	e 8 37	−24	i 15 41	−35	e 17 54	PPS	e 23·6
Bombay		52·4	294	i 9 2k	− 2	i 16 11	−10	—	—	—
Irkutsk		54·2	346	i 9 18	0	i 16 56	+10	—	—	26·4
Almata		59·3	323	i 9 53	− 1	—	—	—	—	—
Frunse		60·5	321	10 0	− 2	18 4	− 4	—	—	23·9
Andijan		60·9	318	10 5	0	18 14	+ 1	—	—	—
New Plymouth		61·0	136	10 6	0	18 13	− 2	25 21?	L_g	29·9
Arapuni		61·7	134	10 21	+11	18 39	+16	i 11 57	pP	25·9
Semipalatinsk		61·8	331	10 9	− 2	e 18 45	+20	—	—	—
Christchurch		62·1	142	e 10 4a	− 9	i 18 39	+11	—	—	—
Wellington		62·5	138	10 10	− 6	18 23	−11	10 17	pP	30·4
Tchimkent		63·5	319	10 7	−15	18 34	−12	—	—	20·9
Apia		66·3	106	e 10 39	− 1	i 19 37	+17	i 11 4	P_cP	—
Chatham Ils.		69·4	138	9 21?	?	18 15	?	—	—	30·4
Sverdlovsk		75·0	331	i 11 32	0	20 55	− 6	—	—	29·4
Tananarive		76·0	251	i 11 36	− 2	20 51	−21	12 6	pP	—
Baku		78·1	312	i 11 44	− 6	—	—	—	—	—
Honolulu		80·2	68	e 12 2	+ 1	i 21 58	+ 1	12 6	P_cP	—
Grozny		80·4	314	i 12 4	+ 2	i 21 57	− 2	—	—	29·4
Erevan		80·9	310	12 9	+ 4	22 3	− 1	—	—	34·4
Piatigorsk		82·5	315	12 15	+ 2	22 16	− 4	—	—	36·6

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sotchi		84·8	314	12 22	− 3	e 22 29	−14	—	—	34·9
Moscow		87·2	326	12 36	0	22 57	[+ 5]	—	—	e 33·9
Ksara		87·3	304	i 12 35	− 2	23 5	− 2	15 52	PP	—
College		89·7	25	e 12 51	+ 3	—	—	e 16 35	PP	—
Helwan		91·1	299	i 12 53	− 2	—	—	—	—	—
Pulkovo		91·1	329	12 48	− 7	23 18	[+ 2]	—	—	—
Istanbul		92·3	310	—	—	23 23	[0]	16 53	PP	55·4
Johannesburg		94·2	244	e 13 9	0	e 23 27	[− 4]	e 17 9	PP	e 45·4
Cernauti	N.	94·5	318	e 12 48k	−22	24 5	− 7	16 49	PP	48·4
Bucharest		94·7	314	e 13 14	+ 3	23 49	[+14]	16 54	PP	44·4
Sitka		96·4	32	e 13 16	− 3	i 23 39	[− 7]	—	—	—
Upsala		97·5	331	e 13 21?	− 3	i 23 48	[− 3]	i 17 22	PP	e 43·4
Belgrade		98·6	315	i 13 28	− 1	i 24 5	[+ 7]	i 17 18	PP	e 41·9
Szeged	E.	98·6	316	e 13 32	+ 3	e 23 41	[−17]	e 25 19	PS	e 31·2
Kecskemet	Z.	98·8	317	e 13 30	0	e 24 12	[+13]	e 17 16	PP	e 35·4
Budapest		99·1	318	13 30	− 1	23 52	[− 7]	17 36	PP	e 34·9
Sarajevo		100·2	314	e 13 40	+ 4	i 24 24	[+19]	e 17 31	PP	—
Copenhagen		101·2	326	e 13 40	− 1	—	—	17 56	PP	—
Prague		101·6	321	e 13 51	+ 8	—	—	—	—	—
Cape Town		101·9	236	12 50	−54	24 26	[+13]	17 42	PP	49·9
Bergen		103·1	333	e 13 21?	−28	24 21?	[+ 3]	—	—	e 44·4
Jena		103·1	321	i 13 33	−16	e 25 21	− 3	e 27 21	PS	—
Triest		103·1	316	e 13 58	+ 9	e 24 35	[+17]	18 5	PP	—
Rome		104·9	313	e 13 37	P	i 24 50	[+23]	—	—	50·2
Stuttgart		105·2	321	e 13 59	P	i 24 33	[+ 4]	i 18 25	PP	e 48·4
Chur		105·6	319	e 13 56	P	—	—	—	—	—
Zurich		106·1	320	e 14 2	P	—	—	e 18 11	PP	—
Strasbourg		106·2	321	e 14 2	P	i 24 32	[− 1]	e 18 28	PP	—
De Bilt		106·5	325	14 35	P	—	—	17 55	PKP	—
Seattle		106·5	39	e 14 3	P	e 25 7	[+33]	e 17 51	PKP	—
Basle		106·6	320	e 14 4	P	e 25 24	S	—	—	—
Neuchatel		107·2	320	e 14 6	P	—	—	—	—	—
Ferndale		107·3	47	i 19 46	?	—	—	—	—	—
Uccle		107·5	324	i 14 9	P	i 24 41	[+ 3]	i 18 42	PP	—
Besançon		107·8	320	e 17 39	?	e 25 3	[+23]	e 18 51	PP	—
Ukiah		108·5	48	e 14 11	P	i 24 52	[+ 9]	e 14 39	pP	—
Paris		109·4	323	e 14 16	P	25 37	SKKS	22 12	PPP	—
San Francisco		109·4	50	e 21 21?	PPP	e 30 21?	?	—	—	—
Spokane		109·6	38	e 14 17	P	i 26 1	SKKS	i 18 47	PP	—
Branner		109·7	50	e 14 27	P	—	—	i 18 23	PKP	—
Kew		109·8	326	i 14 18	P	—	—	i 18 58	PP	—
Santa Clara	Z.	109·9	50	e 18 27	PKP	—	—	—	—	—
Lick		110·1	50	e 14 26	P	e 29 20	PPS	e 18 17	PKP	—
Fresno	N.	111·7	50	e 15 9	P	—	—	—	—	—
Santa Barbara		112·4	52	e 14 32	P	i 29 23	PS	i 18 27	PKP	—
Tinemaha		112·8	49	e 14 34	P	—	—	i 18 28	PKP	—
Butte		113·3	37	e 18 23	[− 3]	25 4	[+ 2]	i 21 31	PPP	42·4
Halwee		113·3	50	i 14 36	P	—	—	i 18 28	PKP	—
Saskatoon		113·6	30	e 19 21?	PP	—	—	—	—	—
Mount Wilson		113·8	52	e 14 37	P	i 29 24	PS	i 18 28	PKP	—
Pasadena		113·8	52	i 14 38	P	—	—	i 18 28	PKP	e 44·5
Bozeman		114·4	37	i 14 33	P	i 25 21	[+15]	i 18 37	PKP	—
Riverside		114·4	52	i 14 42	P	—	—	i 18 29	PKP	—
La Jolla		114·9	53	e 14 46	P	—	—	i 18 33	PKP	—
Salt Lake City		116·1	43	e 14 48	P	e 29 23	PS	e 15 5	pP	i 43·3
Toledo		117·3	316	i 18 34	[0]	—	—	i 19 48	PP	—
Granada		118·1	313	e 18 34	[− 2]	28 8	SKKS	52 3	L_{Rg}	57·4
Tucson		120·2	51	i 18 42	[+ 2]	i 25 31	[+ 4]	i 30 59	PPS	e 47·6
Denver		121·3	41	i 18 48	[+ 6]	i 26 15	[+44]	i 20 19	PP	e 58·1
Lincoln		125·7	35	i 18 49	[− 1]	—	—	20 0	pPKP	—
Chicago		130·0	29	i 19 0	[+ 1]	i 25 55	[− 4]	e 19 24	pPKP	—
Chicago Loyola		130·0	29	i 19 0	[+ 1]	—	—	i 22 21	SKP	—
Manzanillo		130·1	64	e 19 12	[+13]	—	—	i 22 34	PKS	—
Guadalajara	N.	130·5	61	i 19 28	[+28]	i 38 50	SS	—	—	—
Florissant	N.	130·8	34	e 18 54	[− 6]	—	—	i 22 26	PKS	—

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
St. Louis		131·0	34	e 18 50	[−11]	—	—	i 22 28	PKS	—
Seven Falls		131·5	11	e 18 47	[−15]	—	—	i 22 13	PKS	39·3
Shawinigan Falls		131·6	13	e 18 48	[−14]	—	—	i 22 28	PP	—
Ottawa		131·9	17	e 18 33	[−29]	—	—	—	—	—
Little Rock		132·3	40	i 14 2	P	—	—	i 22 29	PP	—
Tacubaya	N.	134·6	62	e 18 59	[− 8]	—	—	—	—	c 61·2
Pittsburgh		134·7	24	i 18 56	[−11]	—	—	i 22 39	PP	—
Williamstown		135·0	15	i 18 56	[−12]	—	—	i 22 46	PP	—
Halifax		135·1	5	e 18 21?	[−47]	—	—	—	—	—
Pennsylvania		135·2	22	e 19 6	[− 2]	e 38 53	SS	i 22 52	PP	—
Harvard		135·7	14	i 18 55	[−14]	—	—	e 22 21?	PP	—
Fordham		136·6	16	i 18 59	[−12]	i 33 47	PPS	i 21 54	PP	—
Vera Cruz	N.	137·4	60	e 19 8	[− 4]	i 28 52	SKKS	—	—	—
Merida	N.	142·1	53	i 19 17	[− 4]	i 26 40	[+21]	—	—	—
Bermuda		147·0	11	e 19 46	pPKP	—	—	—	—	—
Port au Prince		156·3	37	i 19 51	[+ 8]	—	—	i 22 59	PP	—
La Paz		160·5	147	i 19 45	[− 3]	—	—	—	—	69·4

Additional readings :—

Zi-ka-wei iN = +6m.43s. and +6m.47s., PPPN = +7m.35s., iE = +8m.51s. and +9m.5s., iN = +11m.59s. and +12m.21s., SSN = +12m.43s., SSSN = +13m.17s., iN = +15m.49s. and +16m.41s.

Perth i = (+6m.48s.), (+7m.11s.), (+7m.34s.), (+7m.51s.), (+8m.18s.), (+8m.29s.), (+9m.31s.), (+9m.56s.), (+12m.34s.) and (+13m.26s.); readings have been increased by 2h.57m.

Osaka PP = +8m.47s.

Adelaide i = +10m.1s., PP = +10m.9s., i = +12m.51s. and +13m.26s., SS = +14m.31s., S_cS = +17m.42s.

Brisbane iSE = +13m.21s.

Calcutta iPE = +7m.36s., iP_cPN = +9m.48s., iP_cPE = +9m.54s., iSE = +13m.31s., iSSN = +15m.56s., iS_cSN = +17m.43s.

Mizusawa iSE = +14m.3s.

Melbourne i = +8m.1s.

Riverview iP = +7m.56s.a, iN = +13m.47s. and +14m.19s., iSSSN = +17m.23s., iSSSE = +17m.29s.

Sydney i = +9m.45s.

Colombo iE = +11m.58s.

Vladivostok i = +12m.25s.

Kodaikanal SSE = +17m.38s.

Hyderabad SSN = +18m.18s.

Agra PPN = +10m.58s., PPPE = +11m.55s., sSN = +16m.30s., S_cS = +18m.13s.

Bombay iN = +16m.2s., iEN = +16m.56s., iN = +19m.11s.

Arapuni P_cS = +15m.3s., S_cS? = +19m.9s., i = +22m.51s.

Christchurch iP = +10m.10s., i = +10m.18s.

Wellington iZ = +10m.37s., P_cPZ = +10m.58s., PPZ = +12m.31s., PPPZ = +13m.46s., P_cSZ = +14m.56s., iEN = +15m.51s., S_cS? = +19m.6s., i = +19m.51s., L_q = +26·4m.

Apia S_cS = +20m.31s.

Tananarive P_cPEN = +11m.48s., sPN = +12m.15s., EN = +13m.48s. and +21m.6s., S_cSE = +21m.21s., isSEN = +21m.42s., iEN = +22m.9s., E = +23m.25s., SSN = +26m.0s., iN = +26m.12s., EN = +32m.18s.

Erevan e = +20m.47s.

Honolulu i = +13m.15s., +14m.23s., and +14m.44s., iPP = +14m.53s., ipPP = +15m.33s., iSKS = +22m.5s., i = +27m.33s., isSS = +27m.42s., i = +30m.23s. and +30m.38s.

College isPP = +17m.20s., ePPP = +18m.27s.

Istanbul PPS = +26m.7s.

Johannesburg eN? = +20m.15s., eL_qN = +39·4m.

Cernauti PSN = +25m.16s., SSN = +30m.52s.

Bucharest PPPN = +19m.21s., SKKSE = +24m.1s., SKKSN = +24m.5s., SE = +24m.28s., PSN = +25m.49s., PPSE = +26m.29s., SSE = +30m.44s.

Sitka i = +23m.33s., iSKKS = +23m.56s., iS = +24m.25s.

Upsala ePN = +13m.36s., iSN = +24m.25s., iSS = +31m.14s., iSSSE = +35m.14s.

Belgrade iPP = +18m.15s.

Szeged eE = +15m.29s., ePPE = +16m.35s., eSKSE = +23m.19s., eSE = +24m.11s., eE = +27m.11s., eSSE = +30m.13s.

Kecskemet Z e = +20m.2s., iS = +25m.24s., ePS = +26m.56s., e = +30m.14s., eSS = +32m.18s.

Budapest PKPE = +17m.16s., PPN = +17m.46s., eN = +18m.20s., iN = +18m.39s., SKKSN = +24m.41s., SKKSE = +24m.52s., eN = +26m.27s., PSKSE = +27m.17s. eN = +27m.42s. and +28m.30s., SSE = +32m.24s., SSN = +33m.36s.

Sarajevo i = +14m.19s., +18m.28s., and +24m.55s.

Copenhagen +17m.3s.

Cape Town PPE = +17m.5s., PPPN = +19m.34s., SKSE = +23m.30s., SKSN = +23m.34s., SKKSN = +24m.34s., SN = +25m.10s., PSN = +26m.58s., PPSE = +27m.33s., SSN = +32m.36s., SSE = +32m.46s.

Continued on next page.

Jena iZ = +13m.47s., eN = +23m.44s., eN = +28m.21s.
Triest PPP = +20m.26s., e = +24m.35s.
Rome iNZ = +13m.44s., iP = +14m.17s., iEN = +15m.47s., iEZ = +16m.48s., iE = +25m.17s.
Stuttgart iEN = +17m.58s., iPPEN = +18m.30s., iSKKS = +25m.16s., eSN = +26m.13s., i = +28m.9s., iSSN = +33m.33s.
Strasbourg iPPN = +18m.32s., iPPE = +18m.53s., iZ = +19m.21s. and +19m.52s., ePPPZ = +20m.34s. and +20m.51s., iSKSN = +24m.44s., eSN = +26m.10s., iSN = +26m.14s., iPPSN = +28m.52s., iSSE = +33m.38s., iSSN = +34m.4s., iSSSN = +37m.41s.
Seattle pPP = +18m.47s., isPP = +19m.24s., eS = +26m.7s.
Basle e = +26m.29s. and +30m.11s.
Uccle iSKSN = +24m.44s., SN = +26m.12s., PSN = +27m.41s., PPSN = +28m.40s., iEN = +30m.22s.
Ukiah epPP = +18m.56s.
Spokane iEN = +19m.9s., iSN = +26m.21s., iEN = +27m.51s., iPSE = +28m.23s., iPPSE = +29m.10s.
Branner eE = +18m.3s.
Kew iPS = +19m.30s.
Lick iN = +19m.14s.
Butte iPKP = +18m.41s., epS = +27m.14s., iSS = +34m.43s., iSSS = +40m.12s.
Haiwee iPKKPZ = +29m.20s.
Pasadena iPKKPZ = +29m.7s.
Bozeman i = +20m.51s., +21m.6s. and +25m.26s.
Riverside iPKKPZ = +29m.2s.
Salt Lake City ePKP = +18m.39s., PP = +19m.51s., isPP = +20m.15s., eSP = +29m.8s.
Tucson eP = +15m.2s., iPKP = +18m.50s., ePP = +19m.53s., iPP = +20m.16s., ePPP = +22m.37s., iS = +27m.39s. and +27m.57s., iSP = +29m.44s., PS = +29m.49s., i = +30m.47s., SS = +36m.17s., SSS = +39m.29s.
Denver eN = +17m.35s., iEN = +18m.8s., iE = +18m.41s., eE = +19m.33s. and +20m.1s., eN = +20m.11s., eN = +21m.37s., eE = +22m.5s., eN = +22m.14s. and +30m.0s., iPSN = +30m.12s., iE = +32m.15s., iN = +32m.18s.
Lincoln pPP = +21m.3s., ePPP = +23m.9s.
Chicago iPP = +20m.45s., PPP = +24m.1s., isPS = +31m.57s., eSS = +37m.51s., iSSS = +42m.58s.
Chicago Loyola i = +19m.18s. and +22m.39s.
Florissant iPKPN = +19m.0s.
St. Louis eE = +18m.55s., iN = +19m.8s., i = +22m.5s.
Shawinigan Falls i = +19m.3s.
Little Rock iP = +14m.6s.
Pittsburgh iZ? = +19m.9s., +19m.26s., +19m.41s., and +19m.58s.
Williamstown iPKP? = +19m.8s., i = +19m.39s., +19m.58s., and +21m.40s., iPPP? = +23m.9s.
Pennsylvania i = +19m.20s., +21m.55s., and +39m.20s.
Harvard iN = +19m.11s.
Fordham i = +22m.29s.
Port au Prince i = +22m.37s.
Long waves were also recorded at Hamburg and Heligoland.

Dec. 21d. Readings also at 1h. (Colombo, Bozeman, Baku, Sverdlovsk, and Vladivostok) 10h. (Manila), 13h. (Stuttgart), 14h. (Erevan), 21h. (Stuttgart, Sendai, Mito, Nagano, Nagoya, and Osaka), 22h. (Upsala).

Dec. 22d. 4h. 43m. 58s. Epicentre 9°·7N. 83°·7W. (as on 1939 Dec. 21d.).

