

4 APR 1940

# SEISMOLOGICAL LABORATORY

## CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA

ADDRESS:  
 SEISMOLOGICAL LABORATORY  
 220 NORTH SAN RAFAEL AVE.  
 PASADENA, CALIFORNIA

1937

### BULLETIN

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the California Institute of Technology and the Carnegie Institution of Washington, as a cooperative undertaking. This laboratory is the central station of a coordinated group. Auxiliary stations in southern California are maintained and operated as follows: At the Mount Wilson Observatory on Mount Wilson (a Department of the Carnegie Institution of Washington); at Riverside (in cooperation with the City of Riverside); at Santa Barbara (in cooperation with the Santa Barbara Museum of Natural History); at La Jolla (in cooperation with the Scripps Institution of Oceanography of the University of California); at Tinemaha, and at Haiwee, in the Owens Valley (in cooperation with the Department of Water and Power of the City of Los Angeles). Address all correspondence to Pasadena.

**TIME:** At all these stations the minute-marks on the seismograms are coordinated directly by means of auxiliary records written at each station on which the minute-marks are registered closely parallel with recorded dot-and-dash radiotelegraphic signals sent in ordinary course from a powerful transmitting station. This permits direct correlation of the minute-marks at all the stations of the group at practically all times with an accuracy of one second, and usually of one-fifth second.

Standard time is determined at Pasadena by comparing the station clock with automatically recorded radio time signals of the U. S. Naval Observatory, three to five times daily.

The constants of these stations follow.

#### PASADENA SEISMOLOGICAL LABORATORY Central Station

$\Phi = 34^{\circ} 08.9' N.$ ,  $\lambda = 118^{\circ} 10.3' W.$ ,  $h = 295$  m.,      Deeply weathered granite rock, with inclusions of gneiss and schist.

**Apparatus:** horizontal-component torsion seismometers with electromagnetic damping and optical recording. (Cf. Bull. Seis. Soc. Am., XV, 1, 1925).

Instruments, and Constants (approximate);

	$T_n$	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	"	"	"
E — W	6 sec.	800	0.8-0.9

Seismometers with electromagnetic damping and galvanometric-optical recording.

(Cf. Bull. Seis. Soc. Am., XXII, 156, 1932).

N, E and Z inertia-mass 100 kg.,  $T_0 = 1.0$  sec.,  $h = 1$

galvanometers: (1)  $T_1 = 0.25$  sec.,  $h = 4$ .

(2)  $T_1 = 2$  min.,  $h = 1$ .

Horizontal strain seismometer (Cf. Bull. Seis. Soc. Am. XXV, 283, 1935) Axis in N-S line (Long period). Damping critical.

The constants of the short-period instruments do not undergo any significant changes. The constants of the instruments of longer period will be given from time to time when deviations from the values given are significant.

Experimental seismographs of various kinds are in process of development from time to time, and are used for intervals of variable duration. Information concerning these will be given when necessary.

## AUXILIARY STATIONS

Each of the auxiliary stations has equipment as follows:

**Apparatus:** two horizontal-component torsion seismometers with magnetic damping and optical recording;

**Instruments and Constants (approximate);**

	T <sub>0</sub>	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	"	"	"

one vertical component seismometer with galvanometric-optical recording;  
 inertia-mass 100 kg. T<sub>0</sub> = 1.0 or 0.5 sec. Damping critical or slightly less;  
 galvanometer: T<sub>1</sub> = 0.2 sec. h = 4.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

**Mount Wilson Seismologic Station**

Φ = 34° 13.5' N., λ = 118° 03.4' W., h = 1742 m., Weathered granite.

**Riverside Seismologic Station**

Φ = 33° 59.6' N., λ = 117° 22.5' W., h = 250 m. approx., Weathered granite.

**Santa Barbara Seismologic Station**

Φ = 34° 26.5' N., λ = 119° 42.9' W., h = 100m. approx., Heavy, boulder-laden alluvium.

**La Jolla (Scripps Institution Seismologic Station)**

Φ = 32° 51.8' N., λ = 117° 15.2' W., h = 7.7 m. approx., Consolidated detrital material.

**Tinemaha Seismologic Station**

Φ = 37° 05.7' N., λ = 118° 15.5' W., h = 1180 m. approx., Basalt.

**Haiwee Seismologic Station**

Φ = 36° 08.2' N., λ = 117° 57.9' W., h = 1100 m. approx., Loosely cemented tuff.

**SYMBOLS AND NOTATIONS:** in general the symbols and notation conform with the usual international practice. For the phases of deep-focus earthquakes the notation of F. J. Scrase is adopted. When surface waves are not reported no such waves are observed. c, d are abbreviations for compression and dilatation.

When measurements referring to local earthquakes are included P and S will be used without index or subscript, as no attempt will be made in these bulletins to distinguish between  $\bar{P}$ , P\*, and P<sub>n</sub>, although such complications are often clearly indicated and are the subject of study.

**SPECIAL SYMBOLS** indicating the stations of this coördinated group are as follows:

**PASADENA SEISMOLOGICAL LABORATORY**

- For routine instruments of period 0.8 second . . . . . P
- For routine instruments of period 6 seconds . . . . . P<sub>6</sub>
- For instruments of different period analogous notation will be employed.
- For routine instruments, galvanometer period 0.25 second . . . . . P
- For routine instruments, galvanometer period 2 minutes . . . . . PX

- Mount Wilson Seismologic Station . . . . . MW
- Riverside Seismologic Station . . . . . R
- Santa Barbara Seismologic Station . . . . . SB
- La Jolla (Scripps Institution Seismologic Station) . . . . . LJ
- Tinemaha Seismologic Station . . . . . T
- Haiwee Seismologic Station . . . . . H

In general detailed measurements will be given only for the records of the Seismological Laboratory: those for records of the other stations will be given only to supplement the information.

No. 1

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Jan	2	P	20	55	08		
		T		54	52		
Jan	2	P	22	38	13		Normal.
		eSE		42	04		
	P6	eLE		45.5			
	R	ePNE		38	07		
	SB	iPZ			26		
	LJ	iPNEZ		37	57		
	T	ePNE		38	38		
	H	iPN			28		
Jan	3	P	22	35	26		
		eZ		36	15		
	R	eE		35	28		
	LJ	eNEZ		36	09		
Jan	4	P	23	00	45		
Jan	5	PX	11	22.0			Normal? Long waves following P of the next -- apparently surface waves of an earlier shock.
Jan	5	P	11	20	51	c	Deep. Approximately 28°N., 138°E. h = 450 km. using Manila, Chiufeng, Hong Kong, Phu-Lien, and Nanking (the last as given by Strasbourg.) Δ = 85°, 0 = 11:09.1
		epPZ		22	36		
		iSNE		30	32		
		iSKPP'Z		49	35		
	R	ePNE		20	53		
		eSE		30	35		
	SB	iPNEZ		20	46		
	LJ	ePNE			58		
		iSN		30	34		
	T	iPNE		20	45		
		eN		21	55		
		eSE		30	14		
	H	ePN		20	46		
Jan	5	P	21	50	44		Normal?
	PX	eN	22	01.5			
		eLN		14.3			
	MW	iPZ	21	50	44		
	SB	iPNEZ			38		
	T	iPNE			36		
Jan	7	MW	06	23	47		
	SB	ePZ			43		
	T	ePE			40		
Jan	7	MW	07	10	06		
	T	ePNE		09	49		
Jan	7	P	13	34	58		Normal. Strong in Ching-hai and Kan-su, China. Δ = 105° 0 = 13:20.5 USCGS: 35.5°N., 97.5°E., 0 = 13:20.5 J.S.A: 36.1°N., 98.6°E., 0 = 13:20:40 Period of L, 75 seconds, amplitude 600 microns. M, 20 seconds, 200 microns. Magnitude about 7.5
		iPPZ		38	56		
		eSE		46	28		
		ePKKPZ		50	37		
	P6	iSSE		53	29		
		eSSSE		57.7			
		eLE	14	05.3			
	PX	iLN		05	37		
	SB	ePPEZ	13	38	53		
	LJ	ePPN		39	08		
	T	ePE		34	44		
		ePPE		38	39		
		eSE		46	09		
Jan	8	P	09	32	25		
Jan	8	P	15	22	21		Normal? P large, L small.
	PX	eLN		51.0			
	MW	ePN		22	21		
	T	iPNE			33		

Date	Station	Phase	G. C. T.			c	Remarks
			h	m	s		
Jan 10	P	iZ	05	44	26		
	MW	iZ			27		
Jan 11	P	iPNEZ	13	27	07		Normal.
		iSNE			53		
	PX	eLN			34.1		
	MW	iPNZ			27 07		
	R	ePNE			00		
	SB	eN			53		
	LJ	iPNZ			26 56		
		eN			31 33		
	T	ePN			27 25		
		eN			32 23		
Jan 11	P	iZ	13	50	12		
	MW	iZ			12		
Jan 15	P	ePZ	05	29	42		
	MW	ePZ			43		
Jan 16	P	iPZ	10	08	08		
	MW	iPZ			08		
Jan 19	P	ePZ	22	22	20		Normal. Short period waves (S?) superposed on L.
	PX	eLNEZ			24.0		
	MW	iPZ			22 19		
	SB	eZ			32		
	T	ePNE			51		
	H	ePNE			40		
Jan 20	P	ePZ	00	14	30		
	MW	ePZ			27		
	T	eE			19		
Jan 20	P	iPNEZ	21	59	17		
	MW	iPZ			18		
Jan 23	PX	eLN	10	26.5			Normal.
Jan 23	P	ePZ	11	08	57		Normal.
		iEZ			09 00		
		iZ!			36		
		eE			12 52		
		eE			19 48		
	PX	eSN?	55				
	P6	eSE?					
	PX	eLN	33.0				
	MW	iPZ	08 56				
		iZ	09 37				
	T	ePNE	09 06				
		eE	12 38				
	Jan 25	P	ePZ	01	49	01	
MW		ePZ	02				
Jan 25	P	iPZ	06	46	45		Possibly slightly deeper than normal. Phases given as S may possibly be SKS. Distance about 86°, Solomon Islands. O = 06:34.2 USCGS: 12°S., 164°E., O = 06:33.9 J.S.A: 10.6°S., 163.3°E., O = 06:34:00
		iPNE			48		
		iZ			47 07		
	P6	iPPE			50 56		
		iSE			57 15		
	PX	iN			28		
		iLN			07 10 09		
	MW	ePEZ			06 46 48		
		iZ			51 20		
		iSKPP*Z?			07 17 25		
	R	ePE			06 46 50		
		eE			57 14		
	SB	iPEZ			46 43		
		eN			57 20		
	LJ	ePNZ			46 47		
		eN			57 15		

Continued

No. 3

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks		
			h	m	s				
Jan 25	T	ePNE	06	46	52	Continued			
		eSE					57	21	
		eN						39	
	H	ePNE	46	52	38				
		eSE					57	14	
		eN							
Jan 25	MW	ePZ	21	11	10				
	T	iPZ						16	
Jan 26	P	iPZ	01	19	44				
	MW	iPZ						44	
	T	ePN						58	
Jan 26	P	iPZ	04	58	02				
	MW	ePZ						03	
Jan 26	P	ePZ	07	18	51				
	MW	iPZ						53	
	R	ePZ						54	
Jan 26	P	ePZ	07	30	48				
	MW	iPZ						48	
	R	ePZ						45	
	T	ePE						50	
Jan 26	P	ePZ	07	41	47				
		eZ						43	31
	MW	iPZ						41	48
	R	iPZ						49	
Jan 26	P	iPZ	15	09	30				
	MW	ePZ						30	
	T	iPNEZ						49	
Jan 26	P	ePZ	20	21	39				
	MW	ePZ						41	
	T	ePZ						43	
Jan 27	P	iPEZ	04	06	18				
	MW	iPZ						18	
	R	ePZ						19	
Jan 27	P	ePEZ	05	52	53				
	MW	ePZ						55	
	R	iPZ						58	
	T	ePE						53	
Jan 29	P	iPZ	17	37	48	Deep?			
	MW	ePZ						48	
	SB	ePZ						41	
	LJ	ePZ						54	
	T	ePNE						43	
	H	ePN						46	
Jan 30	P	iPEZ	06	37	12				
	MW	iPZ						12	
	R	ePE						20	
	SB	ePZ						08	
	LJ	ePZ						16	
	T	ePE						10	
Jan 30	P	iPEZ	10	44	01	Deep?			
	MW	iPZ						01	
		iZ						28	
	LJ	ePZ					43	54	

Continued

No. 4

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.				c d	Remarks
			h	m	s			
Jan 30	T	ePNE	10	44	14		Continued	
	H	ePN			12			
Jan 30	P	ePZ	13	52	30			
	MW	iPZ			32			
Jan 30	P	ePZ	17	12	39			
	MW	iPZ			41			
	R	iPZ			41			
	LJ	ePZ			39			
	T	ePNE			50			
	H	ePN			50			

C. F. Richter

No. 5

## PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Feb 1	P	iPNEZ	08	54	13		
	MW	iPZ			14		
Feb 1	P	iPNEZ	09	26	40	c	Deep? Very small surface waves recorded.
	MW	iPZ			41		
		iZ		27	27		
		iZ		30	17		
		iZ		33	40		
	SB	ePZ		26	37		
	LJ	ePNEZ			46		
	T	iPNE			45		
	H	ePE			42		
Feb 1	P	ePZ	19	05	52		
	MW	iPZ			53		
	R	iPZ		06	04		
Feb 1	P	ePZ	20	39	12		Normal?
	PX	eLN	21	07.0			
	MW	iPZ	20	39	12		
Feb 2	P	ePZ	16	22	17		
	MW	ePZ			18		
	T	eE			10		
Feb 3	P	ePEZ	02	59	57		
	MW	iPZ			58		
Feb 3	P	iPNEZ	19	15	34	c	Deep?
		iZ		16	03		
	MW	iPZ		15	34	c	
	R	iPZ			37		
		iZ		16	06		
Feb 4	P	ePNEZ	10	36	45		Normal? L? may be S.
		iE		38	15		
	PX	eLN?		44	25		
	MW	ePNEZ		36	44		
		iZ		38	24		
	R	eE		36	47		
	SB	iPNEZ			36		
	LJ	ePZ			57		
	T	ePN			12		
Feb 4	P	iPNEZ	14	47	24	c	Deep?
	MW	iPZ			24		
Feb 5	P	eEZ	00	53	58		
	MW	ePZ			58		
Feb 7	P	iPZ	04	43	39	d	Normal. Periods up to 20 sec. immediately following P.
		iNEZ			40	c	
		iSZ?		45	11		
	PX	iLNZ		45.6			
	MW	iPZ		43	39		
		iNEZ			41		
		iSZ?		45	18		
	R	iPNE		43	47		
	SB	iPEZ			44		
		eNE		45	06		
	T	ePNE		43	14		
		iSN		44	46		
Feb 11	P	iPZ	11	41	48		
		iZ			54		
	MW	iPZ			47		
	T	iPZ			46		
	H	ePZ			47		

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Feb 12	P	iPZ	03	34	11		
		iZ			51		
	T	iPZ			21		
Feb 12	P	iPNEZ	18	44	59	c	Deep?
		iZ		45	48		
	MW	iPZ			00		
	R	iPZ		44	56		
	SB	iPNEZ		45	09		
	T	iPZ			11		
		iZ			44		
	H	iPZ			07		
Feb 12	MW	ePZ	19	51	19		
	R	ePZ			12		
	T	ePZ			52		
Feb 12	P	ePZ	20	35	51		
	MW	ePZ			50		
	R	ePZ			45		
Feb 12	P	ePZ	20	48	20		
	MW	ePZ			19		
Feb 13	P	iPZ	02	52	40		
	MW	iPZ			41		
Feb 13	T	iPZ	01	17	44		
Feb 17	P	iPZ	07	48	22		
	MW	iPZ			23		
		iZ			40		
Feb 17	P	eZ	09	26	35		
		iZ			43		
	MW	iZ			29		
	T	eNE			33		
	H	eE			45		
Feb 17	P	eZ	09	52	21		Part of preceding?
	MW	eZ			20		
Feb 17	P	ePZ	23	11	11		
Feb 19	P	iPZ	09	10	39		Normal. Felt at Hawthorne, Nevada. Epicenter roughly 38.3°N., 118.3°W.
	PX	iSN		11	47		
	MW	iPZ		10	38		
		eSE		11	47		
	R	ePN		10	41		
		iSNE		11	53		
	SB	eZ		10	41		
		iSN		11	45		
	T	iPNEZ		09	57		
		iSNZ		10	14		
	H	ePN			10		
Feb 21	P	ePZ	07	13	41		Perhaps slightly deeper than normal. Readings at 08:00 may refer to a separate shock. S readings indefinite. USCGS: 45°N., 148°E., 0 = 07:02.7 J.S.A: 45.2°N., 148.6°E. 0 = 07:02:05
		iPNEZ			44		
		iZ!			56		
	P6	eSE		22	27		
		eLE		30.0			
	P	eP'P'Z		42	07		
		eP'P'P'Z?	08	00	49		
		iZ			56		

Continued



No. 7

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Continued							
Feb 21	MW	iPZ	07	13	40		
		iPEZ			45		
		iZ!			56		
		eSNE	22	44			
		iP'P'Z	42	08			
	R	ePNE	13	46			
		eSNE	22	48			
	SB	iPNEZ	13	37			
		eSE	22	35			
	LJ	ePNE	13	49			
		eSE	22	58			
	T	ePE	13	32			
		eSE	22	21			
	H	ePN	13	37			
eSN		22	36				
Feb 21	P	iPZ	07	37	37		Aftershock.
		iP'P'Z	08	05	48		
	MW	iPEZ	07	37	36		
		iP'P'Z	08	05	54		
	R	ePN	07	37	41		
	SB	ePNEZ			32		
	LJ	ePZ			48		
	T	ePN			27		
		eSNE	46	20			
	H	ePN	37	46			
Feb 21	P	iPZ	07	48	09		May be part of main shock at 07:13
	MW	iPZ			11		
Feb 21	P	iPZ	08	10	18		Aftershock.
		eP'P'Z		38	32		
	MW	iPZ		10	17		
		eP'P'Z		38	30		
	SB	ePZ		10	13		
	LJ	ePZ			27		
	T	ePE			13		
Feb 21	P	ePZ	09	32	23		
	MW	ePZ			24		
Feb 21	P	iPZ	11	03	10		Aftershock.
		iZ!			23		
	MW	eP'P'Z		31	17		
		iPZ		03	09		
	SB	eP'P'Z		31	06		
		iPNEZ		03	03		
	LJ	ePZ			24		
	T	ePNE			12		
Feb 21	P	ePZ	11	48	07		Aftershock?
		iZ			21		
	MW	ePZ		48	08		
		iZ			21		
	R	eZ		48	11		
		iZ			26		
Feb 21	P	eZ	15	16	29		
		iZ			44		
	MW	eZ			30		
Feb 21	P	eZ	17	39	31		
		MW	eZ			26	
	R	eZ			29		

No. 8

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks		
			h	m	s				
Feb 21	P	eZ	18	51	31				
	MW	eZ			26				
	R	eZ			31				
Feb 21	P	eZ	22	40	09				
Feb 22	P	iPZ	00	40	56	c			
	R	ePE			58				
	SB	iPZ			50				
	LJ	iPZ			58				
	T	ePE			41			01	
	H	ePE			40			58	
Feb 22	P	ePZ	01	23	07				
	PX	eSN?			32			09	
	R	ePE			23			02	
	SB	ePZ						21	
	LJ	ePEZ			22			52	
	T	ePNE			23			35	
	H	ePE						21	
Feb 22	P	iPZ	03	05	07		Normal? Aftershock of Feb 21 at 07h		
		iNZ						20	
	PX	eLN						23.5	
	P	eP'P'Z			33			14	
	T	ePNE			05			07	
	H	eE						16	
Feb 22	P	eZ	04	46	58				
	T	iZ			47			06	
Feb 22	P	ePZ	13	35	00		Normal?		
	PX	eLN						53.3	
	MW	ePZ			34			58	
	SB	ePZ			35			10	
	T	ePZ						05	
	H	eE						15	
Feb 22	P	iZ	14	16	47				
	MW	iZ			32				
		iZ			46				
Feb 23	P	ePZ	00	59	15		Normal?		
	PX	eSNE			01			08	09
		eLN						14.5	
		eP'P'Z			27			32	
	MW	eE			00			59	16
	R	ePNE						20	
	SB	ePZ						10	
	LJ	ePEZ						26	
	T	iPNEZ						03	
	H	ePE						09	
Feb 23	P	iZ	14	02	28				
	MW	eZ						15	
Feb 23	P	ePZ	19	04	11				
	MW	iPZ						12	
		eZ			07			05	
	T	iPZ			04			21	
Feb 24	MW	iPZ	18	56	58		Deep?		
	R	iPNEZ						55	
	T	iPZ			57			06	
	H	iPZ						06	

No. 9

## PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Feb 26	MW	eZ	14	25	19		
		iZ			46		
	T	eZ	03				
Feb 26	P	iPZ	23	29	25		
	MW	iPZ			24		
	T	iPZ			14		
	H	iPZ			20		
Feb 27	P	eZ	01	27	31		
		iZ			41		
	MW	iZ			31		
	T	iZ			22		
	H	eZ			25		
Feb 27	P	iPZ	09	57	41	c	Deep?
	MW	iPZ			42		
	T	iPZ			50		
	H	iPZ			48		
Feb 27	P	iPZ	14	54	32		
	MW	iPZ			32		
	T	ePNE			26		
	H	iPZ			27		