$A = +\cdot1082$, $B = -\cdot9799$, $C = +\cdot1674$; $\delta = -7$; $h = +7$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Balboa Heights		4·2	100	i 1 21	P_g	e 2 19	S_g	—	—	2·5
Merida	N.	12·6	334	i 2 57	− 6	—	—	—	—	—
Port au Prince		14·1	51	i 3 57	PPP	i 7 3	SSS	—	—	9·9
Vera Cruz	N.	15·3	310	i 3 34	− 5	—	—	—	—	—
Tacubaya	N.	17·8	304	e 4 5	− 6	—	—	—	—	—
San Juan		19·1	61	i 4 34	+ 7	i 8 43	SSS	—	—	i 9·5
Guadalajara	N.	21·8	303	i 4 47	− 9	—	—	—	—	—
Manzanillo	E.	22·0	299	e 4 45	−13	—	—	—	—	—
Huancayo		23·1	158	i 5 16k	+ 8	i 9 22	+ 6	—	—	—
Columbia		24·3	6	5 21a	+ 1	e 9 50	+13	i 10 2	SS	—
Little Rock		26·2	343	i 5 36	− 2	i 10 12	+ 3	i 6 9	PP	—
Bermuda		28·5	36	e 6 8	+ 9	11 28	SS	7 27	PPP	11·8
St. Louis		29·4	350	e 6 3	− 4	e 11 9	+ 8	i 7 2	PP	—
Florissant		29·6	350	i 6 4	− 5	i 11 16	+12	i 7 1	PP	13·0
Georgetown		29·7	11	i 6 12	+ 2	i 11 13	+ 7	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
La Paz		30·3	148	i 6 18	+ 3	i 11 22	+ 7	—	—	16·0
Pittsburgh		30·8	5	e 6 20	0	i 11 38	+15	e 7 26	PP	—
Philadelphia		31·1	14	i 6 26	+ 4	i 11 30	+ 2	e 7 27	PP	e 13·0
Pennsylvania		31·4	18	e 6 23	− 2	e 11 37	+ 5	e 7 21	PP	—
Fordham		32·2	16	e 6 33	+ 1	i 11 58	+13	i 7 44	PP	—
Chicago		32·3	355	i 6 31	− 2	e 11 48	+ 2	e 7 30	PP	e 12·5
Chicago Loyola		32·3	355	e 6 26	− 7	i 11 55	+ 9	e 13 27	SS	—
Ann Arbor		32·5	0	e 6 38	+ 4	i 11 44	− 5	7 44	PP	i 17·0
Lincoln		33·1	344	e 6 35	− 5	i 12 8	+ 9	e 7 44	PP	e 13·0
Tucson		33·7	317	i 6 38	− 7	e 11 44	−24	i 7 46	PP	13·8
Toronto		34·0	7	6 44	− 4	12 2	−11	8 7	PP	16·0
Williamstown		34·2	15	i 6 51	+ 2	i 12 34	+18	8 14	PP	16·9
Weston		34·3	17	i 6 42	− 8	i 12 20	+ 3	8 16	PP	—
Harvard		34·4	17	i 6 52	+ 1	e 12 3	−16	i 8 17	PP	e 19·0
Denver		35·4	331	e 6 27	−33	e 12 7	−27	e 7 48	PP	e 15·1
Vermont		35·8	13	e 8 16	PP	i 12 32	− 9	—	—	e 15·5
Ottawa		36·2	10	i 7 6	0	12 48	+ 1	8 36	PP	16·0
East Machias		37·7	19	7 20	+ 1	i 13 15	+ 5	8 43	PP	e 15·8
Shawinigan Falls		37·9	12	7 23	+ 3	13 14	+ 1	8 56	PP	18·0
Palomar	z.	38·5	314	i 7 22	− 4	—	—	—	—	—
La Jolla		38·6	313	i 7 24	− 2	—	—	—	—	—
Halifax		38·9	23	7 35	+ 6	13 40	+12	9 2	PP	18·0
Seven Falls		38·9	14	7 32	+ 3	13 32	+ 4	9 12	PP	18·0
Riverside		39·2	314	i 7 26a	− 5	—	—	—	—	—
Salt Lake City		39·7	327	e 7 31	− 5	i 13 35	− 5	i 9 14	PP	e 16·1
Mount Wilson		39·8	314	i 7 32a	− 4	—	—	—	—	—
Pasadena		39·9	314	i 7 32a	− 5	i 13 2	−41	—	—	e 18·2
Haiwee		40·7	317	i 7 40	− 4	—	—	—	—	—
Santa Barbara	z.	41·1	314	e 7 40	− 7	—	—	—	—	—
Tinemaha		41·4	318	i 7 46	− 4	—	—	—	—	—
Fresno	N.	42·3	316	i 8 0	+ 3	e 13 0	?	e 9 31	PP	—
Bozeman		42·8	332	e 7 54	− 7	e 14 20	− 6	e 9 32	PP	e 16·9
Butte		43·8	333	e 8 8	− 1	e 14 37	− 3	e 9 44	PP	18·1
Lick		43·9	316	e 8 7	− 3	e 14 29	−13	e 19 13	SSS	—
Santa Clara		44·1	316	i 8 6	− 6	i 13 52	−53	—	—	e 23·9
Branner		44·3	316	e 8 12	− 1	e 14 39	− 9	—	—	e 25·5
San Francisco		44·7	316	e 10 2?	PP	e 17 2	SS	—	—	—
Ukiah		45·8	317	e 8 21	− 4	e 14 47	−22	e 10 12	PP	e 18·5
Saskatoon		46·2	341	e 8 2?	−26	—	—	e 10 26	PP	19·0
Ferndale		47·2	319	e 9 32	+56	i 15 2	−27	—	—	e 26·0
Spokane		47·3	330	8 28	− 9	i 15 39	+ 8	—	—	22·5
Seattle		49·9	327	e 8 56	− 1	e 15 53	−14	i 19 13	SS	i 27·3
La Plata		50·6	153	9 9	+ 7	16 20	+ 3	—	—	23·0
Victoria		50·9	328	8 56	− 9	16 26	+ 5	11 2	PP	23·0
Rio de Janeiro		51·2	129	i 9 10	+ 3	i 16 31	+ 6	i 20 20	SS	25·0
Sitka		61·7	332	—	—	18 47	+ 3	—	—	e 24·2
College		70·4	337	e 11 15	− 3	e 20 28	− 2	e 15 22	PPP	—
Scoresby Sund		71·7	18	e 11 19	− 7	e 20 36	− 9	e 14 11	PP	i 29·3
Honolulu		71·8	290	e 11 20	− 6	e 20 26	−20	i 13 50	PP	28·8
San Fernando		74·3	55	11 48	+ 7	21 36	+21	25 32	SS	34·0
Toledo		75·9	51	i 11 54	+ 4	e 21 46	+14	12 5	pP	—
Granada		76·3	54	i 11 59k	+ 7	i 21 47	+10	14 54	PP	37·5
Bidston		76·7	37	—	—	i 21 52	+11	—	—	e 33·0
Edinburgh		76·7	35	e 11 52	− 3	21 43	+ 2	e 14 54	PP	—
Stonyhurst		77·1	37	i 12 0	+ 3	e 21 54	+ 8	e 27 14	SS	39·0
Jersey		77·2	42	e 12 2?	+ 5	e 21 52	+ 5	e 27 32	SS	e 33·7
Kew		78·4	39	i 12 5a	+ 1	i 22 1	+ 1	i 16 7	PPP	e 38·5
Paris		80·3	42	12 18	+ 4	21 22	−58	27 26	SS	e 37·0
Uccle		81·3	40	i 12 22a	+ 2	22 36	+ 6	i 15 30	PP	e 38·0
De Bilt		81·7	38	12 25a	+ 3	22 38	+ 4	—	—	37·0
Neuchatel		83·4	44	e 12 32	+ 2	—+	—	—	—	—
Basle		83·8	43	e 12 34	+ 2	—	—	—	—	—
Strasbourg		83·8	42	e 12 38	+ 6	e 23 1	+ 6	—	—	36·0
Moncalieri		84·2	46	e 11 54	−40	21 7	?	—	—	31·2
Hamburg		84·5	37	e 12 36a	0	e 23 13	+11	—	—	e 37·0

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Zurich		84·5	43	e 12 39	+ 3	e 22 56	− 6	—	—	—
Stuttgart		84·7	42	e 12 39	+ 2	i 23 7	+ 3	e 16 6	PP	e 36·5
Chur		85·2	43	e 12 42	+ 3	—	—	—	—	—
Jena		85·9	40	e 12 40	− 3	e 23 2	[− 5]	e 29 2	SS	e 38·0
Upsala		87·3	30	—	—	e 23 26	− 3	e 29 26	SS	e 39·0
Prague		87·8	39	e 12 51	− 1	e 23 32	− 2	e 31 50	SS	e 37·0
Rome		88·2	48	i 12 55a	+ 1	i 23 23	[+ 2]	i 16 37	PP	43·1
Triest		88·3	44	i 12 53a	− 2	i 23 34	− 5	16 26	PP	41·9
Budapest		91·4	42	—	—	e 30 32	SS	—	—	43·0
Belgrade		93·1	44	13 22k	+ 5	i 26 47	PPS	i 17 12	PP	e 46·1
Pulkovo		93·4	28	17 10	PP	23 52	[0]	25 46	PS	41 5
Chatham Ils.		98·7	227	—	—	33 2?	SS	—	—	49·0
Moscow		98·7	29	—	—	24 21	[+ 1]	26 45	PS	43·5
Istanbul		100·3	45	e 17 58	PP	—	—	—	—	—
Arapuni		104·3	233	—	—	24 38	[− 9]	33 32	SS	49·0
Wellington		105·0	231	18 30	PP	24 48	[− 3]	33 22	SS	48·5
Cape Town	E.	105·4	123	18 53	PP	24 59	[+ 7]	27 59	PS	52·0
Helwan		106·2	56	e 14 32	P	25 2	[+ 7]	18 47	PP	—
Christchurch		106·5	228	e 14 25	P	i 24 56	[− 1]	18 31	PP	49·8
Sverdlovsk		107·5	19	18 54	PP	25 0	[− 1]	28 12	PS	50·0
Ksara		108·2	50	e 14 32	P	i 29 23	PPS	19 2	PP	51·0
Baku		114·3	37	e 20 53	?	e 29 29	PS	e 36 25	SS	e 61·0
Irkutsk		117·9	354	20 0	PP	25 43	[+ 1]	29 45	PS	56·0
Vladivostok		118·2	331	e 18 19	[−30]	25 47	[+ 4]	20 2	PP	—
Tokyo, Cen. Met. Ob.		119·0	321	20 25	PP	—	—	—	—	—
Kobe		122·5	322	20 44	PP	26 13	[+15]	—	—	—
Tashkent		123·5	24	—	—	i 27 41	{+ 4}	e 30 38	PS	—
Samarkand		123·9	27	e 20 17	PP	—	—	—	—	—
Koti		124·3	322	26 12	SKS	(26 12)	[+ 8]	—	—	—
Riverview		124·4	236	e 18 2	[−59]	e 26 7	[+ 3]	e 30 57	PS	e 58·5
Melbourne		128·2	230	i 19 52	[+43]	i 26 24	[+ 9]	i 22 37	PKP	59·4
Tananarive		132·0	107	e 22 50	SKP	e 39 24	SS	—	—	e 60·3
Zi-ka-wei	Z.	132·7	300	e 18 38	[−39]	i 34 30	PPS	i 21 4	PP	69·6
Agra	E.	139·3	24	e 19 22	[− 7]	—	—	i 23 6	SKP	—
Bombay		143·3	39	e 19 40	[+ 4]	e 34 3	PS	e 47 10	SSS	e 70·5
Hong Kong		143·7	331	19 35	[− 1]	29 42	{ 0}	22 44	PP	—
Manila		145·6	314	i 19 41a	[+ 1]	—	—	—	—	—
Calcutta	N.	147·0	13	i 19 49	[+ 6]	e 26 48	[− 2]	e 23 21	SKP	—
Hyderabad		147·8	33	19 51	[+ 8]	30 13	{+ 7}	23 20	PP	70·3
Phu-Lien		148·0	342	e 19 53	[+ 9]	—	—	—	—	—
Perth		151·4	216	i 20 17	[+28]	i 44 44	SSP	i 49 30	SSS	i 70·7
Kodaikanal		152·8	44	20 22	[+31]	—	—	—	—	—
Colombo	E.	156·8	47	19 59	[+ 3]	—	—	—	—	61·1

Additional readings :—
Port au Prince PP = +4m.13s., PPP = +4m.16s., SS = +7m.34s.
San Juan i = +5m.31s. and +7m.5s.
Huancayo i = +7m.19s., iS = +9m.27s. and +9m.34s.
Columbia iS = +9m.55s.
Little Rock iS = +10m.19s.
Bermuda P = +6m.55s.
St. Louis iE = +11m.16s., iSSE = +12m.37s.
Florissant iE = +6m.9s.
La Paz iSN = +11m.35s.
Pittsburgh iZ = +6m.24s. and +10m.59s., i? = +11m.43s.
Philadelphia iS = +11m.44s.
Pennsylvania i = +6m.26s. and +6m.37s., e = +6m.53s., +7m.6s., and +8m.0s.
Fordham iP = +6m.38s.
Chicago ePcP = +8m.30s., iS = +12m.1s.
Ann Arbor SS = +13m.26s.
Lincoln ePcP = +8m.41s., iS = +12m.37s.
Tucson iPPP = +8m.6s., iPcP = +8m.47s., eS = +11m.49s.
Toronto SS = +14m.39s.
Williamstown SS = +14m.51s.
Weston +9m.10s. and +12m.46s.
Harvard iN = +12m.46s.
Denver eN = +6m.42s., eE = +9m.20s.
Vermont iPP = +8m.24s.

Continued on next page.

East Machias iP = +7m.45s., iPP = +9m.3s.
Seven Falls SSS = +16m.34s.
Salt Lake City eP = +7m.41s.
Bozeman eP = +8m.22s. and +8m.42s., PPP = +10m.11s., iS = +14m.35s.
Butte PP = +10m.4s.
Lick iPN = +8m.11s., eSN = +14m.36s.
Ukiah ePPP = +11m.6s., eSS = +18m.7s.
Seattle e = +17m.44s., i = +21m.12s.
Victoria PPP = +12m.20s.
College eP = +11m.18s., S = +20m.35s., eSS = +24m.35s.
Scoresby Sund P = +11m.25s., PPP = +16m.1s., eS = +20m.47s., iS_cS = +21m.46s., SS = +25m.32s., eSSS = +28m.49s.
Honolulu P = +11m.32s. and +11m.37s., ePPP = +15m.42s., iS = +20m.48s., eSS = +25m.12s.
San Fernando SN = +21m.42s.
Granada PPPZ = +16m.57s., iSZ = +22m.3s., SSZ = +27m.27s., G = +31m.32s.
Edinburgh SKS = +22m.1s., S_cS = +22m.9s., PS = +22m.37s., i = +23m.47s., SS = +26m.59s.
Stonyhurst iSKS = +22m.4s., i = +22m.53s., L_q = +36m.32s.
Jersey e = +22m.52s.
Kew iSKSE = +22m.15s., ePPSE = +22m.54s., eSSEZ = +27m.39s., eL_qN = +34·0m.
Paris SSS = +31m.32s.
Uccle PSE = +23m.28s., iSSE = +28m.17s., iSSSE = +31m.38s.
Stuttgart iSN = +23m.12s., ePSE = +24m.16s., eSSN = +29m.12s.
Jena ePN = +12m.44s., eSN = +23m.8s.
Upsala eE = +24m.46s., eSSSE = +33m.20s.
Prague eSKS? = +19m.44s., ePPS = +24m.38s., eSSS = +33m.2s.?
Rome iZ = +13m.31s., iEZ = +13m.59s., i = +16m.16s., iE = +20m.19s., iEN = +22m.34s., iSN = +23m.49s., iE = +25m.2s., iN = +26m.18s., iSSN = +29m.53s., SL = +30m.20s., iSSS = +32m.13s., iL_qN = +37m.54s.
Triest SS = +29m.32s.
Pulkovo eS = +24m.22s., SS = +30m.50s., SSS = +35m.2s.
Moscow SS = +32m.14s.
Wellington SKKS = +26m.4s., SSS = +38m.2s., L_q = +44·0m.
Cape Town E. SKKS = +25m.59s., SS = +33m.39s., SSS = +37m.59s.
Helwan SE = +26m.38s., PSE = +28m.8s., iE = +28m.44s.
Christchurch iE = +25m.47s., iN = +26m.11s., iPSEZ = +27m.59s., PPS = +28m.39s., SS = +33m.40s., SSSE = +37m.35s., L_qN = +44m.37s.
Sverdlovsk SS = +34m.44s.
Baku e = +30m.47s. and +45m.21s.
Irkutsk PPS = +31m.15s., SS = +36m.20s.
Vladivostok PPP = +22m.40s., SKKS = +27m.8s., eS = +27m.52s., PS = +29m.54s., PPS = +31m.10s., SS = +36m.14s.
Riverview eN = +23m.40s.
Melbourne i = +28m.7s., +32m.52s., and +38m.55s.
Zi-ka-wei iZ = +22m.6s.
Hong Kong S = +33m.10s., SS = +41m.30s.
Calcutta eSKKSN = +29m.51s., iPPSN = +35m.58s., eSSN = +42m.1s.
Hyderabad SKSPN = +33m.41s.
Perth i = +21m.2s. and +21m.57s.
Long waves were also recorded at Sydney, Heligoland, Dehra Dun, Besançon, and Bergen.

Dec. 22d. 6h. 59m. 16s. Epicentre 29°·3N. 114°·3W. (as on 1939, September 21d.).