C. F. Richter

Pasadena and auxiliary stations

No. 10

1937

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
Mar 1	P	iPZ	00	47	20		
	MW	iPZ			21		
	T	iPZ			30		
	H	iPZ			27		
Mar 2	P	iZ	15	02	20		L? of shock causing damage at Anna, Ohio.
	T	eZ		01	53		
		eZ		10	12		
Mar 3	P	eEZ	09	26	20		
	MW	eZ			16		
		iZ			25		
	T	eZ			52		
Mar 4	P	iPZ	02	12	45		
	MW	iPZ			47		
	T	iPZ			54		
Mar 5	P	iPZ	13	32	00		
	MW	ePZ		31	56		
	R	ePZ		32	00		
Mar 5	P	iPZ	13	35	50		Possibly part of preceding.
	MW	iPZ			49		
	R	ePZ			50		
Mar 5	P	ePZ	23	22	51		Normal?
	PX	eLNZ		30.5			
	MW	ePZ		22	44		
	R	iPZ			50		
	T	ePZ			57		
Mar 6	P	ePZ	00	20	54		
	MW	iPZ			55		
	T	iPZ		21	07		
Mar 6	P	iPEZ	22	57	53		Deep?
	MW	iPZ			53		
		iZ		58	15		
	T	iPZ		57	54		
	H	ePE			54		
Mar 7	P	iPZ	03	22	03		
	MW	iPZ			03		
Mar 7	P	iPEZ	18	31	57		
	MW	iPZ			57		
	R	iPZ			50		
	T	ePZ		32	20		
Mar 8	P	iPZ	15	28	09		
	MW	iPZ			11		
	R	iPZ			13		
	T	iPZ		27	58		
Mar 8	P	iPZ	23	26	48	c	Deep. Two shocks?
		iZ		29	36		
	MW	iPZ		26	49	c	
		iZ		29	36		
	T	iPZ		27	02		
		iZ		29	40		
Mar 9	P	eZ	05	51.0			Normal. Damage in Anna, Ohio. USCGS: 40°23' N., 84°06' W. O = 05:44:41 J.S.A: 84.2° W., 40.4° N. O = 05:44:33
	PX	eNEZ		59.2			
	MW	iPZ		50	24		
		eZ		58	09		
		eZ		59	03		
	T	eNE		58	46		

PASADENA and auxiliary stations

No. 11

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Mar 9	P	iPZ	13	17	16		
	MW	iPZ			17		
	T	iPZ			24		
Mar 9	P	iPNEZ	15	48	03	c	Probably slightly deeper than normal. P large in proportion to surface waves. USCGS: 8.9° N., 83.8° W. 0 = 15:40.3 J.S.A: 10.6° N., 83.4° W. 0 = 15:40:38
		iSNEZ		54	19		
	PX	eLN		57.5			
	MW	iPEZ		48	01		
		eSZ		54	03		
	R	ePNE		47	58		
		eSNE		53	53		
	SB	ePNE		48	16		
		eSE		54	26		
	LJ	iPNEZ		47	50		
		eSNE		53	54		
	T	iPZ		48	16		
H	ePE		48	11			
	eSE		54	36			
Mar 10	P	ePZ	01	02	02		
	MW	ePZ			02		
Mar 10	P	ePZ	05	01	45		Normal.
	PX	eLZ		11.1			
	MW	iPZ		01	45		
Mar 11	P	iPZ	07	03	09		Deep.
		eZ		04	21		
	MW	iPZ		03	09		
		eZ		03	44		
H		iZ		04	21		
	P	iPNEZ	14	40	50		Deep.
		iZ		42	46		
	MW	iZ		40	50		
	SB	ePNE			44		
LJ	iPNEZ			53			
T		iPNEZ			46		
	H	ePE			48		
Mar 12	P	iPNEZ	01	02	17		
	MW	iPEZ			19		
	R	iPNEZ			20		
	SB	iPNEZ			13		
	LJ	ePZ			15		
	T	iPNEZ			27		
	H	ePE			25		
Mar 13	P	iPEZ	20	44	04		
	MW	iPZ			06		
	R	iPZ			07		
	T	iPZ			14		
	H	ePE			12		
Mar 14	P	eZ	02	01	58		
	MW	eZ			57		
	T	eZ			57		
Mar 14	P	iPZ	04	12	06		
	MW	iPZ			06		
	T	ePZ			18		
Mar 14	P	iPNEZ	12	07	23	d	Normal? Surface waves small. Damage at Taltal, Chile. USCGS: 25° S., 70° W. 0 = 11:55.8 J.S.A: 23.8° S., 71.0° W. 0 = 11:56:01
	PX	iSNE		16	55		
		iNE		17	20		
		eLN		27.6			

Continued

PASADENA and auxiliary stations

No. 12

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks	
			h	m	s			
							Continued	
Mar 14	MW	ePE	12	07	23			
	R	iPNEZ			16			
		eSNE		16	45			
	SB	ePNZ		07	26			
		eSN			16	53		
		eE		17	19			
	LJ	iPNEZ		07	12			
		iPNEZ				36	d	
	T	eSNE		17	13			
		ePE		07	30			
H	eE		17	39				
Mar 15	MW	iPZ	05	55	45			
	T	ePZ		56	07			
	H	ePE			56			
Mar 15	P	eZ	06	14	35		Deep?	
		iZ			42			
		eZ		18	17			
	MW	iZ		14	40			
		eZ			18	02		
	T	ePZ		14	40			
	eZ			18	00			
Mar 16	P	eZ	16	02	46			
	MW	eZ			48			
		eZ		03	47			
	R	eZ		04	02			
	T	eZ		03	54			
Mar 17	PX	ePE	14	07	31		Normal.	
		iSE		13	45			
		eLE			19			
	MW	ePZ		07	31			
		iPZ			23			
	R	iPZ			17			
	LJ	ePN			43			
T	ePNE							
Mar 19	P	ePZ	09	38	45			
	MW	iPZ			47			
		ePZ			53			
	R	ePZ			26			
	T	eZ			32			
Mar 19	P	iPNEZ	18	23	45	c	Deep?	
		iZ		24	00			
	MW	iPEZ		23	46			
		iPNEZ			41			
	SB	iPNEZ			57			
	LJ	iPNEZ			39			
	T	iPNEZ			58			
	H	iPEZ			54			
	Mar 21	P	eZ	03	51	24		
		MW	eZ			05		
eE				50	46			
LJ		eNE			13			
T		eNEZ		52	43			
Mar 21	P	eZ	19	41	10			
	MW	eZ			11			
		eZ			08			
	R	eZ		40	54			
	T	eE		41	00			
	H	eE						

## PASADENA and auxiliary stations

No. 13

1937

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
Mar 23	P	ePNZ	00	55	52		Normal? Surface waves small.
	PX	iSN	01	05	21		
		eLN			17.3		
	MW	ePEZ	00	55	52		
	R	iPZ			50		
	SB	ePZ			58		
	LJ	ePZ			45		
	T	iPNEZ		56	08		
	H	eE			07		
Mar 24	P	iPNE	09	37	24		
	MW	iPZ			20		
	R	iPZ			25		
	LJ	ePZ			37		
	T	ePZ		36	51		
	H	ePE		37	01		
Mar 24	P	ePNE	14	05	44		
	MW	iPZ			43		
	R	iPZ			37		
	T	iPNEZ			57		
Mar 24	P	iPEZ	18	59	47		
	MW	iPZ			46		
	R	iPZ			51		
	H	ePE			29		
Mar 25	P	iPEZ	09	11	12	d	
	R	iPZ			17		
	T	iPZ			22		
	H	ePE			21		
Mar 25	P	eZ	12	50	24		
	R	iPZ			22		
	T	ePZ			40		
Mar 25	P	iPNEZ	16	49	31	c	Normal. (Depth about 15 km.) Time of S at La Jolla inferred from S-P = 11 sec. in aftershocks. Epicenter 33°28' N., 116°35' W. O = 16:49:04 USCGS: 33.4° N., 116.7° W. O = 16:49.2 J.S.A: 33.4° N., 116.7° W. O = 16:49:04 See note at end of this issue of the Bulletin.
		iSNE			55		
	MW	ePE			30		
	R	iPNEZ			21	c	
		iSNE			32		
	SB	ePZ			50		
	LJ	iPNEZ			20	d	
	T	iPNEZ		50	04		
H	iPZ		49	51			
Mar 26	P	iPZ	16	47	57		
	MW	iPZ			56		
	R	iPZ			53		
	T	iPNE		48	18		
Mar 26	P	ePZ	21	11	23		Normal. Northern California.
		iZ		12	03		
		iSEZ		13	01		
	MW	iPZ		11	21		
	R	iPZ			28		
		iSZ		13	13		
	SB	ePZ		11	18		
		eSNEZ		12	36		
	T	iPNEZ		11	00		
		iSZ		12	31		
	H	ePE		11	09		
	eSE		12	52			
Mar 28	P	iPZ	12	32	03		
		iZ			33		

Continued

PASADENA and auxiliary stations

No. 14

1937

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
Mar 28	MW	iPZ	12	32	04		Continued
	R	iPZ		31	59		
	T	iPZ		32	17		
Mar 29	P	iPZ	02	15	50		
	MW	iPZ			50		
	T	iPZ		16	01		
	H	ePE		15	58		
Mar 29	P	iPZ	03	53	01		
	MW	iPZ			02		
Mar 29	P	ePZ	06	26	29		Normal.
	PX	eLN		37.8			
	MW	iPZ		26	30		
	T	ePZ		26	43		
Mar 29	P	iPZ	08	00	30	d	Deep. Tucson readings: (Courtesy USCGS) iP 07 59 53 i 08 00 21 i 29 eP'P' 29 10
		iNEZ			31	c	
		iZ			56		
		iZ	01	08			
		eZ			42		
	PX	iN	09	22			
		iN	10	06			
	MW	iPEZ	00	30			
		iZ			57		
	SB	ePZ			36		
	T	iPNEZ			43		
		iZ	01	11			
		eE	09	41			
		eP'P'Z	28	49			
	H	ePE	00	38			
Mar 29	P	ePZ	10	14	45		
	MW	iPZ			45		
	T	iPZ			37		
	H	ePE			41		
Mar 29	P	iPEZ	12	15	46	c	Deep?
	MW	iPZ			46	c	
	T	iPNEZ		16	01		
	H	ePE		15	53		
Mar 29	P	ePZ	15	26	25		
	MW	iPZ			25		
	R	iPZ			20		
	T	iPNEZ			89		
Mar 29	P	iPZ	17	35	50		
	MW	iPZ			50		
	R	iPZ			46		
	T	iPZ		36	01		
Mar 29	P	ePZ	20	58	59		
	MW	iPZ		59	00		
	R	ePZ		59	00		
Mar 30	P	ePZ	14	59	34		Normal? Small surface waves recorded.
		eNE			54		
	MW	ePZ			39		
	R	ePZ			40		
	T	ePZ			47		
	H	eE			51		



25  
EARTHQUAKE of MARCH, 1937.

This shock occurred at 08:49:04 a.m., P.S.T. (16:49:04 G.C.T.)

The epicenter is at 33°28' N., 116°35' W., within a few kilometers, on the active San Jacinto fault zone.

This is the largest shock in the Southern California area for about two years (magnitude, 6 or slightly greater on the scale worked out by C. F. Richter for use at Pasadena.)

As the epicenter is in a nearly unpopulated mountainous area, little damage resulted. At the nearest point of report, Anza, the intensity was VI (Mercalli); the same intensity was manifested at many points within 50 km. The shock was generally perceptible to distances of the order of 250 km.

Aftershocks were numerous within the few days following; none were large, and the activity decreased rapidly.

A note on this shock by Mr. H. O. Wood will appear in the Bulletin of the Seismological Society.

C. F. Richter

Pasadena, California

We wish to acknowledge with thanks receipt of the following bulletins during February, 1937:

Adelaide	November, December, 1936
Apia	October-December, 1936, No. 4
Budapest	January, 1937, No. 1-3
Cartuja	January-May, 1936
Cheb	Year 1936
Chiufeng	December, 1936
Georgetown, Despatches	November; December, 1936
Helwan	December; 1936
Hong Kong	November, 1936
J. S. A.	December 21-January 25, 1936-1937, 1-2
Karesruhe	July-December, 1936, No. 34
Kew	January, 1937
København	October-December, 1934, No. 32
København	January-March, 1935, No. 33
Little Rock	June-October, 1936, No. 11-12
Manila	November; 1936
Ottawa	December; 1936
Parc St. Maur	December, 1936
Perth	September 19-October 29, 1936, 14-15
Phu-Lien	October, November, 1936
Riverview	November; 1936
San Fernando	November, December, 1936, No. 6
Scoresby-Sund	July-December, 1934, No. 11
Strasbourg	
Bureau Central	December; 1936; No. 56-58
Union Geodesique	December; 1936, No. 131-141
l'Institut	December, 1936
Sydney	October, November, 1936
Taihoku	November, December, 1936
Tortosa	July-September, 1935; Vol. 26, No. 7-9
Trieste	January-March, 1936, No. 1-14
USSR	January-June, 1936
Wellington	October-December, 1935, No. 1-15
Wellington	November, 1936; No. 1-19
Zagreb	July-September, 1935

No. 15

## PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Apr 1	P	ePZ	17	31	57		Normal.
		iNEZ		32	02		
	PX	iSN		41	20		
		eLN		50			
	LJ	ePZ		31	58		
	T	ePZ		32	09		
H	ePE			08			
Apr 1	P	iPNEZ	18	54	34		
	H	ePE			43		
Apr 1	P	iPNZ	19	47	29		
	MW	iPZ			30		
	T	iPZ			38		
Apr 2	P	iPZ	01	48	48		
	MW	iPZ			50		
Apr 2	P	iPNEZ	05	41	31	d	Deep?
	PX	iSNE		50	48		
	MW	iPZ		41	32		
		iZ		43	41		
	LJ	iPZ		41	30		
	T	ePNE			39		
		eSNE		51	05		
	H	ePE		41	38		
Apr 2	P	iPZ	06	48	50		
	MW	ePZ			52		
Apr 3	P	ePZ	00	58	59		
	R	iPZ		59	03		
Apr 3	PX	3LN	04	34			Normal.
Apr 3	P	ePZ	22	22	21		
	T	iPZ		22	13		
Apr 5	P	ePZ	06	48	27		
	MW	ePZ			27		
Apr 5	P	iPZ	06	56	22		
Apr 5	P	iPEZ	07	10	45		Normal.
		eZ		14	55		
	PX	eSE		15	06		
		eEZ		16	14		
	PX	eLE		21.2			
		iLE		24	22		
	R	ePE		10	53		
		eSE		15	10		
	T	ePN		10	57		
		eSE		14	57		
	H	eSN		15	11		
		ePE		10	42		
		eSE		15	10		
	Apr 5	P	iPNEZ	20	23		
PX		eLN		31	28		
MW		ePZ		23	08		
R		iPNEZ		23	07	c	
LJ		iPNEZ		22	58		
T		iPNEZ		23	31		
H		ePE			22		
Apr 5	P	iPNEZ	23	51	37	c	
		eE		55	36		
	MW	iPZ		51	35		
Apr 6	P	iPZ	08	33	50		
	MW	iPZ			50		
Apr 10	P	eZ	12	14	52		
	MW	eZ			52		

Date	Sta- tion	Phase	G. C. T.			C d	Remarks	
			h	m	s			
Apr 10	P	iPNEZ	13	31	53	d	Deep?	
	MW	iPZ			53			
	T	ePNE		32	04			
	H	ePN		31	58			
Apr 11	P	iPZ	06	38	45			
	MW	ePZ			39			
Apr 11	P	iPEZ	08	14	53			
	MW	iPZ			54			
Apr 12	P	ePZ	13	52	54			
	MW	iPZ			36			
Apr 13	P	ePZ	03	06	20			
	MW	iPZ			22			
Apr 13	F	iPNEZ	05	16	21		Normal?	
	PX	eLN			31.2			
	MW	iPNEZ		16	20			
	LJ	iPZ			11			
	T	iPNEZ			34			
	H	ePE			26			
Apr 13	P	ePNEZ	22	25	19			
	MW	iPZ			27			
	H	iPZ			28			
Apr 15	P	ePZ	11	53	05			
	MW	iPZ			06			
	T	iPZ			17			
Apr 15	P	ePZ	12	52	25			
	MW	ePZ			24			
Apr 15	P	eZ	20	31	34			
Apr 16	P	ePNEZ	03	12	59	d	Deep. Very large shock, being investigated at St. Louis by Rev. A. J. Westland. Distance about 78° USCGS: 22°S., 174°W. C = 03:01.9 h = 400 km. J.S.A: 22.2°S., 179.0°E. C = 03:01:34 h = 390 km.	
		iPNEZ		13	02			
		iP <del>e</del> PNE			12			
		ipPEZ		14	36			
		eSEZ?		21	46			
		iN		22	28			
		iNEZ			42			
		PX	iNE		23			07
			iN		26			02
			iN		27			47
		P	iLNE					33.9
			iP'P'Z		40			17
			ipP'P'Z		41			49
	iSKPP'Z			43	12			
	MW	iPNZ		13	00			
		eNE		22	31			
		ipP'P'Z		41	48			
	R	ePNE		13	01			
		iN		22	33			
		iE			42			
	SB	iPNEZ		12	57			
		iN		22	22			
		iEZ			29			
	LJ	ePNEZ		12	59			
		iNE		22	30			
		iP'P'Z		40	11			
		ipP'P'Z		41	48			
eSKPP'Z			43	03				
T	iPNEZ		13	04				
	iNEZ		22	46				
	iP'P'Z		40	02				

Continued

No. 17

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Apr 16	H	ePN	03	13	08	Continued	
		iN		22	04		
		eP'P'N		40	02		
Apr 16	R	iPZ	18	28	20		
		iZ			51		
Apr 17	P	ePZ	12	48	56		
	MW	iPZ			56		
Apr 18	P	iPZ	19	07	51		
	MW	iPZ			52		
	R	iPZ			52		
Apr 21	P	eZ	05	28	33		
	MW	eZ			26		
		iZ			39		
	T	eZ			40		
Apr 21	P	iPZ	18	41	54		
	MW	iPZ			55		
	R	iPZ			57		
Apr 21	P	iPZ	03	02	28		
	MW	ePZ			30		
Apr 22	P	iPZ	09	49	05		Off the coast of northern California, according to Byerly.
		iSZ		50	44		
	MW	iPZ		49	05		
	eSZ		50	43			
T	iPNEZ		48	42			
Apr 22	R	iPZ	22	50	20		
		iZ			37		
Apr 23	P	eZ	12	36	45		
	MW	iZ		35	53		
		iZ		36	20		
	R	eZ			13		
Apr 24	P	iPEZ	05	09	49		
		iZ		10	39		
	MW	iPZ		09	49		
	R	iPZ			50		
		iZ		10	38		
	T	iPZ			28		
	iZ			41			
Apr 25	P	iPZ	04	25	09		
	T	iPZ			18		
Apr 25	P	ePZ	04	29	05		Nevada about 39°N., 117°W.
		iPEZ			15		
		iSNEZ		30	17		
	MW	ePZ		29	05		
		iSZ		30	15		
		ePNE		29	18		
	T	eSNE		30	20		
		iPNEZ		28	19		
		iSN			44		
Apr 25	P	ePZ	10	33	42		Normal. Tucson eP 10:32:56 Courtesy USCGS. Probably Sonora, Mexico.
		iPZ		34	05		
	PX	eLNE		35	05		
	P	iSZ			25		
	MW	ePZ		33	41		
		eSNE		35	33		
	R	ePZ		33	29		
		iPZ			52		
		iSNZ		35	19		
	LJ	iPNEZ		33	35		
		iSE		34	46		
	T	ePNE		35	26		
eSNE			37	06			

Date	Sta- tion	Phase	G. C. T.			c d	Remarks	
			h	m	s			
Apr 25	PX	eLN	21	57	0		Normal.	
Apr 28	P	eZ	14	07	14			
Apr 29	PX	eLN	00	48	5			
Apr 29	P	iPNEZ	18	21	41		Normal? $\Delta = 60^\circ$ approx. Strasbourg gives $56.5^\circ\text{N.}$ , $33.5^\circ\text{W.}$ O = 18:11:33	
	PX	iSN		29	56			
		eLE		42	0			
		IP'P'Z		51	25			
	MW	iPZ		21	39			
		iP'P'Z		51	22			
	R	ePZ		21	38			
Apr 29	P	iPNEZ	18	59	41	c	Normal. USCGS: $53^\circ\text{N.}$ , $161^\circ\text{W.}$ O = 18:52.6 J.S.A: $53.8^\circ\text{N.}$ , $160.5^\circ\text{W.}$ O = 18:52:43 Strasbourg: $57^\circ\text{N.}$ , $157^\circ\text{W.}$ O = 18:52:43	
	PX	iPPN	19	01	12			
		iSNEZ		05	23			
		iSSN		08	07			
		eLE		09	3			
	P	iScSE		09	53			
	MW	iPNEZ	18	59	41			
		eSE		19	05			23
	R	iPNEZ	18	59	45			
		eSE		16	05			30
	SB	ePZ	18	59	29			
		iSE		19	05			04
	LJ	iPNZ	18	59	52			
		iSNE		19	05			47
	T	ePNE	18	59	19			
	eSNE		19	04	56			
Apr 29	P	iPEZ	20	30	01	c	Deep. $46.5^\circ\text{N.}$ , $136^\circ\text{E.}$ , according to Chiufeng. Tucson readings, courtesy USCGS.      iP    20:30:31 i    20:30:56	
		eSE		39	10			
	MW	ePNE		30	02			
		iSNE		39	11			
	R	iPNEZ		30	04			
	SB	iPNEZ		29	45			
	LJ	iPNEZ		30	10			
	T	iPNE		29	51			
	eSNE		38	47				
Apr 29	P	iPZ	21	30	55			
Apr 29	P	ePZ	22	11	33			
	R	iPZ			45			
Apr 30	P	eZ	11	49	14			
	MW	ePZ			08			
		iZ			17			
Apr 30	P	iPZ	23	29	09			

Correction: October 1, 1936, 06h 11m should read October 2, 1936, 06h 11m.