A = −·3594, B = −·7961, C = +·4869; δ = +2; h = +2;
D = −·911, E = +·412; G = −·200, H = −·444, K = −·873.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tucson		4·1	45	e 0 59	− 6	i 1 46	− 9	—	—	—
La Jolla	N.	4·4	325	i 1 9	− 1	—	—	—	—	—
Palomar	Z.	4·6	332	i 1 6	− 6	—	—	—	—	—
Riverside	Z.	5·4	332	e 1 19	− 5	—	—	—	—	—
Pasadena		5·8	328	e 1 27	− 2	i 2 56	S*	—	—	—
Fresno	N.	8·7	330	e 2 17	+ 7	e 4 12	S*	4 43	S_g	—
Lick		10·1	324	—	—	e 5 12	S*	—	—	—
Santa Clara		10·3	323	e 1 31	−61	i 4 20	−10	—	—	e 6·1
Ukiah		12·2	326	—	—	e 5 34	SS	—	—	—
Denver		12·9	34	—	—	e 5 24	− 9	e 5 48	SS	—
Manzanillo	E.	13·6	138	—	—	e 6 24	SSS	—	—	—
Bozeman		16·6	9	e 3 53	− 3	—	—	—	—	e 7·0
Butte		16·7	5	e 3 42	−15	—	—	—	—	7·3
Tacubaya	N.	16·9	122	e 3 55	− 4	—	—	—	—	—
Lincoln		18·4	48	7 43	S	(7 43)	+ 2	e 8 49	P_cP	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Spokane		18·5	354	e 4 11	− 8	e 7 44	0	e 4 22	PP	e 11·6
Seattle		19·3	344	e 4 28	− 1	e 7 16	−46	—	—	e 8·1
Florissant		21·9	58	i 4 53	− 4	i 9 4	+10	9 16	SS	12·2
St. Louis		22·0	58	e 4 52	− 6	e 8 47	− 9	—	—	e 11·4
Saskatoon		23·5	13	e 5 14	+ 2	e 9 32	+ 9	—	—	12·7
Merida	N.	23·8	104	e 5 31	+16	—	—	—	—	—
Chicago		25·0	52	e 5 32	+ 5	e 9 47	− 2	—	—	e 12·7
Columbia		28·6	71	e 6 7	+ 7	e 10 47	− 1	—	—	e 12·2
Pittsburgh		30·1	58	—	—	e 11 22	+10	e 13 46	SSS	i 15·7
Toronto		31·3	53	—	—	e 10 44?	−47	—	—	15·7
Philadelphia		33·7	61	e 7 6	+21	e 11 55	−13	—	—	e 14·6
Ottawa		34·2	51	e 6 51	+ 2	e 11 44?	−32	—	—	17·7
Fordham		34·7	59	e 6 55	+ 1	e 12 26	+ 2	—	—	i 17·0
Williamstown		35·5	56	e 7 1	+ 1	—	—	—	—	i 18·4
Vermont		35·8	53	—	—	e 12 31	−10	—	—	e 17·3
Harvard	z.	36·7	57	e 7 19	+ 9	e 12 57	+ 3	—	—	e 18·9
East Machias		40·0	54	—	—	e 13 48	+ 4	—	—	e 16·8
Honolulu		40·0	269	8 35	+57	—	—	9 21	PP	e 16·5
College		41·3	339	—	—	e 13 28	−36	—	—	e 15·5
Bermuda		42·3	73	e 9 41	PP	—	—	—	—	e 16·2
San Juan		45·1	92	e 10 15	PP	e 15 3	+ 4	—	—	e 18·7
Kew		80·9	35	—	—	e 18 44?	?	—	—	e 35·7
Irkutsk		92·0	338	—	—	e 23 44?	[0]	e 26 36	PPS	43·7
Andijan		110·0	354	21 9	PPP	—	—	—	—	—

Additional readings :—
Tucson eP = +1m.9s.
Denver eE = +5m.40s., eN = +5m.52s., iE = +5m.58s.
Spokane iPN = +4m.15s., iN = +4m.54s.
Seattle eS = +7m.27s.
Florissant iPE = +4m.58s., iN = +8m.53s., eE = +11m.26s.
St. Louis iPEN = +4m.58s.
Pittsbirgh e? = +15m.14s.
Long waves were also recorded at Pennsylvania, Ferndale, Vladivostok, Baku, Sverdlovsk, Triest, Prague, Strasbourg, Uccle, Paris, Jersey, Stonyhurst, Bidston, San Fernando, Scoresby Sund, Sitka, Branner, Salt Lake City, and Vera Cruz.

Dec. 22d. Readings also at 0h. (Rome), 1h. (Zurich), 2h. (Clermont-Ferrand), 3h. (Balboa Heights), 4h. (Samarkand and Florissant), 5h. (Samarkand, Basle, Mount Wilson, La Paz, Palomar, Riverside, Ukiah, Butte, Tucson, Fresno, Denver, Lincoln, Andijan, Salt Lake City, Tchimkent, and near Mizusawa), 6h. (Tucson, Chicago, and near Samarkand), 7h. (Salt Lake City, Pennsylvania, Lincoln, Denver, Fresno, Chicago, and Tucson), 8h. (near Mizusawa), 9h. (Tucson and Tananarive), 10h. (Tucson (2)), 11h. (Balboa Heights (2)), 12h. (Tucson (2)), 13h. (Tucson), 14h. (Tucson (3)), 15h. (Tucson (3), Frunse, Tchimkent, and Andijan), 17h. (Calcutta and Tucson (2)), 18h. (Tucson), 20h. (Tucson), 21h. (Manila), 22h. (Tucson), 23h. (Tucson).

Dec. 23d. 17h. 11m. 4s. Epicentre 9°·7N. 83°·7W. (as on 1939, December 22d.).

A = +·1082, B = −·9799, C = +·1674 ; $\delta = -7$; $h = +7$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Balboa Heights	N.	4·2	100	e 1 21	P*	2 24	S_g	—	—	—
Merida	N.	12·6	334	i 2 59	− 4	i 5 28	+ 2	—	—	—
San Juan		19·1	61	e 4 36	+ 9	e 7 52	− 5	8 35	SSS	i 9·1
Huancayo		23·1	158	e 5 16	+ 8	e 9 23	+ 7	—	—	11·2
Columbia		24·3	6	e 6 44	?	e 9 46	+ 9	10 6	SS	e 11·8
Bermuda		28·5	36	e 8 38	P_cP	—	—	—	—	e 13·7
La Paz		30·3	148	e 6 46	PP	—	—	—	—	14·9
Philadelphia		31·1	14	—	—	e 11 50	+22	—	—	e 13·5
Fordham		32·2	16	i 6 33k	+ 1	e 11 44	− 1	i 7 54	PPP	e 16·4
Chicago		32·3	355	8 32	P_cP	e 11 36	−10	—	—	—
Lincoln		33·1	344	7 20	+40	—	—	—	—	—
Tucson		33·7	317	e 6 37	− 8	e 11 49	−19	e 7 51	PP	e 13·1
Toronto		34·0	7	—	—	e 13 56	SS	—	—	19·9
Ottawa		36·2	10	i 7 4	− 2	13 2	+15	8 44	PPP	17·9
East Machias		37·7	19	e 7 59	+40	e 13 17	+ 7	e 9 24	PPP	e 15·6

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Palomar	z.	38·5	314	i 7 19	− 7	—	—	—	—	—
Seven Falls		38·9	14	e 9 14	PP	e 13 14	−14	e 16 14	SS	21·9
Riverside	z.	39·2	314	i 7 25	− 6	—	—	—	—	—
Pasadena		39·9	314	e 7 29	− 8	—	—	—	—	e 21·2
Tinemaha		41·4	318	i 7 44	− 6	—	—	—	—	—
Bozeman		42·8	332	e 8 29	+28	e 14 36	+10	—	—	e 18·1
La Plata		50·6	153	15 14	S	(15 14)	−63	—	—	30·5
College		70·4	337	e 11 23	+ 5	e 20 16	−14	e 14 10	PP	e 36·0
Toledo		75·9	51	e 11 53	+ 3	—	—	—	—	36·9
Granada		76·3	54	i 12 36k	+44	i 22 6	+29	—	—	35·2
Kew		78·4	39	—	—	e 32 51	?	—	—	e 43·9
Uccle		81·3	40	—	—	e 22 40	+10	e 28 13	SS	e 35·9
Rome		88·2	48	i 12 53a	− 1	23 18	[− 4]	16 10	PP	37·8
Sverdlovsk		107·5	19	—	—	e 25 18	[+16]	e 28 20	PS	43·9

Additional readings :—
San Juan iP = +4m.41s.
Huancayo eP = +5m.21s., S = +9m.28s., iS = +9m.35s.
Fordham iN = +12m.38s.
Tucson eP = +6m.49s., ePPP = +7m.59s., eP_cP = +8m.58s.
College eP = +12m.14s.
Rome PS = +24m.0s., eZ = +25m.5s., SS = +28m.25s.
Sverdlovsk e = +34m.48s.
Long waves were also recorded at Calcutta, Tashkent, Sitka, Baku, Pennsylvania, Paris, De Bilt, Scoresby Sund, Stuttgart, Stonyhurst, Bidston, Budapest, Harvard, Vladivostok, Pulkovo, and Rio de Janeiro.

Dec. 23d. Readings also at 0h. (near La Paz), 1h. (Salt Lake City, Ukiah, Balboa Heights, San Juan, and Tucson (2)), 2h. (near Osaka and Manila), 3h. (Tucson, Almata, and Hong Kong), 4h. (Balboa Heights, Samarkand, Andijan, Tucson, and Tchimkent), 7h. (Tucson), 8h. (Tucson (2), Balboa Heights, San Juan, Prague, Bermuda, and Huancayo), 9h. (Irkutsk, Sverdlovsk, Tchimkent, Frunse, and Almata), 12h. (Calcutta, Rome, Granada, Baku, Helwan, Almata, near Pittsburgh, Ksara, Frunse, Sverdlovsk, Tucson (2), Andijan, and La Paz), 13h. (Uccle), 14h. (Branner, and near Lick), 18h. (Samarkand (2)), 20h. (near Triest), 21h. (Manila), 22h. (Tucson), 23h. (Tucson (2), and Bozeman).

Dec. 24d. 18h. 53m. 30s. Epicentre 15°·0N. 66°·0W.

$A = +·3930$, $B = -·8828$, $C = +·2572$; $\delta = -6$; $h = +6$;
$D = -·914$, $E = -·407$; $G = +·105$, $H = -·235$, $K = -·966$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
San Juan		3·3	358	i 0 59	P*	—	—	—	—	i 4·5
Fordham		26·7	348	e 5 40	− 3	i 9 50	−27	—	—	—
Harvard		27·8	352	i 5 53k	0	i 10 10	−25	—	—	e 28·0
Williamstown		28·3	350	e 5 55	− 2	i 10 27	−16	—	—	—
Huancayo		28·4	200	—	—	e 10 42	− 3	—	—	—
Ottawa	z.	31·3	347	i 6 28	+ 4	i 11 43	+12	—	—	—
La Paz	z.	31·4	183	e 7 22	PP	—	—	—	—	—
St. Louis		31·8	323	e 6 46	+18	—	—	—	—	15·5
Shawinigan Falls		32·0	353	e 6 27	− 3	e 12 7	+25	—	—	—
Tucson		44·2	302	e 8 11	− 1	e 14 47	+ 1	e 9 55	PP	e 17·3
Palomar	z.	49·4	303	i 8 53	0	—	—	—	—	—
Riverside		49·9	303	i 8 56a	− 1	—	—	—	—	—
Pasadena		50·6	303	i 9 2	0	—	—	—	—	—
Haiwee		50·7	306	i 9 4	+ 1	—	—	—	—	—
Tinemaha		51·1	306	i 9 4	− 2	—	—	—	—	—
Clermont-Ferrand		64·8	47	e 10 45	+ 2	—	—	—	—	—
Uccle		66·1	41	e 11 7	+16	—	—	—	—	—
Neuchatel		67·6	45	e 11 18	+17	—	—	—	—	—
Basle		68·0	45	e 11 1	− 2	—	—	—	—	—
Zurich		68·7	45	e 10 53	−14	—	—	—	—	—
Chur		69·3	45	e 11 29	+18	—	—	—	—	—

For Notes see next page,

NOTES TO DEC. 24d. 18h. 53m. 30s.

Additional readings :—
Fordham iP = +5m.54s., i = +9m.58s. and +10m.14s.
St. Louis eEN = +6m.56s. and +7m.6s.
Tucson ePPP = +10m.34s.
Long waves were also recorded at Sverdlovsk.

Dec. 24d. Readings also at 0h. (near Erevan), 1h. (Ksara), 3h. (Huancayo and La Paz), 4h. (Almata), 7h. (Zi-ka-wei, San Francisco, Vladivostok, Irkutsk, Hukuoka, and Sverdlovsk), 8h. (Pulkovo and Tashkent), 10h. (Tucson), 12h. (Tucson, Riverside, Pasadena, Haiwee, Tinemaha, and College), 13h. (Calcutta and Samarkand), 15h. (La Paz), 16h. (Tucson), 17h. (Tucson), 19h. (Andijan, Frunse, Almata, and Tashkent), 20h. (Almata), 21h. (Erevan, Grozny, Baku, and Tananarive), 22h. (Tucson (2), Palomar, St. Louis, San Juan, Huancayo, La Paz, Tinemaha, Haiwee, Pasadena, and Riverside), 23h. (Clermont-Ferrand and Tucson).

Dec. 25d. 5h. 10m. 33s. Epicentre 46°·3N. 7°·4E. (as on 1937, November 15d.).

Intensity IV between Leuk and Sion and in the Vale of Anniviers ; III at Zermatt.

Pietro Caloi.
Caratteristiche sismiche fondamendali dell' Europa Centrale quali risultano dallo studio di 17 terremoti Centro-Europei.

Estratto dal " Bollettino della Societa Sismolog, Italiana," vol. XL-No. 3-4, Anno 1942, pp. 28 etc. Publica de l'Institut Geophysique de Rome, No. 107.

Epicentre 7° 33′·6 ±4′·4E. 46° 13′·8 ±6′·7N.

E. Wanner.
Jahresbericht des Erdbebendienstes der Schweiz im Jahre, 1939, Zurich 1940, page 2 et carte macroseismique Planche I.

$A = +\cdot6875$, $B = +\cdot0893$, $C = +\cdot7206$; $\delta = -10$; $h = -4$;
$D = +\cdot129$, $E = -\cdot992$; $G = +\cdot715$, $H = +\cdot093$, $K = -\cdot693$.

	△	Az.	P.	O−C.	S.	O−C.	Supp.	
	°	°	m. s.	s.	m. s.	s.	m. s.	
Sion	0·0	—	e 0 2	P_g	i 0 4	S_g	—	—
Neuchatel	0·7	336	e 0 17	0	i 0 30	+ 2	e 0 33	S_g
Basle	1·3	6	e 0 26	+ 1	i 0 44	0	—	—
Zurich	1·3	37	e 0 25a	0	i 0 43	− 1	—	—
Chur	1·6	69	e 0 29	− 1	e 0 48	− 3	e 0 50	S_g

Long waves were also recorded at Triest.

Dec. 25d. 6h. Undetermined shock. Epicentre S.E. Europe.

Pulkovo e = 35m.10s., 37m.56s., 39m.30s., and 43m.0s., eL = 45·5m.
Bucharest ePN = 35m.40s., P*N = 35m.48s., P*E = 35m.56s., P_gN = 36m.8s., eE = 36m.43s., SEN = 36m.53s., S*E = 37m.17s., S_gN = 37m.34s., LEN = 38·2m.
Moncalieri e = 35m.42s., i = 42m.8s.
Cernauti ePE = 36m.0s., SE = 37m.48s., LE = 38·5m.
Belgrade eZ = 36m.41s. and 36m.49s., iZ = 37m.59s., iSNE = 38m.1s., i = 38m.27s.
Budapest eE = 36m.56s., ePN = 37m.8s., eE = 39m.42s., eLN = 39m.56s.
Ksara e = 37m.4s. and 38m.19s.
Triest e = 37m.15s., eP = 40m.20s., i = 40m.47s., e = 41m.15s., 41m.35s., and 46m.3s.
Szeged ePN = 37m.53s., eN = 38m.21s. and 38m.51s., eS?N = 39m.59s., eLN = 40·7m.
Chur eP = 37m.56s.
Grozny e = 38m.2s.
Zurich eP = 38m.10s., e = 43m.1s.
Basle eP = 38m.16s., e = 43m.13s.
Neuchatel eP = 38m.18s.
Helwan eN = 38m.28s. and 38m.39s.
Kecskemet ePZ = 38m.52s., eZ = 39m.53s.
Uccle eP = 38m.55s., eS = 42m.38s., eL = 44·5m.
Granada iPZ = 39m.11s.k, iSZ = 44m.29s., L = 49·5m.
Rome eE = 39m.13s., iZ = 39m.30s. and 40m.49s., iN = 41m.2s.
Moscow e = 39m.40s., 40m.55s., 44m.58s., and 45m.2s., eL = 46·5m.
Baku e = 42m.5s., eL = 44·3m.
Sverdlovsk e = 45m.16s., L = 49·0m.
Long waves were also recorded at Kew, Upsala, De Bilt, Hamburg, Prague, and Bidston,

Dec. 25d. 12h. 52m. 47s. Epicentre 52°·2N. 32°·0W.