G. F. Richter

Pasadena, California

We wish to acknowledge with thanks receipt of the following bulletins during May, 1937:

Adelaide	February, 1937
Batavia	July-September, 1936
Bucarest	April, 1937
Budapest	1932
Cartuja	June-September, 1936
Chiufeng	March, 1937, No. 8-10
Helwan	March, 1937
Hong Kong	March, 1937
Hungary	1932
Hungary	1936
Ithaca	January-May, 1936; No. 206-208
J.S.A.	March 9-April 16, 1937, No. 6-9
Ksara	February, March, 1937
La Plata	February, March, 1937
Manila	February, 1937
Nagoya	1936, No. 1-2
Ottawa	March, 1937; No. 7-12
Parc St. Maur	March, 1937, No. 1-2
Phu-Lien	March, 1937
Reykjavik	1936
Riverview	March 5, 1937
Santa Clara	December, 1936
Santa Clara	January, 1937
Strasbourg	
Union Geodesique	March, 1937; No. 25-37
Bureau Central	March, 1937, No. 9-11
l'Institut	March, 1937
Sydney	January-March, 1937
Taihoku	March, 1937
Tananarive	August-September, 1936
Venezia	October-December, 1936, No. 10-12
Venezia	January-June, 1934, No. 1-6
Weston	January, 1937
Zinsen	September-December, 1936, No. 11-15
Zinsen	January, February, 1937, No. 1-4

Pasadena, California

We wish to acknowledge with thanks receipt of the following bulletins during April, 1937:

Apia	January-March, 1937
Beograd	July-December, 1936
Bombay (Colaba)	1936
Bucarest	March, 1937
Budapest	March, 1937, No. 7
Chiufeng	February, 1937, No. 4-7
Firenze	April-July, 1935, No. 5-12
Florissant	October-November, 1936, No. 39-47
Graz	August 8-October 28, 1936, No. 5-6
Helwan	February, 1937
Hong Kong	February, 1937
J.S.A.	March 9, 1937, No. 5
Kew	March, 1937
La Plata	December, 1936, No. 12
Lemberg	April 2-September 6, 1936, No. 2-3
Little Rock	November, 1936, No. 14-17
Manila	January, 1937, No. 1-3
Parc St. Maur	February, 1937, No. 1-2
Perth	December 19-31, 1936, No. 19-20
Phu-Lien	February, 1937
Saint Louis	October, 1936, No. 20-22
San Fernando	January, February, 1937
Strasbourg	
Union Geodesique	February, 1937, No. 13-24
Bureau Central	February, 1937, No. 5-7
Inst. Phys. du Globe	February, 1937
Taihoku	February, 1937
Tokyo	January-June, 1936, No. 1-2
Tortosa	October-December, 1935, XXVI, 10-12
Trieste	July-December, 1935
Trieste	April-June, 1936
Uccle	September-December, 1936, No. 5
Wellington	February, 1937, No. 1-9
Wien	July 27-December 31, 1935, No. 6-9
Wien	April 1-July 12, 1936, No. 3-4
Zagreb	January-June, 1936



No. 19

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
May 1	P	ePZ	05	45	54		Deep?
		eZ		46	42		
	MW	iPZ		45	54		
		iZ		46	45		
	T	iZ		46	56		
		iPZ		45	45		
May 1	P	eZ	06	33	29		
	T	iPZ			19		
May 1	P	iPNEZ	12	32	14		Normal? Surface waves small.
	P6	eE		41	29		
	MW	iPZ		32	12		
	LJ	ePNEZ			05		
	T	ePN			33		
May 1	P	iPNEZ	15	29	18	c	Normal.
		eE		36	48		
	PX	iLE		37.3			
	MW	iPZ		29	19		
	R	ePN			13		
	LJ	iPNEZ			03		
	T	ePNE			42		
	P	eZ	23	22	41		
	T	iZ			45		
	May 2	P	eZ	14	38		
eZ					17		
iZ					24		
May 2	P	iPEZ	22	48	30		
	T	iPZ			16		
May 3	P	ePZ	04	39	57		Deep?
		iZ		40	24		
	MW	iPZ		39	57		
		iZ		40	25		
May 4	P	iPZ	03	50	09		
	MW	iPZ			09		
May 4	P	iPNEZ	05	15	30		Normal. USCGS: 59.5°N., 154°W. 0 = 05:08.7 J.S.A: 59.4°N., 152.9°W. 0 = 05:08:53
	PX	eSN?		21	05		
		eLE		23.3			
	MW	iPNEZ		15	30		
	LJ	ePZ			39		
May 4	P	iPEZ	16	42	57		
	MW	iPZ			57		
	R	iPZ		43	00		
	LJ	iPZ			05		
	T	iPNEZ		42	49		
May 4	P	iPZ	17	35	19		
	MW	iPZ			19		
May 5	P	ePZ	13	29	54		
		iPZ			55		
		iPZ		30	04		
May 5	P	iPNEZ	21	27	52	c	Deep.
		iZ		28	39		
		iZ			48		
	PX	eSN?		37	55		
	MW	iPZ		27	52		
		iZ		28	45		
	R	iPNEZ		27	55		
		iZ		28	43		

Continued

No. 20

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks	
			h	m	s			
May 5	LJ	iPZ	21	27	59		Continued	
		iZ		28	46			
	T	iPNEZ		27	47			
		iZ		28	33			
		iZ		32	49			
		eSE?		37	49			
May 6	P	iZ	08	45	05			
	MW	iZ			06			
May 6	MW	iZ	09	47	53			
May 6	P	ePZ	14	48	57		Off coast of northern California, according to Byerly.	
		iZ		49	09			
		iSE		50	34			
	MW	ePZ		48	57			
		R	ePZ		49			02
		T	iPZ		48			28
May 7	P	ePZ	14	18	05		Normal.	
		PX	eN		19			57
		eSE?		23	43			
		eLN		26.3				
	MW	ePZ		18	02			
		R	ePZ		07			
		LJ	ePNEZ		15			
		T	ePZ		17			44
May 7	P	iZ	14	24	08		May be part of preceding.	
		MW	iZ		08			
		R	iZ		10			
		LJ	eZ		12			
		T	iZ		23			59
May 7	P	iPZ	23	48	33			
		MW	iPZ		33			
May 8	P	iPNEZ	20	04	15	d	Deep?	
		MW	iPNEZ		15			
		R	iPNEZ		09			
		LJ	iPNEZ		03			59
		T	iPNEZ		04			38
May 9	P	ePZ	01	15	38			
		MW	iPZ		37			
May 9	P	iPZ	12	02	05			
		MW	iPZ		05			
		R	iPZ		07			
		T	iPZ		15			
May 9	P	ePZ	14	57	44		Normal.	
		PX	eLE	15	14			
		MW	ePZ	14	57			43
		R	iPZ		46			
		LJ	ePZ		58			05
		T	iPZ		57			32
May 9	MW	iPZ	17	10	35			
May 10	P	iPNEZ	15	37	11	d	Deep.	
		iZ		39	24			
	MW	iPZ		37	13			
		iZ		39	27			
		R	iPZ		37			13
	R	iZ		39	22			
		eE		46	40			
							Continued	

No. 21

PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c d	Remarks	
			h	m	s			
May 10	T	iPNEZ	15	37	21	Continued		
		iZ		38	35			
		iZ		39	35			
		iZ		46	50			
May 11	P	eZ	16	09	58			
	MW	eZ		10	11			
May 12	P	eZ	00	14	41			
May 12	P	iPNEZ	02	58	23	Deep. Readings at 3h 14m may be PKKP or another shock.		
		iZ		59	03			
		PX	eE	03	02		27	
	P	eZ		14	18			
		MW	iPZ	02	58		26	
	T	iZ		59	03			
		iZ		03	02		23	
		eZ		14	19			
		ePE		02	58		24	
P	eE		03	02	27			
	eE		14	37				
May 12	P	eZ	13	27	43			
May 12	P	iPZ	22	48	27			
	MW	iPZ			29			
May 13	P	iZ	00	17	00			
	MW	iZ		16	58			
May 13	P	iPZ	09	22	52	Normal.		
		iZ		24	26			
	PX	eZ		28.2				
	P	eZ		31	08			
	MW	iPZ		22	48			
		iZ		24	24			
	LJ	ePNZ		22	32			
		eZ		24	02			
	T	ePNE		23	18			
eNE			24	55				
May 13	P	iPZ	19	06	14			
		MW	iPZ		15			
	MW	eZ		07	05			
May 13	P	ePNEZ	21	04	18	Normal.		
		PX	eLE		14			
	MW	ePZ		04	17			
		T	ePE		38			
May 15	P	iPZ	03	10	53			
		iZ		11	24			
		eZ			35			
	MW	iPZ		10	54			
May 15	P	iPZ	10	36	35	Normal? Surface waves small..		
		PX	eLN		55			
	MW	iPZ		36	35			
May 15	P	iZ	23	34	59			
	MW	eZ		34	56			
May 16	P	ePEZ	06	39	00			
		MW	ePZ		03			
	T	iPE			12			
May 16	P	ePZ	11	51	29	Normal.		
		iPZ			34			
	PX	eN	12	01	43			
		eLNE		13				
	MW	iPZ		51	35			
T	ePE			48				
May 18	P	iPZ	18	51	42			
	MW	iPZ			41			