A = +·5219, B = −·3261, C = +·7882; δ = −2; h = −6;
D = −·530, E = −·848; G = +·668, H = −·417, K = −·615.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Edinburgh		17·3	66	—	—	e 7 54	SSS	—	—	—
Bidston		17·5	74	i 4 3	− 4	e 7 38	SS	i 8 8	SSS	8·3
Stonyhurst		17·8	73	i 4 9	− 2	i 8 19	SSS	—	—	9·2
Oxford		18·9	79	i 4 24	0	8 1	+ 8	—	—	e 9·2
Scoresby Sund		18·9	10	e 4 29	+ 5	7 59	+ 6	8 18	SS	e 9·2
Jersey		19·1	85	e 4 28	+ 1	e 8 13?	+16	—	—	9·8
Kew		19·5	79	i 4 32	+ 1	e 8 8	+ 2	—	—	i 8·8
Paris		22·1	85	e 5 0	+ 1	e 9 2	+ 4	—	—	e 10·2
Uccle		22·5	79	e 5 3	+ 1	i 9 8	+ 3	—	—	10·2
De Bilt		22·7	75	5 5a	+ 1	9 19	+10	—	—	—
Toledo		22·8	112	e 5 10	+ 5	i 9 29	+18	—	—	10·4
Heligoland	N.	23·8	70	e 4 49	−26	—	—	—	—	e 11·7
San Fernando		24·1	122	—	—	e 10 13	SS	—	—	—
Granada		24·9	116	e 5 42a	+18	i 10 9	+22	—	—	15·5
Hamburg		25·1	69	e 5 33	+ 5	—	—	—	—	12·4
Strasbourg		25·4	81	e 5 32	+ 1	e 10 11	+15	—	—	—
Neuchatel		25·5	85	e 5 33	+ 1	—	—	—	—	—
Basle		25·7	84	e 5 34	+ 1	—	—	—	—	—
Copenhagen		26·0	63	e 5 37	+ 1	—	—	—	—	12·2
Stuttgart		26·2	80	e 5 39	+ 1	—	—	e 6 1	PP	—
Zurich		26·4	84	e 5 33	− 7	—	—	—	—	—
Moncalieri		26·9	89	e 5 43	− 2	10 18	− 2	—	—	14·4
Chur		27·2	84	e 5 13?	−34	—	—	—	—	—
Prague		28·8	74	e 6 31	PP	e 10 45	− 6	—	—	e 14·2
Ottawa		29·2	275	e 6 6	+ 1	—	—	—	—	11·2
Rome		31·5	91	e 6 18	− 8	i 13 24	SSS	i 8 4	PPP	—
San Juan		43·0	231	e 9 51	PP	14 36	+ 7	—	—	e 18·0
Sverdlovsk		50·0	45	e 11 2	PP	e 16 9	0	—	—	22·2
Helwan		50·9	90	e 9 9	+ 4	e 16 25	+ 4	—	—	—
Ksara		51·0	84	e 9 9	+ 3	e 16 30	+ 8	—	—	—
Baku		54·9	68	e 9 20	−15	e 17 24	+ 8	—	—	27·2
Tucson		58·7	283	e 10 2	0	e 18 17	+11	e 12 18	PP	e 24·8
Tinemaha		59·6	292	i 10 8	0	—	—	—	—	—
Haiwee	z.	60·1	291	i 10 18	+ 7	—	—	—	—	—
Palomar	z.	61·5	288	i 10 28	+ 7	—	—	—	—	—
Pasadena	z.	61·7	290	e 10 18	− 4	—	—	—	—	e 34·5
Irkutsk		69·6	27	—	—	e 27 13?	SSS	—	—	e 34·2
Huancayo		74·1	224	e 11 37	− 3	e 21 0	−12	—	—	e 31·8
Colombo	E.	97·7	68	—	—	e 33 43	?	—	—	—

Additional readings:—
Kew iN = +8m.13s.
Stuttgart eNW = +5m.47s.
Rome iN = +14m.7s.
Helwan eE = +16m.43s.
Tucson eP = +10m.10s., ePPP = +13m.52s., eSS = +22m.16s.
Huancayo eP = +11m.53s.
Long waves were also recorded at Calcutta, Tashkent, Moscow, Triest, Budapest, Belgrade, Pulkovo, La Paz, Vladivostok, Ukiah, Butte, and Chicago.

Dec. 25d. 16h. 25m. 4s. Epicentre 6°·1S. 150°·5E. (as on 1938, November 14d.).

$A = -·8655$, $B = +·4897$, $C = -·1055$; $\delta = +3$; $h = +7$;
$D = +·492$, $E = +·870$; $G = +·092$, $H = -·052$, $K = -·994$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Palau		20·8	310	3 56	−49	—	—	—	—	—
Riverview		27·6	178	e 5 40	−11	e 10 24	− 8	e 6 3	PP	e 13·3
Sydney		27·6	178	e 7 8	PPP	e 10 23	− 9	e 12 14	SSS	—
Adelaide		30·7	199	e 6 20	+ 1	i 10 56	−25	6 48	PP	10·4
Melbourne		32·0	189	i 6 26	− 4	11 26	−16	—	—	15·3
Manila		35·8	306	i 7 18	+15	12 9	−32	—	—	15·6
Arapuni		39·2	148	—	—	e 13 56?	+24	—	—	—
Perth		41·3	227	i 7 41	− 8	13 38	−26.	i 9 21	PP	24·8
Christchurch		42·1	156	e 7 6	−49	14 28	+12	18 28	L_g	e 21·6
Osaka		42·9	342	7 32	−30	—	—	—	—	—
Kobe		43·1	342	8 15	+11	—	—	—	—	—
Mito		43·3	348	8 17	+12	—	—	—	—	—
Nagano		44·1	346	8 4	− 8	—	—	—	—	—
Hong Kong		45·4	309	8 34	+12	14 42	−22	—	—	—
Zi-ka-wei	z.	46·2	325	e 8 18	−10	—	—	—	—	22·6
Akita		46·6	350	9 13	+41	—	—	—	—	—
Vladivostok		51·8	343	e 9 4	− 8	i 16 22	−11	—	—	25·1
Calcutta	N.	67·1	297	e 13 12	PP	i 19 42	− 9	—	—	—
Irkutsk		70·1	332	e 11 4	−12	20 12	−15	—	—	33·9
Colombo	E.	71·6	279	11 13	−12	20 35	− 9	21 8	PPS	25·1
Bombay		80·4	290	—	—	e 21 59	?	—	—	—
College		83·9	32	—	—	e 22 53	− 3	e 24 8	PPS	e 37·6
Frunse		83·9	314	e 12 35	+ 2	—	—	—	—	—
Andijan		85·0	312	12 28	−10	—	—	—	—	—
Tashkent		87·4	312	—	—	e 22 55	[−21]	i 24 12	PS	41·3
Tchimkent		87·4	313	12 20	−30	—	—	—	—	—
Samarkand		88·9	310	11 43	?	—	—	—	—	—
Pasadena		94·5	56	i 13 24	+ 1	—	—	—	—	e 43·8
Mount Wilson		94·6	56	e 13 27	+ 3	—	—	—	—	—
Tinemaha		94·6	54	e 13 25	+ 1	—	—	—	—	—
Sverdlovsk		95·0	326	—	—	23 43	[−18]	26 2	PPS	41·9
Palomar	z.	95·5	57	e 13 30	+ 2	—	—	—	—	—
Tucson		100·6	58	e 13 51	0	e 25 12	−13	e 17 41	PP	e 40·8
Baku		102·0	310	e 20 34	PPP	e 24 28	[− 9]	e 28 22	PPS	47·9
Ksara		113·8	303	e 19 52	PP	e 28 56?	PS	—	—	59·9
Uccle		127·3	333	—	—	e 37 41	SS	—	—	e 59·9
Rome		128·5	319	e 20 26	?	e 30 33	PS	e 22 15	PP	i 56·9
Huancayo		131·0	111	e 19 26	[+12]	e 26 40	[+18]	e 21 38	PP	e 53·8
La Paz	z.	135·7	121	i 19 22k	[0]	—	—	i 22 56	PP	69·9
Granada		141·1	326	e 19 27	[− 5]	—	—	e 22 30	PP	77·9

Additional readings :—
Riverview e?N = +4m.58s.
Adelaide P_cP = +9m.41s., SS = +11m.46s.
Perth i = +5m.21s., +9m.46s., and +15m.56s., SS = +17m.56s., i = +20m.4s. and +21m.1s.
Tashkent i = +23m.11s., +24m.43s., +25m.57s., and +28m.30s.
Sverdlovsk SS = +31m.2s.
Tucson ePPP = +19m.54s., ePS = +26m.28s., eSS = +31m.53s., eSSS = +35m.54s.
Baku e = +34m.58s. and +38m.4s.
Rome e = +35m.9s., +38m.17s., and +51m.11s.?
Huancayo ePKS = +22m.36s., iPKS = +22m.43s., ePPP = +24m.23s., eSKSP = +31m.18s., ePS = +32m.1s., ePKP,PKP = +37m.50s., PSPS = +39m.42s., eSSS = +44m.10s.
Long waves were also recorded at Prague, Wellington, Florissant, Lincoln, Ukiah, Pulkovo, Moscow, San Juan, Toledo, De Bilt, Paris, Rio de Janeiro, Kew, Jersey, and Bidston.

Dec. 25d. Readings also at 0h. (Sverdlovsk, Baku, and Williamstown), 1h. (Bucharest, Belgrade, and Triest), 2h. (Tucson, near Apia and Ksara), 3h. (Sverdlovsk and Vladivostok), 9h. (Jena), 10h. (Harvard, Seven Falls, Shawinigan Falls, and Ottawa), 11h. (Irkutsk, Sverdlovsk, Baku, and Mizusawa), 12h. (East Machias), 16h. (La Paz, Fordham, and Santa Clara), 19h. (Pasadena and Palomar), 20h. (Manila), 21h. (Pasadena, Perth, Irkutsk, Ksara, Sverdlovsk, Mizusawa, Vladivostok, Samarkand, Andijan, Calcutta, Hong Kong, and Tucson), 22h. (Frunse, Sverdlovsk, Grozny, Tucson, Hong Kong, Calcutta, Andijan, Samarkand, Pasadena, Palomar, Haiwee, and Manila), 23h. (Rio de Janeiro, La Paz, Tinemaha, Huancayo, near Christchurch, Tucson, Haiwee, Palomar, Pasadena, and Irkutsk).

Dec. 26d. 11h. 55m. 7s. Epicentre 13°·3N. 88°·7W. (as on 1937 Oct. 20d.).

$A = +\cdot0221$, $B = -\cdot9733$, $C = +\cdot2285$; $\delta = +1$; $h = +6$;
$D = -1\cdot000$, $E = -\cdot023$; $G = +\cdot005$, $H = -\cdot228$, $K = -\cdot974$.

Pasadena suggests depth $h = 70$kms.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Merida	N.	7·7	353	i 1 49	− 7	—	—	—	—	—
Balboa Heights		9·9	114	e 2 35	PP	—	—	—	—	—
Tacubaya	N.	11·8	303	e 2 55	+ 2	i 5 20	+14	—	—	—
Columbia		21·8	17	e 4 58	+ 2	8 59	+ 7	5 23	sP	—
San Juan		22·3	74	e 4 56	− 5	9 4	+ 2	i 5 37	PP	e 10·1
St. Louis		25·3	357	e 5 29	− 1	e 9 40	−14	i 5 57	PP	—
Florissant		25·5	357	i 5 31	− 1	e 9 38	−19	i 6 7	PPP	12·4
Tucson		27·7	318	e 5 51	− 1	e 10 30	− 3	e 6 11	pP	e 11·4
Pittsburgh		28·1	14	e 6 9	+14	i 10 37	− 3	i 6 47	PP	—
Lincoln		28·3	350	e 6 5	+ 8	e 10 38	− 5	—	—	—
Huancayo		28·4	152	5 59	+ 1	i 10 48	+ 3	e 6 50	PP	12·2
Chicago		28·5	0	e 6 14	pP	e 10 40	− 6	e 7 23	pPP	—
Bermuda		28·9	44	e 5 51	−12	e 11 3	+10	e 6 7	pP	e 13·7
Philadelphia		29·1	22	—	—	e 10 53	− 3	—	—	e 14·0
Fordham		30·4	23	i 6 20a	+ 4	i 11 15	− 1	i 6 34	pP	16·2
Toronto		31·3	13	i 6 37	pP	e 11 25	− 6	e 14 7	?	15·4
Williamstown		32·2	23	e 6 29	− 3	—	—	—	—	—
La Jolla		32·5	312	e 6 36	+ 2	—	—	e 9 19	P_cP	—
Palomar		32·5	313	e 6 34	0	i 12 58	S_cP	i 9 20	P_cP	—
Harvard		32·7	24	i 6 36	0	—	—	—	—	—
Ottawa		33·8	17	i 6 45	− 1	i 12 12	+ 2	8 15	PPP	16·9
Mount Wilson		33·8	314	e 6 47	+ 1	—	—	—	—	—
Pasadena		33·8	314	i 6 46k	0	i 13 3	S_cP	i 6 55	pP	—
Vermont		33·8	21	—	—	e 12 3	− 7	—	—	e 15·4
Salt Lake City		34·0	328	e 6 43	− 5	e 12 8	− 5	—	—	e 13·7
Haiwee		34·7	317	e 6 54	0	e 13 5	S_cP	e 9 26	P_cP	—
Tinemaha		35·5	317	e 6 59	− 1	—	—	i 9 27	P_cP	—
La Paz		35·9	143	i 7 3k	− 1	12 41	− 1	—	—	17·0
East Machias		36·3	26	7 6	− 1	e 13 17	sS	—	—	e 17·7
Seven Falls		36·9	20	e 8 41	PP	e 12 59	+ 1	e 15 41	SSS	16·9
Bozeman		37·4	335	e 7 8	− 8	e 12 57	− 8	e 7 33	pP	e 15·5
Butte		38·3	335	e 7 24	0	e 13 6	−13	e 8 58	PP	e 15·8
Berkeley		38·6	316	—	—	e 13 22	− 1	—	—	e 21·7
Ukiah		39·9	317	e 7 33	− 4	e 13 17	−26	e 8 5	pP	e 17·1
Rio de Janeiro		57·2	128	e 17 49	S	(e 17 49)	+ 4	—	—	—
College		65·2	337	e 10 36	− 9	e 18 41	−47	e 13 6	PP	26·6
Toledo		77·5	51	e 12 15	+16	—	—	—	—	—
Granada		78·2	54	i 12 43k	+40	i 21 54	− 3	28 20	SSS	i 36·5
Uccle		81·7	39	—	—	e 22 22	−12	e 27 47	SS	37·9
Clermont-Ferrand		81·9	45	e 11 53	−30	—	—	—	—	—
Triest		89·1	43	e 13 0	+ 2	e 23 15	[−12]	e 16 37	PP	e 39·7
Rome		89·4	47	e 13 12	+12	e 23 46	− 3	e 16 28	PP	e 41·7
Sverdlovsk		105·6	16	—	—	24 47	[− 6]	e 27 55	PS	45·9
Ksara		109·5	47	e 19 2	PP	e 28 33	PS	—	—	52·9
Irkutsk		113·7	351	—	—	e 28 53?	PS	e 34 53?	SS	e 56·9
Baku		114·2	34	—	—	e 29 25	PS	e 35 43	SS	e 54·2
Agra	E.	137·8	17	—	—	e 34 52	PPS	—	—	—
Calcutta	N.	144·3	4	—	—	31 57	PS	—	—	—

For Notes see next page.

NOTES TO DEC. 26d. 11h. 55m. 7s.

Additional readings :—
San Juan i = +6m.16s.
St. Louis iN = +5m.43s., +5m.47s., and +6m.1s., eN = +9m.49s.
Florissant iN = +5m.35s. and +5m.50s., iE = +9m.49s., eN = +9m.56s., eSSE = +10m.29s.
Tucson eSP = +6m.26s., PPP = +6m.43s., ePcP = +8m.55s., esS = +11m.2s.
Pittsburgh iSNW = +11m.40s., iNE? = +12m.19s.
Lincoln eS = +10m.49s.
Huancayo ePcP = +8m.44s.
Chicago ePcP = +9m.0s., esS = +11m.8s.
Williamstown i = +6m.34s. and +6m.50s.
Ottawa SS = +14m.23s.
Pasadena isPZ = +7m.10s., iPcPZ = +9m.22s.
Bozeman ePP = +8m.28s., epPP = +8m.59s., ePcP = +9m.34s.
Berkeley eZ = +14m.38s.
Ukiah ePcP = +9m.34s., eS = +13m.38s.
College ePPP = +14m.40s., epPPP = +14m.59s., eSSS = +26m.15s.
Triest ePPP = +18m.30s., eS = +23m.47s., ePS = +24m.37s., ePPS = +25m.17s., eSS = +30m.20s.
Rome eZ = +16m.51s., eN = +25m.12s., eSSN = +29m.47s., eN = +37m.32s. and +40m.42s.
Irkutsk e = +38m.53s.? and +49m.53s.?
Long waves were also recorded at Tashkent, San Fernando, Wellington, Upsala, Colombo, Vladivostok, Jersey, and De Bilt.

Dec. 26d. 21h. 49m. 46s. Epicentre 9°·7N. 84°·8W.

A = +·0893, B = −·9818, C = +·1674 ; δ = −7 ; h = +7 ;
D = −·996, E = −·091 ; G = +·015, H = −·167, K = −·986.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Balboa Heights		5·2	97	e 1 25	+ 4	e 2 31	+ 9	e 2 34	S*	—
Merida	N.	12·1	338	i 2 51	− 6	—	—	—	—	—
Tacubaya	N.	16·9	306	i 4 3	+ 4	—	—	—	—	—
San Juan		20·1	62	e 4 37	− 1	e 8 18	− 1	i 4 48	PP	e 10·3
Huancayo		23·6	156	e 5 15	+ 2	i 9 39	+14	i 5 36	PP	i 10·6
Columbia		24·4	8	—	—	e 10 2	+23	e 10 36	SS	—
Bermuda		29·1	37	e 7 2	PP	e 11 7	+11	—	—	12·0
La Paz	Z.	30·8	147	6 18	− 2	—	—	—	—	17·4
Chicago		32·2	355	—	—	e 11 51	+ 6	—	—	e 13·7
Tucson		32·9	317	e 6 36	− 2	e 11 53	− 3	e 7 47	PP	e 13·2
Williamstown		34·4	17	i 6 49	− 2	—	—	—	—	—
Ottawa		36·4	11	i 7 5	− 3	e 12 44	− 6	e 8 44	PPP	17·2
Palomar	Z.	37·7	314	e 7 18	− 1	—	—	—	—	—
La Jolla		37·8	313	e 7 19	− 1	—	—	—	—	—
Mount Wilson		39·0	314	i 7 28	− 2	—	—	—	—	—
Pasadena		39·1	314	i 7 29	− 2	—	—	—	—	e 18·4
Salt Lake City		39·1	328	e 7 28	− 3	e 13 36	+ 5	e 9 19	PPP	16·6
Haiwee		40·0	317	i 7 39	+ 1	—	—	—	—	—
Tinemaha		40·7	318	e 7 44	0	—	—	—	—	—
Fresno	N.	41·5	316	e 7 54	+ 4	—	—	—	—	—
Bozeman		42·3	333	e 7 55	− 2	—	—	—	—	e 17·8
Lick	N.	43·1	317	e 8 6	+ 2	—	—	—	—	—
La Plata		51·1	151	9 8	+ 2	16 20	− 4	—	—	29·9
Rio de Janeiro		52·0	129	e 16 32	S	(e 16 32)	− 4	—	—	26·9
Granada		77·2	54	i 12 1a	+ 4	i 21 56	+ 9	27 6	SS	36·2
Clermont-Ferrand		81·7	45	e 11 54	−28	—	—	—	—	—
Ksara		109·0	49	18 14?	PP	28 14?	PS	—	—	58·7

Additional readings :—
San Juan iS = +8m.39s.
Huancayo i = +10m.20s.
Bermuda eS = +11m.20s.
Tucson eP = +6m.58s. and +7m.24s., ePPP = +8m.18s., ePcP = +8m.40s.
Bozeman eP = +8m.30s.
Long waves were also recorded at Rome, Baku, Irkutsk, Sverdlovsk, Triest, Fordham, and Philadelphia.

Dec. 26d. 23h. 57m. 16s. Epicentre 39°·7N. 39°·7E. (as on 1939 Nov. 21d.).

Destructive, particularly in the districts of Erzican, Sivas, and Tokat; numerous victims in the districts of Amasya, Gümüsame, and Ordu, and in the districts of Samsun, Trabzon, Tunceli, and Yosgat.

The shock was felt Intensity V at Larnaca (Cyprus) at 600kms. from the epicentre.

The epicentral zone extended over 250kms., along the Kelkit Fault following the line Erzican, Susehri, Koyulhissar, Resadiye, and Niksar. Maximum acceleration (1500 mm./sec.^{2}) at Koyulhissar (40°·3N. 38°·0E.).

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Etude microseismique.

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Die türkishe Erdbebenkatastrophe unter Geodynamischen Gesichtopunkten, "Die Umschau," Heft 4, Jahrgang, 1940.

$A = +\cdot5936$, $B = +\cdot4928$, $C = +\cdot6362$; $\delta = -4$; $h = -2$;
$D = +\cdot639$, $E = -\cdot769$; $G = +\cdot490$, $H = +\cdot406$, $K = -\cdot772$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Erevan		3·7	80	1 2	+ 2	i 1 44	− 1	1 14	P_g	—
Sotchi		3·9	0	i 1 1	− 1	—	—	e 1 5	P*	—
Piatigorsk		5·0	28	i 1 21	+ 3	—	—	—	—	—
Grozny		5·8	49	e 1 34	+ 5	i 2 19	−19	i 1 45	P*	—
Ksara		6·6	209	i 1 44	+ 3	i 3 36	S_g	—	—	—
Baku		7·9	81	i 2 2	+ 3	—	—	—	—	—
Istanbul		8·2	282	0 8	?	2 33	−65	—	—	—
Bucharest		11·1	299	i 2 42k	− 1	—	—	—	—	—
Helwan	z.	12·0	218	i 2 51k	− 4	—	—	—	—	—
Cernauti		13·1	315	e 2 32	−38	—	—	3 22	PP	5·0
Belgrade		15·1	296	i 3 36a	0	i 6 43	SS	i 3 58	PPP	—
Szeged		15·7	301	i 3 44	0	i 6 53	+14	e 3 54	PP	e 9·2
Moscow		16·1	356	i 3 46	− 3	6 55	+ 6	—	—	e 8·2
Kecskemet		16·2	303	e 3 50	0	i 6 52	+ 1	i 4 1	PP	e 9·2
Sarajevo		16·4	292	e 3 55	+ 2	—	—	i 4 13	PP	—

Continued on next page,

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Budapest		16·8	305	i 3 59	+ 1	i 7 14	+ 9	—	—	—
Laibach		19·5	298	i 4 40	+ 9	i 8 23	+17	i 5 5	PPP	9·3
Triest		19·9	297	i 4 32	− 4	i 8 13	− 2	i 4 55	PP	e 9·4
Prague		20·6	310	i 4 41k	− 2	e 8 24	− 5	—	—	—
Rome		20·7	285	i 4 41k	− 3	i 8 39	+ 8	i 5 2	PP	i 9·6
Pulkovo		20·9	348	i 4 43	− 3	8 35	0	—	—	—
Samarkand		21·0	81	4 52	+ 6	9 11	SS	—	—	—
Sverdlovsk		21·9	31	i 4 57	0	i 8 47	− 7	—	—	—
Tashkent		22·5	75	4 46	−16	—	—	—	—	—
Jena		22·6	309	i 4 56	− 7	i 9 11	+ 4	i 5 13	PP	e 10·7
Tchimkent		22·7	73	e 5 2	− 2	e 9 12	+ 3	—	—	—
Chur		23·0	300	e 5 5	− 2	e 9 23	+ 9	—	—	—
Stuttgart		23·5	304	i 5 10k	− 2	i 9 34	+11	i 5 47	PP	e 11·5
Zurich		23·7	300	e 5 12k	− 2	e 9 36	+ 9	—	—	—
Göttingen		23·9	311	e 5 12	− 4	i 9 45	+15	—	—	i 11·6
Copenhagen		24·1	322	i 5 17	− 1	9 44	+10	5 44	PP	—
Moncalieri		24·1	295	i 5 18	0	—	—	—	—	—
Basle		24·4	300	e 5 19	− 2	e 9 51	+12	—	—	—
Sion		24·4	298	e 5 20	− 1	e 9 44	+ 5	—	—	—
Strasbourg		24·4	303	i 5 18a	− 3	9 45	+ 6	5 45	PP	11·5
Hamburg		24·5	315	i 5 22k	0	i 9 50	+10	—	—	—
Upsala		24·5	333	i 5 20	− 2	i 9 49	+ 9	i 5 53	PP	—
Neuchatel		24·8	299	e 5 22	− 3	e 10 2	+16	—	—	—
Andijan		24·9	77	5 27	+ 1	i 11 21	SSS	i 6 29	PPP	—
Besançon		25·6	299	e 5 34	+ 2	i 10 10	+11	i 5 55	PP	—
Heligoland		25·8	317	i 5 32k	− 2	e 9 56	− 6	i 5 57	PP	e 12·2
Marseilles		25·8	290	5 38	+ 4	9 26	−36	—	—	14·7
Frunse		26·3	71	5 43	+ 4	—	—	—	—	15·7
De Bilt		26·8	311	i 5 42k	− 2	10 28	+ 9	i 6 19	PP	—
Uccle		27·0	307	i 5 44k	− 1	i 10 21	− 1	—	—	11·7
Clermont-Ferrand		27·4	296	e 5 16	−33	i 9 35	−53	—	—	e 17·3
Paris		27·9	302	i 5 50k	− 4	i 10 41	+ 4	i 6 54	PP	e 14·7
Almata		28·0	69	e 5 56	+ 1	11 0	+22	—	—	—
Algiers		28·8	276	i 6 0	− 2	i 11 2	+11	—	—	—
Bergen		29·7	327	i 6 9	− 1	10 44?	−22	i 6 57	PP	—
Kew		30·0	307	i 6 10	− 2	i 11 17	+ 7	i 6 59	PP	i 15·1
Semipalatinsk		30·2	55	6 16	+ 2	11 46	+33	—	—	—
Oxford		30·6	307	i 6 13k	− 5	—	—	—	—	—
Jersey		31·0	303	e 6 4	−17	i 11 14	−12	e 7 20	PP	—
Stonyhurst		31·6	312	i 6 24	− 2	i 11 50	+15	i 6 52	PP	—
Bidston		31·9	310	i 6 10	−19	i 11 18	−22	i 7 3	PP	—
Edinburgh		32·4	315	6 21	−13	11 19	−29	7 23	PP	—
Dehra Dun	N.	32·6	94	e 6 56?	+21	e 12 48	+57	e 14 33	SSS	e 18·3
Toledo		33·4	285	i 6 39	− 3	i 12 0	− 3	e 8 4	PPP	—
Granada		33·8	281	i 6 46a	0	i 12 31	+21	7 56	PP	17·3
Agra		34·1	99	i 6 49a	+ 1	13 9	+55	7 9	pP	—
Bombay		35·3	116	e 7 0	+ 1	i 13 2	+29	—	—	18·1
San Fernando	E.	36·0	280	i 7 1	− 4	—	—	i 7 59	PP	—
Hyderabad		40·2	112	7 39	− 1	14 9	+21	9 29	PP	21·0
Scoresby Sund		43·3	335	8 9	+ 4	14 32	− 1	i 9 52	PP	i 17·6
Calcutta		44·5	97	i 8 12	− 3	i 14 58	+ 7	i 9 53	PP	e 22·0
Kodaikanal	E.	44·6	120	e 8 11a	− 5	i 15 14	+22	10 8	PP	23·1
Irkutsk		45·2	51	e 8 31	+11	i 15 10	+ 9	—	—	22·7
Colombo	E.	48·6	121	7 47	−60	14 55	−54	—	—	—
Ivigtut		55·2	324	i 9 51	+14	e 17 19	− 1	10 45	PcP	i 22·2
Tananarive		58·8	171	10 5	+ 3	18 21	+14	14 3	PPP	27·9
Phu-Lien		59·5	87	e 10 9	+ 2	18 37	+21	—	—	—
Dairen		61·2	62	10 22	+ 3	19 8	PS	—	—	—
Hong Kong		64·4	81	10 46k	+ 6	20 46	?	11 4	PcP	37·9
Zi-ka-wei		65·0	69	e 10 44	0	17 11	?	i 12 55	PP	39·2

Continued on next page.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Zinsen		65·3	61	10 49	+ 3	19 22	− 7	13 28	PP	—
Vladivostok		65·7	53	e 10 47	− 1	i 19 40	+ 6	—	—	35·4
Johannesburg		66·4	191	e 10 50	− 3	e 20 8	PS	e 11 32	PcP	e 27·0
Taihoku		68·4	75	11 10	+ 4	—	—	—	—	—
Hukuoka		70·0	63	11 26	+11	20 29	+ 3	—	—	—
Kumamoto		70·6	64	11 7	−12	20 42	+ 9	—	—	—
Halifax		71·4	313	11 35	+11	e 20 44	+ 2	21 12	PS	30·7
Matuyama		71·4	60	11 26	+ 2	21 8	PS	—	—	38·5
Kobe		72·6	59	11 40	+ 9	20 54	− 2	14 38	PP	36·0
Muroto		72·7	61	11 32	0	21 10	+13	14 24	PP	38·8
Osaka		72·8	59	11 40	+ 8	21 49	PS	15 4	PPP	—
East Machias		73·4	315	e 12 7	+31	21 5	0	e 14 31	PP	i 29·7
Nagoya		73·5	57	11 44	+ 8	21 22	+16	—	—	i 40·1
Mizusawa	E.	73·7	52	e 11 36	− 2	e 21 59	PPS	—	—	39·0
Seven Falls		73·7	318	i 11 43	+ 5	i 21 19	+11	21 55	PS	37·7
Sendai		74·1	53	11 45	+ 5	21 53	PS	14 52	PP	e 40·9
Manila		74·2	84	i 11 47k	+ 7	21 32	+18	—	—	—
Tokyo, Cen. Met. Ob.		74·9	56	11 53	+ 9	22 19	PPS	15 11	PP	40·0
Shawinigan Falls		75·1	319	e 11 44	− 2	21 28	+ 4	25 56	SS	32·7
College		75·6	4	e 11 58	+10	e 21 32	+ 3	e 16 36	PPP	i 30·9
Cape Town		75·9	198	12 12	+22	21 55	[− 2]	14 40	PP	35·9
Vermont		76·7	317	i 12 3	+ 8	e 21 35	− 6	e 26 44	SS	31·7
Harvard		77·2	315	i 12 2a	+ 5	i 21 40	− 7	i 14 58	PP	—
Ottawa		77·4	319	i 11 56	− 2	i 21 49	0	22 14	PS	—
Williamstown		78·0	315	e 12 0	− 2	e 21 44	−11	i 12 27	PcP	e 36·0
Fordham		79·6	315	i 12 11a	+ 1	i 21 51	−21	15 35	PP	—
Bermuda		79·9	304	e 12 14	+ 2	e 22 17	+ 1	15 17	PP	32·7
Toronto		80·5	320	e 12 6	− 9	i 22 7	−15	32 44?	SSS	—
Philadelphia		80·9	315	e 12 16k	− 1	e 22 11	−15	i 22 45	ScS	i 35·4
Pennsylvania		81·8	317	i 12 48	+26	e 22 54	+19	e 28 32	SS	—
Georgetown		82·7	315	e 12 26	− 1	—	—	—	—	—
Pittsburgh		83·1	318	e 12 29	0	i 22 49	+ 1	i 13 15	pP	—
Sitka		83·5	357	e 12 32	+ 1	22 45	− 7	i 15 49	PP	i 33·2
Ann Arbor		83·6	321	i 12 26	− 6	i 22 50	− 3	28 44	SS	—
Saskatoon		84·0	340	e 13 2	+29	e 23 27	+30	32 44?	SSS	36·7
Chicago		85·8	324	e 12 51	+ 9	23 2	[− 4]	16 1	PP	—
Chicago Loyola		85·8	324	e 12 43	+ 1	e 23 25	+10	i 24 19	PS	—
Columbia		88·5	314	e 13 0	+ 4	23 17	[− 7]	e 17 58	PPP	—
Florissant		89·5	323	i 13 1	+ 1	i 23 31	[+ 1]	i 24 47	PS	36·7
St. Louis		89·6	323	i 13 1	0	i 23 12	[−18]	i 23 48	SKKS	—
San Juan		90·0	294	e 13 1	− 2	i 23 35	[+ 2]	e 16 45	PP	—
Lincoln		90·6	328	e 13 12	+ 7	e 23 46	[+11]	i 33 58	SSS	e 35·8
Spokane		90·6	345	i 14 9	+64	e 23 34	[− 3]	i 25 9	PS	—
Bozeman		91·0	340	e 13 17	+10	e 23 35	[− 4]	i 28 59	SS	i 35·6
Victoria		91·0	348	i 12 59	− 8	22 56	[−43]	—	—	37·7
Butte		91·1	341	e 13 9	+ 1	e 23 45	[+ 6]	i 25 6	PS	i 39·1
Seattle		91·6	347	e 16 56	PP	23 31	[−11]	25 1	PS	37·0
Little Rock		93·7	322	i 13 7	−13	i 23 40	[−14]	i 25 0	PS	36·7
Denver		94·3	333	e 17 11	PP	e 23 50	[− 7]	i 25 49	PS	e 37·4
Salt Lake City		95·8	339	e 13 33	+ 4	24 7	[+ 2]	e 17 51	PP	i 39·0
Ferndale		98·8	347	—	—	e 27 4	PPS	—	—	e 49·7
Rio de Janeiro		99·1	248	e 14 2	+18	i 24 44	[+21]	i 32 40	SS	i 38·6
Ukiah		100·0	346	e 13 58	+10	e 25 13	− 7	e 18 3	PP	e 42·8
Perth		100·3	123	i 17 34	PP	24 19	[− 9]	i 19 24	PPP	59·7
Tinemaha		100·9	342	e 14 1	+ 9	—	—	—	—	—
Berkeley		101·1	344	e 14 2	+ 9	e 27 33	PS	e 18 32	PP	e 49·2
San Francisco		101·2	344	e 20 44?	PPP	e 34 44?	?	—	—	—
Lick		101·4	344	e 14 40	+45	—	—	e 18 40	PP	e 47·1
Branner		101·5	344	e 17 44	PP	e 26 44	PS	e 18 44	PP	—
Haiwee		101·5	341	e 14 6	+11	—	—	e 17 21	PKP	—

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		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Santa Clara		101·5	344	e 14 24	+29	e 26 41	PS	i 18 34	PP	—
Fresno	N.	101·6	343	e 14 33	+37	e 24 36	[+ 1]	e 19 47	PPP	e 47·3
Tucson		103·4	335	e 14 4	0	24 35	[− 8]	e 18 18	PP	42·1
Merida	N.	103·6	312	—	—	i 28 19	PPS	—	—	—
Mount Wilson		103·6	341	e 14 12	+ 8	—	—	—	—	—
Pasadena		103·7	341	e 14 14	+ 9	i 24 29	[−16]	i 18 19	PP	e 42·7
Palomar	Z.	104·2	340	i 14 16	+ 9	—	—	i 18 9	PP	—
Balboa Heights		105·9	296	e 17 44?	PP	—	—	—	—	—
Oaxaca	N.	109·3	315	—	—	e 25 45	{−15}	—	—	—
Tacubaya	N.	109·8	318	e 18 51	PP	—	—	—	—	—
Guadalajara	N.	110·7	323	e 18 46	PP	—	—	—	—	—
Manzanillo	N.	112·2	323	—	—	i 35 14	SS	—	—	—
La Paz		114·0	268	14 52	P	25 10	[−18]	i 19 24	PP	44·4
La Plata		116·5	246	20 14	PP	26 2	[+25]	29 38	PS	47·3
Huancayo		116·8	277	e 15 30	?	i 25 35	[− 3]	e 19 34	PP	—
Honolulu		117·2	17	e 15 11	P	e 25 36	[− 4]	e 20 15	PP	i 45·2
Adelaide		117·4	113	e 21 1	?	25 51	[+11]	i 34 44	SS	63·4
Montezuma		118·0	262	e 20 31	PP	36 29	SS	—	—	—
Melbourne		123·3	113	i 21 6	?	i 26 22	[+21]	i 24 2	PPP	64·7
Riverview		126·0	106	e 17 47	?	—	—	e 21 0	PP	e 52·9
Sydney		126·0	106	e 15 56	P	—	—	e 23 59	PPP	e 54·8
Apia		142·2	55	e 20 9	[+35]	32 38?	SKSP	22 8?	PP	i 60·0
Christchurch		145·0	111	e 19 33a	[− 6]	42 20	SS	i 23 4	PP	62·0
New Plymouth		145·0	103	i 19 46	[+ 7]	—	—	—	—	—
Arapuni		145·9	101	e 24 44?	?	i 48 32	SSS	60 44?	L_g	73·7
Wellington		146·1	106	19 31	[−10]	42 44?	SS	20 0	pPKP	71·7

Additional readings :—
Erevan iS* = +2m.14s., S_g = +2m.32s.
Grozny i = +1m.49s. and +2m.15s.
Istanbul S_g = +46s.
Bucharest iE = +2m.49s.
Cernauti i = +3m.0s., +3m.7s., and +4m.0s.
Belgrade i = +3m.41s., +4m.58s., +7m.27s., +7m.44s., and +8m.13s.
Szeged iE = +4m.42s., iN = +5m.32s., iS?N = +6m.22s., eSSN = +7m.8s., iE = +7m.52s., iN = +8m.2s., iE = +8m.22s., eP_cPN = +8m.47s.
Kecskemet ePE = +3m.53s., iZ = +5m.23s. and +6m.21s., eSSZ = +7m.11s., eE = +8m.25s., eN = +8m.35s.
Sarajevo i = +3m.59s., +4m.42s., +5m.10s., and +5m.30s.
Laibach iNW = +6m.25s. and +7m.58s.
Triest iPPP = +5m.2s., i = +5m.49s., e = +6m.31s., SS = +8m.56s.
Prague i = +4m.45s.
Rome iZ = +4m.44s., iE = +4m.49s., iZ = +4m.54s., i = +4m.59s., iPPPZ = +5m.8s., iZ = +5m.23s., iE = +5m.27s. and +5m.32s., i = +5m.40s.
Tashkent i = +5m.8s.
Jena ePE = +4m.59s., iPN = +5m.3s., iPE = +5m.7s., iSE = +9m.23s.
Stuttgart eL_g = +10m.44s.
Göttingen i = +5m.23s.
Copenhagen i = +9m.53s.
Strasbourg iZ = +5m.39s., PPPN = +6m.6s., eN = +6m.51s., iSN = +9m.57s.
Upsala iPPP = +6m.6s.
Besançon i = +5m.44s.
Heligoland iN = +10m.20s.
Uccle i = +6m.3s., iE = +6m.45s. and +10m.43s.
Clermont-Ferrand PP = +5m.44s., PPP = +5m.58s.
Paris i = +6m.11s., SS = +12m.37s.
Kew iPPPZ = +7m.31s., iP_cP = +9m.53s., i = +11m.32s.
Jersey i = +6m.31s.
Bidston iP_cP = +9m.56s.
Edinburgh P_cP = +9m.18s., P_cS = +12m.59s., SS = +13m.7s.
Toledo i = +6m.44s., +9m.17s., +10m.20s., and +12m.12s., SS = +14m.29s.
Granada P_cPE = +9m.46s., iSE = +12m.35s., P_cSE = +13m.31s., SSN = +14m.35s.
Agra eN = +6m.52s., PP = +8m.34s., PPP = +9m.40s., P_cSEN = +12m.48s., sS?EN = +13m.54s., iN = +15m.55s., SSEN = +16m.31s.
Bombay i?EN = +7m.19s., iE = +7m.22s., iN = +7m.27s., +7m.44s., +8m.47s., +9m.6s., +13m.17s., +13m.29s., and +14m.17s.
San Fernando iN = +7m.13s., iPPPE = +8m.23s.
Hyderabad PSN = +14m.45s., SSN = +17m.2s.
Scoresby Sund iP = +8m.27s. and +8m.37s., i = +8m.45s., +9m.20s., +10m.17s.. and +10m.23s., iPPP = +10m.27s., i = +10m.37s., +14m.23s., +15m.12s., +15m.22s., and +17m.15s.
Calcutta iPPPN = +10m.35s., eSS = +18m.5s., iN = +19m.31s.