No. 22

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
May 20	P	iPEZ	12	26	55		
	MW	iPZ			57		
	R	iPZ			29		
	T	ePE			49		
May 21	P	ePZ	02	09	47		Normal?
	PX	eLN		32			
	MW	iPZ		09	50		
	R	iPZ			52		
May 21	P	iPZ	08	59	42		
	MW	iPZ			43		
	R	iPZ			44		
May 21	P	iPZ	10	40	54		
	MW	iPZ			55		
	R	iPZ			55		
May 21	P	iPNEZ	13	21	04	c	Normal? P large, S? very small. Surface waves small. St. Louis gives: 2.3°N., 78.5°W. 0 = 13:12:17 USCGS: 2.5°N., 78.7 W. 0 = 13:12.2
		eSZ?		26	16		
	PX	eLNE		35.8			
	MW	iPNEZ		21	04	c	
		iZ		23	27		
	R	iPNZ		20	58		
May 21	LJ	iPNEZ			55		
May 21	P	iPZ	06	42	11		
May 23	P	iPNEZ	06	25	33		
	MW	iPZ			34		
	R	iPZ			33		
	LJ	ePZ			33		
	T	iPE			38		
May 23	P	ePNEZ	08	25	30		Atlantic about 0°, 25°W., according to Strasbourg.
	MW	iPZ			29		
	R	iPZ			26		
	T	ePE			35		
May 23	P	ePZ	18	44	44		
	MW	iPZ			43		
	T	ePE			58		
May 23	P	iPZ	22	58	53		
		iZ		59	22		
	MW	iPZ		58	52		
May 24	P	ePZ	00	47	56		Normal.
	PX	eLE		59.1			
	MW	ePZ		47	51		
	R	ePZ			46		
May 24	P	iPZ	02	16	56		
	MW	iPZ			57		
May 25	<del>MW</del>	eZ	03	02	55		
		iZ		03	23		
May 27	P	eZ	04	46	14		
		eZ		47	14		
	MW	eZ			14		
May 27	P	iPEZ	19	23	14		
	MW	iPZ			15		
	R	iPZ			19		
May 28	R	eZ	02	53	10		
May 28	P	iPZ	07	24	04		Deep?
		iZ			35		
	MW	iPZ			04		
	R	iPZ			08		
	LJ	iPZ			10		
	T	iPE			00		



No. 24

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
May 31	P	iPNEZ	00	48	03	d	Deep.
		iNEZ			37		
	MW	iPZ			03		
		iZ			38		
	R	iPZ			05		
		iZ			39		
	LJ	iPZ			02		
T	ePE			11			
	eE			45			
May 31	P	iPZ	10	56	46		
	R	ePZ			47		
May 31	P	iPEZ	12	32	11		
	R	iPZ			10		
	T	iPZ			20		
May 31	P	iPNEZ	15	44	55	c	Normal? Surface waves small.
	PX	eLE	16	11.6			
	MW	ePNE	15	44	58		
	R	iPNEZ			57		
		iZ	45	31			
	LJ	iPNEZ	44	58			
	T	iPEZ			56		
		iZ	45	25			
	eZ	48	24				

C. F. Richter

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
June 2	P	iPNEZ	21	08	04	d	Normal. Mexico.
	PX	eSNZ		11	22		
		eLNE		13			
	MW	iPNEZ		08	04	d	
	R	iPNEZ		07	57		
	LJ	ePNE			45		
June 2	T	ePE		08	34		
		eSE		12	49		
June 3	PX	eLZ	00	51.6			Normal.
June 3	P	eZ	07	48	37		
		eZ		49	10		
June 3	P	iZ	10	30	54		
	MW	iPZ			32		
		iZ			54		
	T	iZ			55		
June 5	P	eZ	14	49	58		Normal. Group of shocks distant about 350 km. from Tucson. See the following.
	MW	eZ		47	53		
		eZ		49	58		
	R	eZ		47	55		
	LJ	eNZ		49	30		
June 5	P	eZ	15	03			Normal. Phases indefinite. Superposition of at least two shocks recorded at Tucson with P at 15:01:50 and 15:04:13. (Courtesy USCGS)
	MW	eZ		02	21		
	R	eZ			12		
	LJ	eZ		01	58		
	T	eZ		04	13		
June 5	P	eZ	15	23	12		Normal. Same source as the preceding shocks.
	MW	eZ			12		
	R	eZ			05		
June 6	P	eZ	00	16	32		
	R	eZ			31		
	T	eZ			10		
		iZ			41		
June 6	P	ePZ	18	06	50		
	MW	ePZ			51		
June 7	P	iPZ	04	11	19		
	MW	ePZ			16		
	R	iPZ			13		
June 7	P	iPZ	06	05	49		
	MW	iPZ			50		
	R	iPZ			51		
	T	iPZ			58		
June 7	P	ePZ	11	30	55		
	MW	iPZ			56		
	R	ePZ			57		
	T	iPZ		31	19		
June 7	P	ePZ	12	24	54		
	MW	iPZ			55		
	R	iPZ			51		
	T	iPZ		25	20		
June 8	P	ePZ	10	54	17		
June 8	P	iPNEZ	18	11	19	c	
		iZ			50		
	R	iPNEZ			23		
	LJ	iPZ			28		
	T	iPZ			10		
June 8		iZ			59		
	P	iZ	20	16	15		
	MW	iZ			01		
June 8	T	iZ		15	53		

No. 26

## PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			e d	Remarks
			h	m	s		
June 8	P	iPNEZ	22	35	29	d	Deep. $\Delta = 29.9^\circ$ h = 200 km. O = 22:29:34 pP very large at P, MW, R. Small surface waves recorded. At Pasadena, PcP smaller than pPcP. At Riverside, pPcP smaller than PcP. USCGS: 16.2°N, 87.6°W. O = 22:29.5 J.S.A: 14.7°N, 92.6°W. O = 22:29:35
		ipPNEZ	36	06			
		esPZ			32		
		iPcPZ	38	33			
		ipPcPZ	39	16			
		iSNEZ	40	12			
	MW	iScSN	45	52			
		iPNEZ	35	29			
		ipPNZ	36	06			
		ePcPZ	38	33			
	R	ipPcPZ	39	19			
		eSE	40	13			
		ePNEZ	35	22			
		ipPZ	36	00			
	LJ	isPZ	36	23			
		iPcPZ	38	29			
		ipPcPZ	39	14			
		iSN	40	01			
		ePZ	35	16			
		ipPZ		54			
		iZ	36	09			
	T	eSNE	39	48			
		iPNEZ	35	45			
ipPZ		36	22				
isPPZ		37	59				
iPcPZ		38	37				
ipPcPZ		39	22				
eSN		40	24				
iSNE	40	39					
eScSNE	45	58					
June 10	P	ePZ	15	15	54		
	R	ipZ			51		
	T	ipZ			54		
June 11	P	ePZ	10	19	38		
June 12	P	ePZ	08	29	12		
	MW	ipZ			14		
	T	ipZ			30		
June 12	P	iPNEZ	18	19	57	d	Deep?
	MW	iPNEZ			58		
		iZ	21	33			
	R	ipZ	20	00			
		iZ	21	37			
	LJ	ipZ	20	04			
T	iPNEZ	19	51				
		iZ	21	25			
June 13	P	iPNEZ	15	42	52	c	Deep?
	MW	ipZ			53	c	
	R	ipZ			54		
	T	ipZ	43	02			
June 13	P	iPNEZ	23	29	23	d	Normal.
	PX	iSNEZ	34	04			
		eLN	36.0				
	MW	ePNE	29	22			
		eSN	34	01			
	R	ipZ	29	02			
		eNE		13			
	LJ	ipNZ		06			
		eSN	33	41			
	T	iPNEZ	29	40			



No. 27

PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
June 14	P	iPEZ	12	43	37	c	Normal?
	PX	eLZ	13	11			
	MW	iPZ	12	43	38	c	
	LJ	iPZ			37		
	T	iPZ			45		
June 14	P	ePZ	13	23	12		
	PX	eLZ		50			
	MW	ePZ		23	03		
	T	ePZ			17		
		eZ		26	45		
June 15	P	eZ	10	09	27		
	MW	eZ			28		
	T	iZ			35		
June 15	P	ePZ	21	52	00		
	MW	ePZ			01		
June 16	P	eZ	00	04	41		
	P6	eE		05	06		
	MW	eZ		04	41		
	R	eZ			47		
	T	eZ			21		
June 16	P	eZ	19	34	36		May not be distant.
	MW	eZ			30		
June 17	P	eZ	08	19	57		
	MW	eZ			57		
June 17	P	iPEZ	18	02	24	c	Deep?
		iZ		03	10		
	MW	iPZ		02	24	c	
		iZ		03	10		
	R	iPZ		02	27		
June 18	T	iPZ			11	c	
	P	iPZ	09	09	11		Normal.
	PX	eSNEZ		10	57		
	MW	iPNEZ		09	11		
		iSZ		11	07		
	R	ePN		09	16		
		eSE		11	11		
	SB	eE		10	31		
	T	iPNEZ		08	33		
		iEZ			46		
		iSNE		09	43		
		ePZ		08	49		
		iEZ		09	02		
June 19	P	ePNEZ	17	18	56	d	
		ePPZ		21	07		
		ePPZ		22	25		
	PX	eN		28	39	d	
		iPKKPZ		36	48		
	MW	iPNEZ		18	58	d	
		iPPZ		21	12		
		iSPZ			49		
		iPPZ		22	27		
		iPKKPZ		36	50		
	R	ePNE		18	58		
	SB	ePNE			54		
	LJ	iPNZ			55		
eN			28	38			
iPZ			19	04			
T	iZ		21	20			

Continued



No. 29

## PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
June 23	P	ePZ	16	52	57		
	MW	iPZ		53	00		
	R	ePZ		52	54		
	T	iPZ		53	14		
June 24	MW	iPZ	02	16	51		
	T	iPZ			32		
June 24	P	ePZ	03	30	28		Normal.
		iPNEZ			33		
	PX	eLN		34	50		
	MW	ePNEZ		30	27		
	R	ePZ			20		
	LJ	ePZ			07		
	T	iPNEZ			58		
	H	ePN			46		
June 24	P	iPNEZ	13	19	22	c	Normal. Two shocks from the same epicenter, 1m 53s apart, the second larger. Pasadena distant 41° USCGS: 8°N, 84°W. 0 = 13:11.8 J.S.A: 8.1°N, 84.2°W. 0 = 13:11:36
	MW	iPZ			23		
	R	iPZ			16		
	T	iPZ			39		
	H	ePZ			29		
June 24	P	iPNEZ	13	21	15	c	Normal. J.S.A: 13:13:29
		iPcPZ			23 15		
	P6	iSE			27 27		
	PX	eLN			30.8		
	MW	iPNEZ			21 15		
		iPcPZ			23 16		
	R	iPZ			21 09		
		iPcPZ			23 13		
	SB	ePZ			21 20		
	LJ	ePNZ			04		
	T	iPNEZ			32		
		iZ			22 25		
		iPcPZ			23 25		
eSE				28 03			
H	iPNEZ			21 23			
June 24	P	iPNEZ	15	06	53	c	Deep?
		iZ			07 51		
	MW	iPZ			06 53	c	
		iZ			07 51		
		iZ			08 14		
	R	iPNEZ			06 48		
	LJ	iPNZ			42		
	T	iPNEZ			07 10	c	
H	ePNEZ			01			
June 24	P	iPZ	20	10	45		Normal. Using data of American and European stations, 36°N, 36°W. 0 = 19:58.9 in agreement with USCGS. Δ = 66°
		iZ			11 47		
	PX	ePPZ			13 08		
		ePPPZ			15 05		
		iZ			17 58		
		eSN?			20 00		
	MW	eLZ			34.8		
		iPNEZ			10 46		
		iPPZ			13 06		
	R	iPZ			10 42		
ePPZ				13 00			