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Kodaikanal SSE = +18m.36s.
Ivigtut iP = +10m.1s., iPP = +11m.40s., PPP = +13m.12s., i = +14m.36s., +16m.50s., +17m.34s., and +17m.45s., iS_cS = +19m.25s., i = +20m.10s., iSS = +21m.9s.
Tananarive EN = +18m.30s., PSEN = +18m.51s., SSN = +22m.12s., N = +22m.30s., SSSE = +24m.33s.
Hong Kong PP = +13m.35s., SS = +26m.29s.
Zi-ka-wei iZ = +10m.55s. and +16m.11s.
Zinsen PPP = +14m.47s., i = +23m.23s., SSS = +27m.27s.
Vladivostok iP = +10m.56s.
Johannesburg ePPN = +13m.2s., e?N = +13m.38s. and +15m.2s., e?E = +21m.32s., i?N = +22m.32s., eSSE = +24m.2s.
Halifax i = +11m.52s., SS = +25m.14s.
Kobe PP = +16m.24s., SS = +27m.2s., SSS = +31m.27s.
Muroto PPP = +15m.59s., SS = +24m.57s., SSS = +29m.29s.
East Machias ePPP = +16m.40s., S = +21m.20s., iS_cS = +21m.47s., i = +21m.57s., iSS = +26m.8s., i = +26m.32s.
Mizusawa eSN = +22m.3s.
Seven Falls i = +11m.58s., SS = +26m.38s., SSS = +29m.56s.
Sendai PS = +24m.20s.
Tokyo Cen. Met. Ob. PPP = +17m.18s., PS = +23m.26s., SS = +28m.43s., SSS = +31m.55s.
Shawinigan Falls i = +11m.49s.
College eP = +12m.49s., iS = +22m.1s., iS_cS = +22m.16s., iSS = +27m.17s., iSSS = +29m.45s.
Cape Town PE = +12m.20s., PS = +22m.36s., SSE = +26m.28s.
Vermont eS = +21m.49s., S = +22m.4s., iS_cS = +22m.14s., iSS = +27m.0s., iSSS = +30m.43s.
Harvard eN = +13m.17s.
Ottawa iZ = +12m.1s., SS = +27m.14s., SSS = +30m.14s.
Williamstown iP = +12m.5s., i = +14m.12s., iPP = +14m.44s., iPPP = +16m.34s., eSS = +26m.26s., eSSS = +29m.33s.
Fordham iZ = +12m.31s., +12m.56s., +14m.43s., and +16m.19s., i = +22m.37s.
Toronto i = +12m.18s. and +18m.45s.
Philadelphia iP = +12m.38s., i = +24m.7s., iSS = +27m.10s.
Pennsylvania i = +13m.9s., e = +32m.8s.
Georgetown iP = +12m.29s.
Pittsburgh iPZ = +12m.33s. and +12m.37s., iZ? = +12m.54s., i? = +14m.6s., +16m.41s., +18m.2s., +19m.26s., +19m.50s., +21m.39s., +21m.57s., and +22m.24s.
Sitka P = +12m.48s., iS = +22m.55s., iS_cS = +23m.25s., PS = +23m.46s., iPPS = +24m.12s., i = +27m.58s., iSS = +28m.3s.
Ann Arbor +16m.2s. and +22m.26s., eSSS = +32m.32s.
Chicago ePPP = +18m.17s., iS = +23m.20s. and +23m.28s., i = +27m.18s., iSSS = +32m.5s., i = +32m.54s.
Chicago (Loyola) i = +24m.41s. and +29m.27s.
Columbia eS = +23m.28s., iPS = +24m.12s., i = +25m.46s., +26m.47s., and +28m.12s., iSS = +29m.53s.
Florissant iE = +13m.7s., iSKKSE = +23m.54s., iE = +24m.20s.
St. Louis iN = +15m.3s., iSN = +23m.52s.
San Juan P = +13m.11s. and +13m.32s., iPPP = +18m.6s., i = +20m.55s., iS = +24m.9s., iPS = +24m.45s., SS = +30m.6s., SSS = +34m.0s.
Lincoln S = +24m.4s., iS = +24m.10s.
Spokane iN = +14m.37s., eSKKSN = +23m.56s., iN = +24m.59s., iEN = +26m.39s.
Bozeman eP = +13m.37s., iS = +24m.10s., iSSS = +32m.32s., i = +35m.6s.
Victoria iS = +23m.44s.
Butte ePP = +17m.2s., iS = +24m.17s., i = +28m.59s. and +32m.54s.
Seattle S_cS = +24m.32s., PPS = +26m.32s., iSS = +29m.49s., eSSS = +33m.45s.
Denver eN = +17m.15s., +21m.11s., and +22m.7s., eE = +23m.30s., eN = +23m.59s. and +24m.9s., eSKKSE = +24m.38s.
Salt Lake City eP = +13m.56s., PPP = +19m.58s., iPS = +25m.53s., i = +29m.13s. and +29m.41s., iSS = +30m.56s., iSSS = +34m.36s., i = +36m.49s.
Ferndale eEN = +36m.44s. and +45m.26s.
Ukiah ePPP = +20m.4s., ePS = +26m.32s., iPPS = +27m.22s., eSS = +32m.12s., eSSS = +36m.17s.
Perth i = +18m.44s., +21m.2s., +22m.4s., +22m.44s., and +27m.59s., PP = +28m.54s., PPP = +30m.58s., PPPP = +32m.44s., PPPPP = +33m.44s., PS = +37m.1s., PPS = +37m.56s., SS = +42m.9s., i = +44m.6s., SSS = +48m.7s., i = +48m.59s., SSSS = +50m.24s., i = +51m.41s., +52m.24s., and +55m.49s.
Berkeley ePEN = +14m.28s., eE = +14m.35s., ePKPE? = +17m.41s., eN = +19m.33s. and +30m.55s., eEN = +34m.14s.
Lick eN = +18m.59s.
Branner eEN = +29m.14s., eE = +32m.14s. and +44m.14s.
Fresno eN = +33m.14s.
Tucson eP = +14m.13s., PPP = +20m.35s., SKKS = +25m.15s., iS = +25m.49s., PS = +27m.2s., iPPS = +28m.4s., eSS = +32m.47s., SS = +32m.54s., ePSPS = +33m.46s., iSSS = +37m.14s.
Pasadena ePKPZ = +17m.36s., ePSN = +27m.21s., iPKKPZ = +30m.12s., eSSN = +32m.56s.

Continued on next page.

Palomar ePKKPZ = +30m.32s.
La Paz PSZ = +29m.28s., SSN = +35m.9s., SSSN = +39m.54s.
La Plata SS = +36m.32s., SSS = +40m.32s.
Huancayo PP = +20m.17s., iPP = +21m.3s., iPPP = +22m.53s., iSKKS = +26m.31s., iS = +27m.41s. and +28m.9s., iPS = +29m.37s., iSS = +36m.13s.
Adelaide P = +24m.32s., SKS = +31m.34s., PS = +35m.44s., SS = +41m.44s.
Honolulu P = +15m.25s., PPP = +22m.23s., PPS = +30m.56s., SS = +35m.58s., i = +37m.30s. and +43m.22s.
Melbourne i = +30m.24s. and +32m.9s.
Riverview eE = +20m.24s., iN = +24m.0s.
Sydney e = +20m.2s.
Apia eSS? = +41m.44s.?
Christchurch iZ = +19m.49s., SKKSE = +31m.12s., SKSPE = +34m.41s., PPS = +36m.3s., SSS = +47m.40s.
Arapuni e = +40m.8s.
Wellington PKP$_2$Z = +20m.36s., PP = +22m.54s., PPS?Z = +35m.59s., i = +56m.52s., L_Q = +60·7m.

Dec. 26d. Readings also at 0h. (Samarkand (2)), 2h. (Manila), 3h. (Agra), 4h. (Sotchi (2) and Samarkand (2)), 6h. (Huancayo), 7h. (Tucson, Palomar (2), Pasadena (2), Haiwee (2), Tinemaha (2), Fresno (2), Lick (2), Berkeley (2), and Branner (2)), 9h. (Tchimkent), 10h. (Calcutta, Manila, Sverdlovsk, and Irkutsk), 11h. (Harvard), 12h. (near Mizusawa), 17h. (Tacubaya), 19h. (near Mizusawa, Grozny, Erevan, and near Baku), 23h. (Sotchi (2)).

Dec. 27d. 0h. Undetermined shock. Epicentre probably in Turkey.
Stuttgart eNE = 50m.46s. and 51m.23s., iS = 55m.46s.
Zurich eP = 50m.47s.
Basle eP = 50m.59s., eS = 55m.19s.
Erevan eP = 51m.21s., e = 51m.41s., eS$_g$ = 52m.11s.
Sotchi iP = 51m.40s., i = 51m.50s., 51m.52s., 52m.13s., and 52m.25s., S$_g$ = 52m.54s.
Piatigorsk e = 52m.0s.
Grozny P = 52m.23s., eS* = 53m.35s., eS$_g$ = 53m.58s.
Belgrade ePZ = 54m.16s.$_a$, iS = 59m.11s.
Rome iPZ = 55m.15s.$_a$, i = 55m.29s., and 55m.57s., eS = 59m.24s.
Samarkand P = 55m.17s.
Copenhagen eP = 55m.52s.
Strasbourg e = 55m.53s.
Andijan P = 56m.12s.
Frunse eP = 56m.29s.
Long waves were also recorded at Fordham.

Dec. 27d. 2h. 48m. 25s. Epicentre 39°·6N. 38°·1E.

A = +·6080, B = +·4767, C = +·6349; δ = 0; h = −2;
D = +·617, E = −·787; G = +·500, H = +·392, K = −·773.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sotchi		4·1	14	i 1 2	− 3	i 1 46	− 9	i 1 14	P*	—
Erevan		5·0	80	1 34	P$_g$	2 52	S$_g$	—	—	—
Grozny		6·8	55	e 1 47	+ 3	e 3 33	S*	—	—	—
Bucharest		10·1	303	e 2 41	PP	5 5	S*	—	—	6·3
Helwan		11·2	212	i 2 50k	+ 6	—	—	i 3 2	PPP	—
Belgrade	Z.	14·1	298	e 4 24k	+61	e 7 53	L	—	—	(e 7·9)
Moscow		16·2	359	e 3 48	− 2	e 6 51	0	—	—	—
Triest		18·9	299	i 4 24k	0	e 8 14	SS	4 45	PP	e 9·6
Rome		19·5	286	i 4 31$_a$	0	i 8 13	+ 7	i 5 0	PP	—
Pulkovo		20·8	350	4 40	− 5	8 27	− 6	—	—	10·1
Jena		21·7	310	e 4 53	− 2	e 8 53	+ 2	—	—	—
Chur		21·9	301	e 4 58	+ 1	e 8 55	+ 1	—	—	—
Samarkand		22·2	80	5 3	+ 3	—	—	—	—	—
Stuttgart		22·5	305	e 5 1	− 1	e 9 7	+ 2	—	—	—
Sverdlovsk		22·7	33	i 5 3	− 1	—	—	—	—	13·6
Zurich		22·7	301	e 5 2	− 2	e 9 11	+ 2	—	—	—
Copenhagen		23·4	323	i 5 9	− 2	—	—	—	—	—
Basle		23·4	301	e 5 11	0	e 9 25	+ 4	—	—	—
Strasbourg		23·4	304	e 5 17	+ 6	—	—	—	—	—
Neuchatel		23·7	300	e 5 13	− 1	—	—	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tchimkent		23·9	72	5 13	− 3	9 35	+ 5	—	—	—
Upsala		24·0	335	i 5 25	+ 8	9 39	+ 7	i 5 53	PP	e 13·2
Uccle		26·0	308	e 5 41	+ 5	—	—	—	—	—
Andijan		26·1	75	e 5 37	0	—	—	—	—	—
Clermont-Ferrand		26·3	296	e 5 18	−21	—	—	—	—	—
Frunse		27·5	70	e 5 49	− 1	—	—	—	—	—
Bergen	E.	29·1	328	e 7 35?	PPP	—	—	—	—	—
Almata		29·2	68	6 3	− 2	—	—	—	—	—
Williamstown		77·1	315	(i 11 55)	− 2	i 11 55	P	—	—	—
Fordham		78·8	314	i 12 6	0	—	—	—	—	e 35·9
Tucson		102·9	334	e 14 1	0	—	—	—	—	—

Additional readings :—
Grozny e = +2m.46s.
Triest PPP = +4m.56s., SS = +9m.50s.
Rome iE = +4m.48s., iZ = +5m.17s., iE = +5m.30s.
Jena eSZ = +8m.59s.
Fordham i = +12m.13s.

Dec. 27d. 3h. 2m. 29s. Epicentre 3°·6S. 134°·5E.

A = −·6996, B = +·7119, C = −·0622 ; δ = +11 ; h = +7 ;
D = +·713, E = +·701 ; G = +·044, H = −·044, K = −·998.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Palau		10·9	357	2 43	+ 3	4 58	+14	—	—	—
Manila		22·5	324	i 5 6k	+ 4	i 9 22	+17	—	—	—
Adelaide		31·4	174	i 6 25	0	11 27	− 5	7 21	PP	17·9
Perth		33·2	210	7 33	PP	12 4	+ 4	14 31	SSS	17·3
Riverview		33·9	155	e 6 57	+10	i 12 5	− 6	—	—	19·7
Sydney		33·9	155	—	—	e 12 1	−10	—	—	e 16·3
Melbourne		35·4	166	e 7 1	+ 1	i 12 15	−19	i 15 1	SS	17·9
Miyazaki		35·4	356	7 0	0	12 18	−16	—	—	—
Nagasaki		36·4	355	7 9	+ 1	—	—	—	—	—
Zi-ka-wei		36·8	342	e 7 11	0	i 15 46	SSS	i 8 51	PPP	18·5
Hukuoka		37·2	355	e 7 19	+ 4	—	—	—	—	—
Osaka		38·0	2	7 12	− 9	13 44	+30	—	—	—
Tokyo Cen. Met. Ob.		39·4	8	7 34	+ 1	—	—	—	—	—
Nagano		40·2	5	7 37	− 3	14 4	+16	—	—	—
Wazima		40·8	4	7 44	− 1	—	—	—	—	—
Sendai		42·1	9	7 45	−10	14 1	−15	—	—	—
Mizusawa		42·9	9	e 7 57	− 5	e 14 16	−11	—	—	—
Akita		43·4	7	8 6	0	14 57	+22	—	—	—
Mori		45·8	7	8 22	− 3	—	—	—	—	—
Vladivostok		46·6	357	8 30	− 3	15 19	− 2	—	—	24·1
Wellington		52·1	143	e 8 31?	−43	—	—	—	—	27·5
Irkutsk		61·2	339	10 20	+ 1	18 38	0	—	—	31·5
Almata		69·6	320	e 11 16	+ 3	—	—	—	—	—
Tchimkent		74·2	317	11 38	− 2	—	—	—	—	—
Samarkand		75·2	313	11 46	0	—	—	—	—	—
Sverdlovsk		84·2	329	i 12 36	+ 2	i 23 57	PS	—	—	—
College		88·0	25	e 12 48	− 5	e 23 53	+17	e 13 11	pP	e 36·1
Tinemaha	z.	105·9	53	e 14 12	P	—	—	—	—	—
Haiwee	z.	106·3	54	e 14 11	P	—	—	e 18 26	PP	—
Pasadena	z.	106·7	56	e 14 11	P	—	—	—	—	—
Palomar	z.	107·5	57	e 18 45	PP	—	—	—	—	—
Tucson		112·7	57	e 14 40	P	e 25 10	[−13]	e 19 37	PP	e 46·1
Balboa Heights		145·8	80	e 19 38	[− 2]	—	—	—	—	—

Additional readings :—
Adelaide i = +6m.41s., SS = +12m.31s., ScS = +17m.2s.
Perth PPP = +7m.56s.
Melbourne i = +16m.19s.
Zi-ka-wei iN = +7m.28s., SZ = +10m.56s.
Mizusawa eSE = +14m.20s.
Sverdlovsk i = +12m.53s.
College ePPP = +18m.11s., esS = +23m.59s., eSS = +28m.45s.
Tucson eP = +14m.44s., ePKP = +18m.15s., ePPP = +21m.57s., eS = +27m.2s., ePS = +28m.49s., ePPS = +30m.15s.
Long waves were also recorded at La Plata.

Dec. 27d. 19h. 28m. 48s. Epicentre 33°·8N. 118°·1W.