Continued

No. 30

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
June 24	T	ePNE	20	10	37		Continued
		ePPZ		12	34		
	H	ePNE		10	41		
June 24	P	iPZ	21	20	14		
	MW	iPZ			15		
	R	iPZ			17		
June 27	P	iPZ	05	56	52		
	MW	iPZ			50		
	T	iPZ		57	04		
June 29	P	iPNEZ	15	26	46		
		iZ			52		
	MW	ePZ			43		
	R	ePZ			36		

C. F. Richter

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
July 1	P	ePZ	06	04	32		Normal
	PX	eLNZ		07.2			
	MW	ePZ		04	38		
	T	eZ		05	03		
July 1	P	eP'Z	12	08	49		Normal. Distance about 130°. Strasburg gives northwest Sumatra about 5°N., 95°E.
		iP'Z			58		
	PX	ePPZ		11	06		
		ePKSNEZ		12	21		
	MW	eLZ		55			
		eP'Z		08	43		
		ePPZ		11	17		
		ePKSZ		12	19		
	LJ	iZ			33		
		ePKSZ			17		
T	eP'Z		08	53			
July 1	P	iPNEZ	15	01	20		
	MW	iPZ			20		
	LJ	ePZ			08		
July 2	P	ePZ	02	49	51		Normal.
		iNEZ		50	08		
	PX	eSNZ?		59	18		
		eSSN	03	06.4			
	MW	ePZ	02	49	31		
		iPPZ		53	13		
	R	ePNE		50	01		
	LJ	ePNZ		49	59		
iPNEZ				54			
July 2	T	ePZ	03	15	58		
July 2	P	iPNEZ	03	57	07		
	MW	iPZ			07		
	LJ	iPZ			12		
	T	ePZ		56	59		
July 3	P	ePZ	05	30	21		
	MW	ePZ			21		
	R	iPZ			16		
	T	ePZ			24		
July 4	P	iPEZ	05	25	52		
	MW	iPZ			54		
	R	ePZ			56		
	LJ	ePZ			52		
July 4	P	iPNZ	06	08	00		Normal. $\Delta = 88^\circ$ . Solomon Islands. USCGS: 13°S., 163°E.
		ePPZ		11	39		
	MW	iSNE		18	39		
		ePSZ		19	25		
		iSSN		24	28		
		iLN		31	42		
		iPNEZ		08	01		
		iPPZ		11	36		
	R	iPZ		08	02		
		ePNZ			06		
	LJ	iPNEZ			05		
		eSNE		18	45		
July 4	P	iPNEZ	06	51	30		Normal. Surface waves recorded. Aftershock of preceding.
		iPNEZ			32		
	R	iPNEZ			34		
	LJ	ePNEZ			31		
		ePNEZ			34		
	T	eSZ	07	02	14		
July 4	P	ePZ	07	38	55		Normal. Surface waves recorded. Aftershock.
	MW	ePZ			55		

Continued

Date	Station	Phase	G. C. T.			c	d	Remarks
			h	m	s			
July 4	R	iPZ	07	39	00			Continued
	LJ	ePZ		38	59			
	T	ePNEZ		39	01			
July 4	P	ePZ	07	52	11			
	MW	ePZ			12			
	R	ePZ			15			
	LJ	ePZ			18			
	T	ePZ			16			
July 4	P	ePZ	07	58	06			
	MW	iPZ		57	53			
	R	iPZ			55			
	T	ePZ		58	01			
July 4	P	ePZ	10	50	40			
	MW	iPZ			42			
	R	iPZ			43			
	T	ePZ			47			
July 4	MW	eZ	14	41	13			
	R	eZ			15			
July 4	MW	ePZ	15	14	21			
July 4	P	iPZ	19	51	45	c		Tucson iP = 19:52:08. (Courtesy USCGS)
	MW	iPZ			45	c		
	R	ePZ			46			
July 4	MW	ePZ	22	44	32			
	R	ePZ			33			
July 5	P	iPNEZ	01	48	23			Normal?
	PX	eLE		02	03			
	MW	iPZ		01	48	30		
	R	iPZ			30			
	T	ePZ			04			
July 5	P	iPNEZ	17	18	21			
	MW	iPZ			20			
July 5	P	iPNEZ	23	50	37	c		Deep?
		eZ		51	34			
	MW	iPNEZ		50	39	c		
	R	iPZ			39			
	T	eZ		51	36			
		iPZ		50	45			
July 8	P	iPNEZ	12	59	22	d		Deep?
		iZ			28			
		i	13	01	05			
		iZ			11			
	MW	iPNEZ	12	59	22			
		iZ	13	01	06			
	R	iPNEZ	12	59	17			
		iZ	13	01	02			
	SB	ePEZ	12	59	45			
	LJ	ePNEZ			09			
	T	ePNE			43			
July 8	P	ePZ	22	49	28			
	MW	ePZ			30			
		iZ			39			
	R	iPZ			32			
		iZ			41			
	T	iPZ			31			
July 9	P	iPZ	13	44	19	c		Deep? Depth apparently about 70 km.
		iZ			38			
		iZ			53			
	MW	iPZ			19	c		
		iZ			38			

Continued



Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
July 9	R	iPZ iZ	13	44	21 40	c	Continued
July 9	P MW R	ePZ ePZ iZ ePZ	16	03	23 23 32 20		
July 9	P PX MW R SB LJ	iPNEZ iZ eZ eSNE iE iPNEZ iZ iZ iPNEZ iPEZ iPNEZ	17	38	14 42 39 46 47 38 39 23 38 11 22 05	d	Deep. South America.
July 11	P PX MW R T	iPNEZ eLN iPZ iPZ iPNEZ	13	51	42 14 51.6 42 40 44		Normal? Surface waves small.
July 11	P MW	ePZ ePZ	14	53	31 31		
July 11	P PX MW R T	iPNEZ ePPNE eLE iSNE iPNEZ iPNEZ iPNEZ eSE	17	23	16 24 07 26.2 26 35 23 16 05 58 27 32	c c	Normal. Long-period surface waves precede short-period S at Pasadena. J.S.A: 20.7°N., 108.3°W. 0 = 17:19:31
July 12	P MW	iPNEZ iPZ	19	40	52 52		
July 14	P P6 MW R SB T	ePNE eZ eLN iPZ ePZ iPZ iPNEZ	04	19	43 20 14 23.7 19 42 35 59 20 12		Normal.
July 14	P MW R	iPZ iPZ iPZ	13	36	59 37 00 02		
July 14	P PX MW R SB LJ T	ePNEZ eSN iLNEZ iPZ iPZ iPNEZ iPNEZ iPZ	22	40	25 50 23 23 04.9 22 40 24 28 18 43 13		Normal. South of Japan.
July 15	P PX P MW	iPNEZ iZ iZ eSNE eP'P'Z iPZ iZ	19	13	20 51 14 03 21 19 43 10 13 22 57		Deep. Region of Kamchatka. Roughly $\Delta = 62^\circ$ , $h = 100-200$ km.

Continued



Date	Station	Phase	G. C. T.			c d	Remarks	
			h	m	s			
July 15	MW	iZ	19	14	03	Continued		
		eSZ		21	26			
		eP'P'Z		43	04			
	R	iPZ		13	24			
	SB	iPZ		13	13			
		iZ			53			
	LJ	iPZ			32			
	T	iPZ		13	06			
		iZ			36			
iZ				41				
July 15	P	ePZ	03	05	25			
	MW	iPZ			27			
	R	iPZ			29			
July 16	P	iPEZ	07	06	10	c		
	MW	iPZ			11			
	R	iPZ			11			
July 16	P	iPZ	10	30	36		Normal? $\Delta = 79^\circ$ . Surface waves small. South of Japan.	
	PX	iSNE		40	36			
		eLNZ			55			
	MW	iPZ		30	36			
	R	ePZ			37			
	SB	iPZ			27			
	LJ	ePN			42			
	T	iPZ			30			
July 17	P	ePEZ	18	52	52		Normal.	
	PX	eLZ		19	18.5			
	MW	iPZ		18	52			53
	R	iPZ			55			
	T	iPZ			43			
July 18	P	iPNEZ	01	08	37		Normal. $\Delta = 38^\circ$ . Eastern Aleutian Islands.	
	PX	eSNE		14	29			
		eLZ			19.3			
	MW	iPZ		08	37			
	R	iPZ			41			
	SB	iPZ			28			
	LJ	ePN			45			
	T	iPNEZ			18			
July 19	P	iZ	03	07	07		Normal.	
	PX	eE			19.4			
		eLE			33			
	MW	iZ		07	04			
	R	iZ			06			
July 19	PX	eLE	10	23			Normal.	
July 19	P	iPNEZ	19	44	28	d	Deep. $h = 170$ km. $\Delta = 53^\circ.0 = 19:35:27$ USCGS: $0.0^\circ\text{N.}, 77.0^\circ\text{W.}$ $0 = 19:35:14$ $h = 160$ km. J.S.A: $1.5^\circ\text{N.}, 77.5^\circ\text{W.}$ $0 = 19:35:50$ $h = 175$ km. Strasbourg: $1.0^\circ\text{S.}, 75.8^\circ\text{W.}$ $0 = 19:35:16$  The epicenter by Strasbourg agrees best with the Pasadena observations.	
		ipPEZ		45	08			
		isPN			42			
		iPcSZ		49	18			
		iSNEZ		51	47			
		isSN		53	06			
		iScSN		54	00			
		isScSN		55	23			
		eLE		20	02.4			
		P	eP'P'Z		14			41
	ipP'P'Z			15	34			
	MW	iPNEZ		19	44	28	d	
		ipPNEZ			45	10		
		iSEZ			51	48		
iP'P'Z			20	14	45			
Continued								