Intensity VI at Long Beach and Huntington Park. Epicentre 33°47′N. 118°08′W. (Los Angeles). Macroseismic area 2500 sq. miles.

R. Bodle.

United States Earthquakes, 1939, Washington, 1941, p. 20, Chart p. 63.

A = −·3922, B = −·7345, C = +·5537; δ = −11; h = +1;
D = −·882, E = +·471; G = −·261, H = −·488, K = −·833.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.	
		°	°	m. s.	s.	m. s.	s.	m. s.	
Pasadena		0·3	350	i 0 9k	− 2	—	—	—	—
Mount Wilson		0·4	5	i 0 10k	− 3	i 0 17	− 4	—	—
Riverside		0·6	72	i 0 15a	0	i 0 27	+ 1	—	—
Palomar	Z.	1·1	114	i 0 23a	+ 1	—	—	—	—
La Jolla		1·2	143	i 0 23	− 1	i 0 39	− 2	—	—
Santa Barbara		1·4	296	i 0 28	+ 1	e 0 46	0	—	—
Haiwee		2·3	3	i 0 41	+ 1	i 1 16	S_g	—	—
Fresno	N.	3·2	335	e 0 54	+ 2	e 1 40	S*	—	—
Lick		4·6	322	e 1 17	+ 5	e 2 33	S_g	e 1 29	P_g
Branner		4·9	319	e 1 14	− 3	e 2 17	+ 2	—	—
Tucson		6·3	102	e 1 38	+ 2	3 20	S*	e 2 8	P*

Dec. 27d. 20h. 0m. 49s. Epicentre 40°·8N. 36°·8E.

A = +·6079, B = +·4548, C = +·6509; δ = +6; h = −2;
D = +·599, E = −·801; G = +·521, H = +·390, K = −·759.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sotchi	3·5	37	e 0 58	+ 1	e 1 49	+ 9	—	—	—
Piatigorsk	5·7	53	e 1 43	P*	i 2 19	−16	i 2 57	S*	—
Erevan	5·9	92	1 29	− 2	—	—	e 2 16	?	—
Ksara	7·0	186	e 2 4	P*	i 3 32	S*	—	—	—
Grozny	7·1	67	e 1 50	+ 2	i 3 3	− 7	—	—	—
Baku	10·0	86	e 2 49	PPP	e 4 26	+ 4	—	—	—
Rome	18·3	280	—	—	e 7 23	−16	—	—	e 12·3
Sverdlovsk	22·3	36	e 4 58	− 3	e 8 55	− 7	—	—	21·2
Tashkent	24·4	79	e 3 19	?	—	—	—	—	—

Additional readings:—
Piatigorsk i = +3m.25s. and +3m.45s.
Grozny e = +2m.38s.
Tashkent i = +3m.56s. and +4m.57s.
Long waves were also recorded at Helwan.

Dec. 27d. 22h. 34m. 8s. Epicentre 40°·8N. 36°·8E. (as at 20h.).

A = +·6079, B = +·4548, C = +·6509; δ = +6; h = −2;
D = +·599, E = −·801; G = +·521, H = +·390, K = −·759.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sotchi	3·5	37	e 0 56	− 1	i 1 38	− 2	—	—	—
Piatigorsk	5·7	53	1 20	− 8	2 32	− 3	—	—	—
Erevan	5·9	92	2 15	P_g	e 3 29	S_g	—	—	—
Ksara	7·0	186	i 1 45	− 1	i 3 35	S*	—	—	—
Grozny	7·1	67	e 1 58	P*	3 8	− 2	3 31	S*	—
Bucharest	8·7	298	e 2 28	P*	i 4 22	S*	4 56	S_g	—
Baku	10·0	86	e 2 32	+ 5	i 4 32	+10	—	—	5·5
Cernauti	10·8	318	e 2 22	−17	3 57	−45	—	—	—
Helwan	11·8	204	2 55	+ 2	e 5 10	+ 4	e 3 7	PP	—
Moscow	15·0	3	e 3 37	+ 2	e 6 29	+ 6	—	—	—
Triest	17·5	294	i 4 9	+ 2	i 7 17	− 4	4 21	PP	e 9·0
Rome	18·3	280	i 4 18	+ 1	i 7 49	+10	i 4 53	PP	e 9·8
Pulkovo	19·4	351	e 4 29	− 1	8 12	+ 8	—	—	—
Stuttgart	21·1	303	e 4 51	+ 3	e 8 49	+10	—	—	—
Zurich	21·2	298	e 4 51	+ 2	e 8 51	+10	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Copenhagen		21·8	322	e 4 57	+ 1	9 7	+15	—	—	—
Basle		21·9	298	e 4 57	0	e 9 1	+ 7	—	—	—
Sverdlovsk		22·3	36	e 5 2	+ 1	i 9 7	+ 5	—	—	10·9
De Bilt	Z.	24·3	309	—	—	i 10 30	SS	—	—	—
Tchimkent		24·5	76	5 54	PP	—	—	—	—	—
Uccle		24·6	305	—	—	9 52	+10	—	—	e 12·9
Andijan		26·8	79	6 4	PP	11 6	SS	—	—	—
Irkutsk		46·2	51	—	—	e 17 52?	SS	—	—	e 28·9
Calcutta	N.	46·8	97	—	—	e 15 20	− 4	—	—	—

Additional readings :—
Piatigorsk S = +2m.4s.
Grozny e = +2m.48s.
Bucharest E = +2m.34s., SEN = +4m.9s., S*E = +4m.35s.
Triest PPP = +4m.28s., eSS = +8m.27s.
Rome iE = +5m.3s., iS = +7m.58s.
Sverdlovsk iP = +5m.9s., iS = +9m.15s.
Long waves were also recorded at Budapest, Belgrade, and Granada.

Dec. 27d. Readings also at 0h. (Sotchi), 1h. (Sotchi (3), Erevan, and Rome), 2h. (Sotchi, Erevan (3), Grozny (3), Sitka, Pasadena, Palomar, Rome, College, Balboa Heights, and Tucson (2)), 3h. (La Paz, Ksara (2), Sotchi (5), Erevan (4), Grozny (3), Rome, and near Tananarive), 4h. (Sotchi), 5h. (Triest, Bucharest, Ksara, Sotchi (2), and Grozny), 6h. (Ksara, Sotchi (2), Grozny, Baku, and Sverdlovsk), 7h. (Ksara, Sotchi (3), Erevan, Grozny (2), Baku, Sverdlovsk, and near Tananarive), 8h. (near Hukuoka, Ksara, Sotchi (2), Erevan, and Grozny), 10h. (Ksara, Sotchi, Erevan, and Grozny), 11h. (near Samarkand and Sotchi), 12h. (Fordham, Ksara, Sotchi, Erevan, and Grozny), 13h. (New Plymouth, near Wellington, and Christchurch), 15h. (Ksara), 18h. (Ksara, Sotchi (2), Erevan, Grozny, and Piatigorsk), 19h. (near Branner, Ksara, Sotchi (2), Erevan, Grozny, Baku, Sverdlovsk, and Piatigorsk), 20h. (near Granada), 21h. (Manila), 22h. (Baku, Sotchi, Piatigorsk, Erevan, Ksara, Grozny, Rome, Tashkent, Sverdlovsk, and Triest), 23h. (Sotchi, Grozny, Triest, Vera Cruz, Oaxaca, St. Louis, Tinemaha, Williamstown, Mount Wilson (2), La Jolla, Haiwee (2), Tucson, Christchurch, Pasadena (2), and Palomar (2)).

Dec. 28d. 0h. Undetermined shock.

Melbourne e = 2m.22s., L = 10·3m.
Huancayo e = 2m.36s.
Riverview ePEN = 2m.45s., iSEN = 7m.17s., eLN = 9·3m.
Vladivostok e = 3m.5s., 4m.53s., and 6m.42s., i = 6m.50s., 14m.43s., 16m.26s., and L = 23·5m.
Christchurch S = 3m.42s., eL_g = 11m.8s., L_r = 14m.30s.
Adelaide eP = 3m.50s., e? = 8m.50s., 10m.6s., and 10m.51s.
Sydney e = 6m.24s., eL = 9·2m.
Irkutsk e = 8m.57s., 18m.35s., and 27m.0s., eL = 34·0m.
Pasadena iP = 9m.42s.a, iZ = 10m.9s., eLEZ = 37·2m.
Mount Wilson iPNZ = 9m.43s.a.
Haiwee iP = 9m.45s., eZ = 10m.11s.
La Jolla eP = 9m.45s.
Riverside ePEN = 9m.45s.
Tinemaha ePEN = 9m.45s.
Palomar iPZ = 9m.51s., iZ = 10m.17s.
Tucson eP = 10m.9s.
Andijan eP = 10m.15s.
Arapuni e = 11m.0s.?
Perth i = 11m.40s. and 12m.5s., P_cS = 15m.5s., S = 15m.30s., i = 17m.25s., 18m.20s., and 20m.10s., iL = 20·8m.
Ottawa iZ = 15m.38s., L = 56·0m.
Williamstown i = 15m.42s.
Granada ePKP = 16m.6s.k, eL = 81·0m.
Toledo e = 16m.26s., eP = 16m.28s., e = 22m.0s.
Colombo eE = +18m.0s.
Ksara e = 18m.59s., L = 66·5m.
Sverdlovsk e = 21m.25s.
Tashkent e = 39m.48s.
Long waves were also recorded at Wellington, De Bilt, Paris, Florissant, Baku, Balboa Heights, and La Paz.

Dec. 28d. 2h. 23m. 22s. Epicentre 40°·8N. 36°·8E. (as on 1939 Dec. 27d.).

$A = +·6079$, $B = +·4548$, $C = +·6509$; $\delta = +6$; $h = -2$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sotchi		3·5	37	e 0 50	− 7	1 32	− 8	—	—	—
Piatigorsk		5·7	53	e 1 24	− 4	i 3 16	S_g	—	—	—
Erevan		5·9	92	e 2 15	P_g	e 3 23	S_g	—	—	—
Ksara		7·0	186	e 1 51	+ 5	3 39	S*	—	—	—
Grozny		7·1	67	e 1 55	+ 7	—	—	—	—	—
Bucharest		8·7	298	e 2 14	+ 4	3 56	+ 6	e 2 20	PP	—
Cernauti		10·8	318	e 1 52	−47	3 52	−50	—	—	—
Rome	z.	18·3	280	e 4 21	+ 4	—	—	—	—	—
Copenhagen		21·8	322	e 4 54	− 2	—	—	—	—	—
Strasbourg		22·0	302	5 8	+10	—	—	—	—	—
Sverdlovsk		22·3	36	i 5 3	+ 2	e 9 2	0	—	—	13·6

Additional reading :—
Bucharest S?EN = +4m.17s.

Dec. 28d. 3h. 25m. 20s. Epicentre 40°·0N. 37°·0E.

$A = +·6135$, $B = +·4623$, $C = +·6402$; $\delta = -4$; $h = -2$;
$D = +·602$, $E = -·799$,; $G = +·511$, $H = +·385$, $K = -·768$.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sotchi		4·1	28	i 0 58	− 7	i 1 41	−14	1 27	P_g	—
Erevan		5·8	85	e 2 3	P_g	3 16	S_g	—	—	—
Piatigorsk		6·1	46	e 1 27	− 7	i 2 34	−11	—	—	—
Ksara		6·3	190	e 1 44	+ 8	3 40	S_g	—	—	—
Grozny		7·3	60	e 2 1	P*	e 2 55	−20	2 28	P_g	—
Bucharest		9·2	302	e 2 17a	+ 1	4 5	+ 2	e 2 21	PP	—
Helwan		11·1	206	i 2 46a	+ 3	i 5 6	+17	2 55	PP	—
Cernauti		11·5	320	e 2 2	−46	4 9	−50	—	—	—
Belgrade		13·1	297	i 3 11a	+ 1	i 5 50	+12	—	—	i 7·0
Szeged		13·8	303	e 3 24	+ 5	e 6 26	SSS	—	—	e 10·2
Kecskemet	z.	14·3	304	e 3 30	+ 4	(e 6 10)	+ 4	e 4 7	PPP	e 6·2
Budapest		15·0	304	3 32	− 3	(e 6 30)	+ 7	—	—	6·5
Moscow		15·8	2	e 3 31	−14	6 13	−29	—	—	10·2
Triest		17·9	296	4 15	+ 3	7 32	+ 2	4 31	PP	8·5
Rome		18·6	283	i 4 21a	0	e 7 49	+ 3	i 4 46	PP	—
Prague		18·8	311	4 16a	− 7	7 46	− 4	—	—	e 10·7
Pulkovo		20·2	350	i 4 33	− 6	e 8 1	−20	—	—	9·9
Jena		20·8	309	i 4 39	− 6	e 8 34	+ 1	—	—	e 11·7
Stuttgart		21·6	304	e 4 50	− 4	i 9 3	+14	i 5 8	PP	e 13·0
Zurich		21·8	300	e 4 52	− 4	e 8 56	+ 4	—	—	—
Moncalieri		22·1	294	e 4 55	− 4	—	—	—	—	9·0
Basle		22·4	300	e 5 0	− 2	e 9 7	+ 3	—	—	—
Strasbourg		22·5	303	e 5 3	+ 1	e 9 8	+ 3	—	—	12·7
Copenhagen		22·6	323	i 5 0	− 3	9 4	− 3	—	—	—
Hamburg		22·8	316	e 5 4	− 1	e 9 15	+ 4	—	—	e 13·5
Sverdlovsk		22·8	299	e 5 2	− 3	i 9 9	− 2	—	—	14·4
Neuchatel		22·8	299	e 5 3	− 2	e 9 22	+11	—	—	—
Samarkand		23·0	82	5 29	PP	e 9 19	+ 5	—	—	—
Upsala		23·3	334	5 9	− 1	e 9 10	−10	5 42	PP	e 11·7
Besançon		23·5	298	e 5 20	+ 8	i 9 32	+ 9	—	—	12·7
Heligoland		24·2	315	e 5 16	− 3	e 9 41	+ 6	—	—	e 15·1
Tashkent		24·5	76	e 5 21	− 1	i 9 32	− 8	i 6 11	PPP	—
Tchimkent		24·6	74	5 26	+ 3	9 48	+ 6	—	—	—
De Bilt		25·0	310	5 26a	± 1	9 56	+ 7	i 10 45	SS	—
Uccle		25·1	306	e 5 27	− 1	9 55	+ 4	—	—	e 12·2
Clermont-Ferrand		25·4	294	e 4 51	−40	—	—	—	—	—
Paris		26·0	301	e 5 33	− 3	e 10 2	− 4	e 12 46	SSS	e 13·7
Andijan		26·8	77	5 42	− 2	e 10 27	+ 8	—	—	—
Frunse		28·2	72	e 6 33	PP	—	—	—	—	—
Kew		28·2	307	i 5 54	− 2	e 10 45	+ 4	—	—	e 17·2

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Bergen		28·3	328	—	—	e 10 40?	− 3	—	—	—
Jersey		29·0	303	e 5 40?	−24	e 11 40?	+46	—	—	17·7
Almata		29·8	69	e 6 57	PP	—	—	—	—	—
Stonyhurst		29·9	312	—	—	11 21	+12	—	—	19·7
Bidston		30·2	310	—	—	e 10 42	−31	—	—	e 16·7
Toledo		31·3	282	i 6 21	− 3	11 29	− 2	e 7 21	PP	—
Granada		31·7	279	e 6 43	+16	e 12 16	PP	7 38	PP	16·4
Semipalatinsk		31·8	56	e 7 11	PP	—	—	—	—	—
Agra	E.	36·2	98	i 7 7k	+ 1	12 57	+10	8 28	PP	—
Bombay		37·3	114	e 7 20	+ 4	i 13 22	+18	i 8 53	PP	i 21·6
Hyderabad		42·2	109	8 3	+ 7	14 23	+ 6	9 49	PP	21·1
Kodaikanal	E.	46·5	118	e 8 36	+ 5	—	—	—	—	—
Calcutta	N.	46·6	96	e 8 19	−13	i 15 23	+ 2	e 18 38	SS	i 23·6
Irkutsk		46·6	51	8 34	+ 2	15 20	− 1	—	—	20·7
Colombo	E.	50·5	119	9 2	0	—	—	—	—	25·2
Zi-ka-wei	Z.	66·8	68	e 8 46	?	—	—	—	—	—
Vladivostok		67·2	52	e 10 58	0	e 19 49	− 3	—	—	e 38·1
Williamstown		76·3	315	i 11 57	+ 5	—	—	—	—	—
Huancayo		114·7	275	e 14 50	P	e 29 50	PS	e 39 22	SSS	—

Additional readings :—
Sotchi P* = +1m.3s., S* = +1m.32s.
Piatigorsk e = +2m.30s.
Grozny S_g = +3m.32s.
Bucharest iE = +3m.1s., eE = +3m.22s., eN = +3m.40s., SN = +4m.8s., SE = +4m.40s.
Helwan SSN = +5m.17s., SSE = +5m.44s.
Belgrade iZ = +3m.16s.
Szeged eE = +4m.37s.
Budapest PN = +3m.35s.
Triest PPP = +4m.42s., i = +4m.55s. and +6m.31s.
Rome iP = +4m.24s.k, iZ = +5m.5s., iSEZ = +7m.56s., iN = +11m.11s., iE = +12m.34s. and +17m.4s.
Pulkovo iP = +5m.7s., iS = +9m.14s.
Jena eSN = +8m.40s.
Stuttgart iNW = +4m.56s.
Strasbourg ePZ = +5m.6s.
Copenhagen i = +9m.13s.
Hamburg eSN = +9m.18s.
Sverdlovsk iP = +5m.7s., iS = +9m.14s., L_q = +11·9m.
Upsala iS = +9m.27s., SSN = +10m.33s.
Tashkent i = +9m.3s.
Kew iEZ = +10m.57s.
Granada SS = +14m.21s.
Agra SSE = +15m.32s.
Bombay iE = +15m.56s., iL_qE = +17m.48s.
Hyderabad SE = +14m.28s., S_cSN = +17m.55s.
Huancayo eP = +15m.4s.
Long waves were also recorded at Cape Town, Edinburgh, Chicago, Bozeman, La Paz, Harvard, and Scoresby Sund.

Dec. 28d. 12h. 15m. 35s. Epicentre 35°·8N. 120°·3W. (as given by Pasadena).

A = −·4101, B = −·7019, C = +·5823 ; δ = −8 ; h = 0 ;
D = −·863, E = +·505 ; G = −·294, H = −·503, K = −·813.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Fresno	N.	1·0	24	i 0 20	− 1	—	—	—	—	—
Santa Barbara		1·4	161	i 0 29	+ 2	—	—	—	—	—
Lick		1·7	325	i 0 30	− 1	i 0 51	− 3	—	—	—
Haiwee		1·9	80	i 0 36a	+ 2	i 1 7	S_g	—	—	—
Santa Clara	Z.	2·0	319	e 0 33	− 2	i 1 5	+ 3	—	—	—
Tinemaha		2·0	52	i 0 56	S	(i 0 56)	− 6	—	—	—
Branner		2·2	317	e 0 35	− 3	—	—	i 0 40	P*	—
Mount Wilson		2·4	131	i 0 44a	+ 3	i 1 20	+ 8	—	—	—
Pasadena		2·5	133	i 0 43a	0	i 1 17	+ 3	—	—	—
Berkeley		2·6	323	i 0 39	− 5	i 1 9	− 8	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Riverside		3·0	127	e 0 51	+ 1	—	—	—	—	—
Palomar	z.	3·7	129	i 1 2	+ 2	—	—	—	—	—
Ukiah		4·0	327	e 1 2	− 2	e 1 57	+ 5	e 1 12	P*	—
Salt Lake City		8·3	50	e 2 21	P*	e 3 26	−14	—	—	e 4·2
Tucson		8·6	111	e 2 10	+ 1	3 44	− 4	e 2 53	P_g	4·3
Bozeman		12·1	33	—	—	e 5 14	0	—	—	e 6·2
Lincoln		19·2	67	e 4 31	+ 3	e 7 36	−23	—	—	e 10·5
Chicago		26·1	65	—	—	e 9 53	−14	—	—	e 12·9
East Machias		40·7	61	e 8 19	+35	—	—	e 9 5	PP	e 16·0

Additional readings :—
Lick iN = +34s.
Santa Clara 1Z = +36s.
Branner 1N = +44s.
Berkeley ePEN = +43s.
Ukiah eS = +2m.5s.
Bozeman eS = +4m.45s.
Long waves were also recorded at Philadelphia, Butte, Baku, and Sverdlovsk.

Dec. 28d. 17h. 40m. 43s. Epicentre 40°·8N. 36°·8E. (as at 2h.).

A = +·6079, B = +·4548, C = +·6509 ; δ = +6 ; h = −2.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Sotchi	3·5	37	e 1 1	+ 4	e 1 53	S_g	—	—	—
Piatigorsk	5·7	53	e 1 33	+ 5	e 2 25	−10	e 2 53	S*	—
Erevan	5·9	92	e 2 7	P_g	e 3 9	S_g	—	—	—
Ksara	7·0	186	e 1 43	− 3	i 3 33	S*	—	—	—
Grozny	7·1	67	1 50	+ 2	3 10	0	e 2 16	P_g	—
Baku	10·0	86	e 2 45	PP	e 4 41	SS	—	—	5·3
Sverdlovsk	22·3	36	e 4 56	− 5	9 3	+ 1	—	—	11·3

Additional readings :—
Piatigorsk e = +2m.11s.
Long waves were also recorded at Helwan and Rome.

Dec. 28d. 19h. 9m. 53s. Epicentre 39°·7N. 39°·7E. (as on 1939 Dec. 26d.).

A = +·5936, B = +·4928, C = +·6362 ; δ = −4 ; h = −2.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Erevan	3·7	80	e 1 2	+ 2	e 2 19	S_g	—	—	—
Sotchi	3·9	0	e 1 6	+ 4	1 49	− 1	—	—	—
Piatigorsk	5·0	28	e 1 16	− 2	e 2 51	S_g	e 1 36	P_g	—
Grozny	5·8	49	e 1 49	P*	2 59	S*	2 11	P_g	—
Ksara	6·6	209	e 1 44	+ 3	i 3 33	S_g	—	—	—
Sverdlovsk	21·9	31	4 54	− 3	8 58	+ 4	—	—	11·1

Additional readings :—
Sotchi e = +1m.36s.
Long waves were also recorded at Baku and Rome.

Dec. 28d. Readings also at 0h. (Sotchi, Tucson, Ksara, Piatigorsk, Grozny, Erevan, Rome, Baku, and Sverdlovsk), 1h. (Sverdlovsk, Baku, Rome, Erevan (2), Grozny (2), Ksara (2), and Sotchi (3)), 2h. (Sverdlovsk, Sotchi, and Grozny), 4h. (Stuttgart, Triest, Tucson, and Belgrade), 5h. (Tucson (2), Ksara, Erevan, and Sotchi (2)), 6h. (Sotchi, Erevan, Grozny, Baku, Sverdlovsk, and Ksara (2)), 7h. (Ksara, Sverdlovsk, Baku, Grozny, Erevan, Sotchi (2), Rome, Moncalieri, Triest, Istanbul, and Zurich), 8h. (Grozny, Triest, Sotchi, Erevan, Tchimkent, and near Rome), 10h. (Rome, Ksara, and Copenhagen), 11h. (Rome), 12h. (Ksara, Erevan, Sotchi (2), and Grozny), 14h. (Grozny, Sotchi, Erevan, Ksara, Rome (2), Baku, Belgrade (2), Helwan, Piatigorsk, Sverdlovsk, Sofia (2), Irkutsk, and Bucharest), 15h. (Ksara), 16h. (Tucson), 18h. (near Apia), 19h. (Tchimkent and Ksara), 21h. (Tucson), 23h. (Tucson and near Mizusawa).

Dec. 29d. 11h. 33m. 31s. Epicentre 39°·7N. 39°·7E. (as on 1939 Dec. 28d.).

$A = +\cdot5936$, $B = +\cdot4928$, $C = +\cdot6362$; $\delta = -4$; $h = -2$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Erevan		3·7	80	1 27	P_g	2 38	S_g	—	—	—
Sotchi		3·9	0	1 1	− 1	i 1 43	− 7	i 1 10	P*	—
Grozny		5·8	49	1 46	P*	2 43	+ 5	3 19	S_g	—
Ksara		6·6	209	e 1 43	+ 2	i 3 42	S_g	—	—	—
Baku		7·9	81	—	—	e 3 18	−12	e 4 8	S*	5·7
Istanbul		8·2	282	e 1 29?	−34	3 29	− 9	—	—	—
Bucharest		11·1	299	e 2 41	− 2	—	—	—	—	i 6·4
Helwan		12·0	218	i 2 54a	− 1	5 17	+ 6	3 21	PP	(7·2)
Sofia		12·7	289	e 2 11	−54	—	—	—	—	—
Cernauti		13·1	315	e 2 27	−43	—	—	—	—	—
Belgrade		15·1	296	—	—	e 6 37	SS	—	—	e 7·5
Moscow		16·1	356	3 46	− 3	6 48	− 1	—	—	—
Triest		19·9	297	8 10	S	(8 10)	− 5	8 20	SS	e 11·6
Prague		20·6	310	—	—	e 8 21	− 8	e 9 5	SS	—
Rome		20·7	285	i 4 43k	− 1	i 8 31	0	i 9 0	SS	i 9·3
Pulkovo		20·9	348	e 4 44	− 2	e 8 30	− 5	—	—	e 10·5
Sverdlovsk		21·9	31	i 5 1	+ 4	i 9 3	+ 9	—	—	10·5
Tashkent		22·5	75	e 5 4	+ 2	e 9 23	+18	—	—	—
Jena		22·6	309	e 4 57	− 6	—	—	—	—	—
Tchimkent		22·7	73	5 15	+11	9 32	+23	—	—	—
Stuttgart	N.W.	23·5	304	e 4 57	−15	e 9 21	− 2	—	—	—
Copenhagen		24·1	322	e 5 17	− 1	9 41	+ 7	—	—	—
Basle		24·4	300	e 5 17	− 4	e 9 39	0	—	—	—
Strasbourg		24·4	303	e 4 23	−58	e 9 44	+ 5	—	—	—
Hamburg		24·5	315	e 5 20	− 2	e 9 44	+ 4	—	—	e 14·5
Upsala		24·5	333	i 5 29	+ 7	9 44	+ 4	i 6 3	PP	—
Frunse		26·3	71	e 7 8	?	—	—	—	—	—
De Bilt		26·8	311	—	—	i 10 35	+16	—	—	—
Uccle		27·0	307	e 5 44	− 1	e 10 30	+ 8	—	—	e 12·5
Kew		30·0	307	—	—	e 11 29?	+19	—	—	—
Agra	E.	34·1	99	e 6 57	+ 9	—	—	—	—	—
Calcutta	N.	44·5	97	—	—	e 15 4	+13	—	—	—
Irkutsk		45·2	51	e 8 27	+ 7	e 18 36	SS	—	—	e 23·5

Additional readings :—
Sotchi i = +1m.16s., S* = +1m.26s., S = +1m.34s.
Grozny e = +2m.26s.
Baku e = +5m.6s.
Helwan PPPZ = +3m.35s., iZ = +5m.35s.,; L was given as SE.
Cernauti iEN = +2m.30s., +2m.43s., and +4m.39s.
Triest e = +7m.41s., eS = +11m.3s.
Jena e = +5m.4s.
Strasbourg e = +4m.39s.
Upsala SE = +9m.47s.
Long waves were also recorded at Stonyhurst, Bidston, and Jersey.

Dec. 29d. 13h. 18m. 15s. Epicentre 39°·7N. 39°·7E. (as at 11h.).

$A = +\cdot5936$, $B = +\cdot4928$, $C = +\cdot6362$; $\delta = -4$; $h = -2$.

		△	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Erevan		3·7	80	1 10	P*	e 2 14	S_g	—	—	—
Sotchi		3·9	0	1 1	− 1	1 52	+ 2	—	—	—
Grozny		5·8	49	1 50	P_g	2 50	S*	—	—	—
Ksara		6·6	209	1 54	P*	i 3 42	S_g	—	—	—
Baku		7·9	81	e 2 9	+10	e 3 45	S*	—	—	e 5·0
Istanbul		8·2	282	e 2 45?	P_g	4 57	L	—	—	(4·9)
Helwan	Z.	12·0	218	e 2 51	− 4	i 6 59	L	—	—	(i 7·0)
Rome		20·7	285	—	—	e 9 3	SS	i 9 45	SSS	11·5
Samarkand		21·0	81	e 6 13	?	—	—	—	—	—
Sverdlovsk		21·9	31	4 57	0	9 0	+ 6	—	—	11·2
Basle		24·4	300	e 5 20	− 1	—	—	—	—	—
Andijan		24·9	77	5 56	PP	e 11 7	SSS	—	—	—
Frunse		26·3	71	e 6 15	PP	—	—	—	—	—

Additional reading :—
Rome eN = +9m,6s,

Dec. 29d. 16h. 4m. 27s. Epicentre 39°·7N. 39°·7E. (as at 13h.).

$A = +\cdot5936$, $B = +\cdot4928$, $C = +\cdot6362$; $\delta = -4$; $h = -2$.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Erevan	3·7	80	e 1 21	P_g	—	—	—	—	—
Sotchi	3·9	0	i 0 58	− 4	1 24	?	i 1 8	P*	—
Grozny	5·8	49	e 1 54	P_g	e 3 22	S_g	—	—	—
Ksara	6·6	209	e 1 45	+ 4	i 3 36	S_g	—	—	—
Istanbul	8·2	282	e 2 33?	P*	4 34	S_g	—	—	—
Rome	20·7	285	e 7 20	?	e 9 22	SSS	—	—	—
Sverdlovsk	21·9	31	4 57	0	9 8	+14	—	—	12·5

Additional readings :—
Grozny $S_g = +3$m.27s.
Long waves were also recorded at Baku.

Dec. 29d. Readings also at 2h. (Sotchi and Erevan), 10h. (near Tananarive), 14h. (near Ksara), 16h. (Sotchi (2)), 17h. (Pasadena, Tinemaha, Haiwee, Mount Wilson, Riverside, Calcutta, Sverdlovsk, Tashkent, Tchimkent, Frunse, Balboa Heights, Huancayo, Tucson, and San Juan), 19h. (Istanbul), 20h. (San Juan, Huancayo, Balboa Heights, and Sotchi), 21h. (Tucson), 22h. (near La Paz, Sotchi, and Huancayo), 23h. (Riverview and Tucson).

Dec. 30d. Readings at 1h. (Riverview), 2h. (Riverview and Almata), 5h. (Sofia, Fresno, and Tucson), 7h. (Sverdlovsk and Triest), 9h. (near Osaka), 10h. (Berkeley, Branner, Lick, and Fresno), 12h. (Triest and Stuttgart), 13h. (Triest (3), Tucson, and Ksara), 14h. (Tucson, Apia, Tinemaha, Mount Wilson, and Pasadena), 15h. (Ksara, Fresno, Branner, Lick, Erevan, Grozny, and Sotchi), 16h. (Lincoln (2), and Triest), 19h. (near Christchurch and Wellington), 20h. (near Mizusawa), 22h. (Sotchi, Grozny, Erevan, and Ksara).

Dec. 31d. 6h. 52m. 58s. Epicentre 35°·5N. 141°·0E. (as on 1939 May 8d.).

Intensity III at Tyosi, Kakioka, and Yokohama; II at Tukubasan, Mito, Tokyo, and Utunomiya; I at Osima, Kumagaya, Misima, Hunatu, Kohu, Hukusima, Shirakawa, and Matumoto. Epicentre 35°·6N. 140°·8E. Shallow.

See Seismological Bulletin of the Central Met. Obs., Japan, for the year 1939, Tokyo, 1949, p. 34.

$A = -\cdot6342$, $B = +\cdot5135$, $C = +\cdot5781$; $\delta = +9$; $h = 0$;
$D = +\cdot629$, $E = +\cdot777$; $G = -\cdot449$, $H = +\cdot364$, $K = -\cdot816$.

	Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
	°	°	m. s.	s.	m. s.	s.	m. s.		m.
Tyosi	0·2	335	0 14	+ 4	0 18	+ 2	—	—	—
Tokyo	1·0	281	0 22	+ 1	0 32	− 4	—	—	—
Kakioka	1·0	318	0 19	− 2	0 29	− 7	—	—	—
Mito	1·0	334	0 20	− 1	0 31	− 5	—	—	—
Tukubasan	1·0	315	0 20	− 1	0 30	− 6	—	—	—
Mera	1·1	239	0 24	+ 2	0 36	− 3	—	—	—
Yokohama	1·1	267	0 23	+ 1	0 37	− 2	—	—	—
Onahama	1·4	357	0 30	+ 3	0 47	+ 1	—	—	—
Utunomiya	1·4	320	0 27	0	0 46	0	—	—	—
Kumagaya	1·5	296	0 27	− 1	0 47	− 2	—	—	—
Osima	1·5	241	0 27	− 1	0 46	− 3	—	—	—
Misima	1·7	257	0 32	+ 1	0 52	− 2	—	—	—
Hunatu	1·9	270	0 33	− 1	0 55	− 4	—	—	—
Hukusima	2·3	349	0 40	0	1 5	− 4	—	—	—
Omaesaki	2·4	248	0 46	+ 5	1 13	+ 1	—	—	—
Nagano	2·6	297	0 44	0	1 10	− 7	—	—	—
Hamamatu	2·8	254	0 52	P*	1 27	S*	—	—	—
Sendai	2·8	358	0 47	0	1 16	− 6	—	—	—
Nagoya	3·3	264	0 55	+ 2	1 43	S*	—	—	—
Toyama	3·3	291	0 56	+ 3	1 40	+ 5	—	—	—

Continued on next page.

		Δ	Az.	P.	O−C.	S.	O−C.	Supp.		L.
		°	°	m. s.	s.	m. s.	s.	m. s.		m.
Aikawa		3·4	318	0 55	0	1 34	− 3	—	—	—
Gihu		3·5	269	0 56	− 1	1 44	+ 4	—	—	—
Misusawa		3·7	4	0 59	− 1	e 1 46	+ 1	—	—	—
Miyako		4·2	10	1 6	− 1	1 51	− 6	—	—	—
Osaka		4·6	261	1 7	− 5	2 11	+ 4	—	—	—
Siomisaki		4·8	247	1 11	− 4	2 0	−12	—	—	—
Aomori		5·3	358	1 23	+ 1	2 53	S_g	—	—	—
Koti		6·5	254	1 39	0	2 59	+ 4	—	—	—
Mori		6·6	358	1 51	+10	3 13	S*	—	—	—
Hirosima		7·1	266	1 49	+ 1	3 22	+12	—	—	—
Sapporo		7·5	2	3 14	S	(3 14)	− 6	4 6	S_g	—
Hukuoka		8·9	261	2 21	+ 9	4 43	S_g	—	—	—
Vladivostok		10·4	320	e 2 33	− 1	e 4 40	+ 8	i 2 44	PP	4·9
Zi-ka-wei	z.	16·9	260	e 3 56	− 3	7 8	+ 1	i 4 16	PP	i 9·1
Andijan		53·0	298	e 9 14	− 7	e 16 53	+ 3	—	—	—
Tinemaha	z.	77·0	53	i 11 57	+ 1	—	—	—	—	—
Haiwee	z.	77·7	55	e 12 0	0	—	—	—	—	—
Mount Wilson	z.	78·7	56	e 12 6	0	—	—	—	—	—
Pasadena	z.	78·7	56	e 12 5	− 1	—	—	—	—	—
Riverside	z.	79·3	56	e 12 7	− 2	—	—	—	—	—
Palomar	z.	80·0	56	e 12 13	0	—	—	—	—	—
Ksara		81·8	305	e 12 20	− 2	—	—	e 15 36	PP	46·0
Tucson		84·8	53	e 12 37	0	—	—	—	—	—

Additional readings :—
Vladivostok e = +2m.49s., i = +3m.1s., e = +3m.32s.
Tucson eP = +12m.55s.
Long waves were also recorded at Irkutsk, Tashkent, and Baku.

Dec. 31d. Readings also at 2h. (near Mizusawa), 4h. (near Tananarive), 5h. (near Tananarive and Triest), 6h. (near Mizusawa, near Sotchi, Erevan, Tucson, and Ksara), 10h. (near Ferndale), 11h. (Ksara), 12h. (Ksara, La Paz, and Huancayo), 13h. (near Apia, Tacubaya, and Vera Cruz), 14h. (Ksara), 15h. (near Tucson), 16h. (Tucson (2), Oaxaca, Tacubaya, and Vera Cruz), 18h. (Balboa Heights, and near Mizusawa), 20h. (Balboa Heights), 23h. (near Osaka and Hukuoka).