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Continued							
July 19	R	iPNEZ	19	44	25		
		ipPNZ		45	03		
		iSE		51	38		
	SB	eP'P'Z	20	14	45		
		ePNEZ	19	44	38		
		ipPNEZ		45	20		
		eZ		49	20		
	LJ	eSNEZ		52	17		
		ePN		44	15		
		ipPNE		45	00		
	T	eSE		51	20		
		iPNEZ		44	37		
		iZ		45	19		
eSNE			52	08			
eNE			54	11			
July 22	P	iPZ	10	52	45		
	MW	iPZ		46		d	
	R	iPZ		41			
	T	iPZ		43	01		
July 22	P	iZ	13	25	26		
	MW	iZ			26		
	R	iZ			22		
July 22	P	iPNEZ	17	16	24		Normal. Strong in Central Alaska. USCGS: 64.6°N., 145.8°W. 0 = 17:09:5 J.S.A.: 64.5°N., 145.1°W. 0 = 17:09:36 Strasbourg: 64.9°N., 145.8°W. 0 = 17:09:24 Paper on this shock by E.H.Bramhall, B.S.S.A., Vol. 28, p. 71. Readings at 18 <sup>h</sup> 01 <sup>m</sup> probably refer to an aftershock.
	PX	iSNE		22	03		
		ILN		25	20		
	P	iZ	18	01	52		
	MW	iPNEZ	17	16	25		
		iSNE		22	02		
		iZ	18	01	55		
	R	iPNEZ	17	16	28		
		iSE		22	13		
	LJ	ePNEZ		16	35		
	SB	ePNEZ			19		
		eSE		22	02		
	T	iPNEZ		16	03		
		eSN		20	29		
eZ		18	01	29			
H	ePNE	17	16	11			
July 23	P	ePZ	07	16	12		
		eZ		17	30		
	PX	eLE		25.5			
	MW	iPZ		16	15		
	R	iPZ			16		
July 24	P	ePZ	00	00	39		
	MW	ePZ			39		
July 24	P	ePZ	09	08	42		Normal.
		iZ			47		
		eZ		09	37		
	PX	eLE		21.0			
	MW	iPZ		08	42		
	R	iPZ			44		
	SB	eZ			42		
	H	iPZ			34		
	July 24	P	iPZ	15	30	53	
iZ				32	01		
MW		iPZ		30	53		
		iZ		32	02		
Continued							

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## PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c	Remarks		
			h	m	s				
July 24	R	iPZ	15	30	56		Continued		
	SB	iPZ						47	
	LJ	ePN						24	
	T	iPZ						50	
July 24	P	iPNEZ	16	13	09	d	Normal?		
	PX	eLE						16	10
		eSNZ							32
	MW	iPZ						13	09
		iSNEZ						16	32
	R	ePZ						13	02
		eSNEZ						16	05
	SB	iPZ						13	23
	LJ	ePN						12	44
		eSN						15	37
	T	ePN						13	50
H	ePNE		32						
July 24	P	iPEZ	19	45	24				
	MW	iPZ						26	
	R	iPZ						26	
	T	eZ						30	
July 25	P	ePZ	11	37	06		Additional readings at Mt. Wilson: eZ 11:37:23, eZ 11:37:36		
	MW	iPZ						07	
	R	iPZ						10	
July 25	P	iPEZ	13	19	39		Normal.		
	PX	iSNE						24	59
		eLN						25.5	
		iPZ						19	39
	R	iPNEZ							42
	SB	ePNEZ							31
	LJ	ePN							47
	T	iPNEZ							19
		iZ						22	19
	H	ePNE						19	25
July 26	P	iPNEZ	03	52	33	d	Deep. (h about 100 km.) $\Delta = 25^\circ$ . Destructive in Mexico. USCGS: 18°35'N., 95°44'W. 0 = 03:47.1 J.S.A: 18.6°N., 86.5°W. 0 = 03:47:11 Strasbourg: 19°N., 86.5°W. 0 = 03:47.2 Tucson (Courtesy USCGS) iP = 03:51:33 Compare the next entry.		
		iPcPZ						56	01
	PX	iSE							51
		iLN						57	36
	MW	iPNEZ						52	33
	R	iPNEZ						52	27
	SB	iPNEZ							44
	LJ	iPNE							21
		eSN						56	35
	T	iPNEZ						52	48
	H	iPNEZ							42
July 26	P	iZ	04	25	31		This may be part of the preceding shock, but is apparently too early for P'P'. Tucson 1 = 04:25:58 (Courtesy of USCGS)		
	MW	iZ						32	
	R	iZ						33	
	T	iZ						24	
July 26	P	ePZ	07	58	06		Normal? Surface waves possibly from another shock.		
	PX	eLNE						08	18.0
	R	ePZ						07	58
July 26	P	ePZ	08	28	36		Normal.		
	PX	eLNEZ						48	
	MW	iPZ						28	35
	R	ePZ							38

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
July 26	P	iPZ	17	57	20		
		eZ		58	08		
	R	iPZ		57	22		
	H	ePNE			23		
July 26	P	iPZ	20	08	22		Normal, or perhaps slightly deeper. Off Japan. Strasbourg: 37°N., 141°E. h = 100 km. USCGS: 40°N., 141°E. $\theta = 19;56.6$ Tokyo according to Strasbourg: 37.3°N., 142.5°E.
		iZ			44		
	FX	iSNE	18	03			
		iNE			10		
		iLE	27	11			
	MW	ePE	08	24			
		eN	18	11			
	R	iPNEZ	08	24			
	SB	iPZ			15		
	LJ	eN	17	52			
H	ePN	08	35				
	H	ePNE			08		
July 29	P	iPNEZ	21	42	38	c	Deep?
	MW	iPZ			39	e	
	R	iPZ			39	c	
	SB	iPZ			34		
	H	ePNE			47		
July 30	P	iPZ	14	48	56		
	MW	iPZ			58		
	R	iPZ			57		
July 30	P	eZ	14	15	39		Normal. May be part of preceding.
	PX	eLE		40			
	MW	ePEZ		15	38		
	R	ePZ			39		
July 31	P	ePEZ	11	01	34		Surface waves small.
	PX	eLE		27.4			
	MW	iPZ		01	34		
	R	iPZ			37		
July 31	P	eZ	20	49	10		Normal. China.
	PX	eNE		59	45		
		eLN	21	16.2			
	MW	eZ	20	49	10		
	R	eZ			10		
	SB	eZ			07		
	T	eZ			02		
	H	eNE			24		
		eN		59	41		
	July 31	P	eZ	21	14	23	
MW		eZ			24		
R		eZ			22		
SB		eZ			15		

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PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Aug 1	PX	eLNE	10	11	37		Normal. Tucson (Courtesy USCGS) iP = 10:08:37, i = 10:08:49, iS = 10:09:43 Probably Gulf of California.
	P	eSNES			44		
	MW	ePZ		09	29		
		eSZ		11	36		
	R	ePZ		09	26		
		eZ			41		
		eSNEZ		11	29		
	LJ	ePZ		09	35		
		eSNEZ		10	52		
	T	eZ		13	32		
	H	eNE		12	26		
Aug 1	P	ePZ	10	54	27		Normal. China. Aftershock of July 31, 20 <sup>h</sup> .
	PX	eLNE	11	28			
	MW	ePZ	10	54	27		
	R	ePZ			39		
	T	ePZ			20		
	H	eE			21		
Aug 2	P	iPZ	03	36	00		Deep?
		iZ			38		
	MW	iPZ		35	59		
		iZ		36	39		
		eZ		37	59		
		iZ		38	52		
	R	iPZ		35	55		
		iZ		36	35		
		iZ		37	54		
		iZ		38	49		
T	iPZ		36	10			
	iZ			45			
Aug 2	P	iPNEZ	15	56	11	c	Normal.
	PX	eSE	16	04	12		
		eLE		15			
	MW	ePNE	15	56	12		
	R	iPNEZ			13		
	LJ	ePZ			20		
	T	iPZ		55	58		
	H	ePE		56	04		
Aug 3	P	ePZ	22	00	29		Surface waves small.
	PX	eNZ		09	23		
	R	ePZ		00	25		
		eZ		09	10		
	T	ePNEZ		00	49		
		eN		09	54		
	H	ePE		00	52		
	eE		10	08			
Aug 4	P	iZ	23	54	23		Deep? Felt in N. Sumatra, according to Batavia. Strasbourg: 10°N., 95°E. Bombay: 6°N., 94.5°E.
		iEZ		57	37		
	R	iZ		54	25		
		iZ		57	39		
Aug 5	P	iPNEZ	06	52	22	c	Deep.
	MW	iPNEZ			23		
	R	iPZ			24		
	LJ	iPZ			21		
	T	iPNEZ			32		
	H	ePE			30		

Date	Station	Phase	G. C. T.			c	Remarks
			h	m	s		
Aug 5	P	ePNEZ	14	57	03		Normal. Strasbourg: 7°S., 149°E. approx.
	PX	eE	15	07	23		
		eN		08	03		
		eLE		27.0			
	MW	ePZ	14	57	02		
		eEZ	15	07	20		
	R	ePEZ	14	57	04		
		iE	15	07	33		
	SB	ePZ	14	57	00		
	LJ	ePZ			05		
	T	iPZ			05		
		eN	15	07	30		
	H	ePE	14	57	10		
	eE	15	07	34			
Aug 6	P	ePZ	05	39	16		
	MW	iPZ			17		
	R	iPZ			18		
Aug 6	P	iPZ	12	09	27		
	MW	iPZ			28		
	R	ePZ			29		
	T	ePZ			35		
Aug 7	P	iPZ	14	54	44	c	
	MW	iPZ			45	c	
	R	ePZ			49		
	LJ	ePZ			55		
	T	iPZ			32		
Aug 7	P	ePZ	22	42	09		
	MW	iPZ			10		
	R	iPZ			18		
Aug 8	P	iPEZ	10	24	25	d	Deep?
		iE		34	42		
	MW	iPZ		24	27		
		eZ		28	11		
	R	iPNEZ		24	28	c	
	LJ	iPZ			31		
	T	iPEZ		24	25		
		eE		34	35		
	H	ePEZ		24	23		
Aug 9	P	eZ	08	44	41		
	MW	eZ			34		
		eZ			44		
	R	eZ			34		
	T	eZ			44		
eZ				44			
Aug 9	P	ePZ	12	49	56		Near Titizima. Foreshock of the following.
	MW	eZ		50	00		
Aug 9	P	ePZ	14	51	55		Normal. Near Titizima, according to Nagoya and Zinsen. Bombay gives 26°N., 140°E.
	PX	eLE	15	17.5			
	MW	ePZ	14	51	57		
	R	iPZ			57		
Aug 10	P	iPNEZ	16	13	36	d	Deep?
		eZ		15	09		
		iZ			50		
	MW	iPNEZ		13	36		
		eZ		15	50		
	R	iPNEZ		13	30		
	LJ	ePNEZ			24		
T	ePE			53			

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PASADENA and auxiliary stations

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Date	Station	Phase	G. C. T.			c	Remarks	
			h	m	s			
Aug 10	P	ePEZ	19	43	51			
	MW	iPZ			50			
	R	iPZ			43			
	LJ	ePZ			38			
	T	ePZ	44	07				
	H	ePE			07			
Aug 11	P	ePZ	01	10	55		Deep. 7°S., 116°E. $\theta = 00:55:55$ h = 610 km. $\Delta = 123^\circ$ . Strasbourg gives: 7°S., 115.7°E., 600 km. Batavia gives: 6.5°S., 116.5°E., 650 km. Readings following 01:13 refer to various branches of P", formerly considered to be a diffracted P'. See M.N.R.A.S., Geophys. Suppl. Vol. 4, pp. 363-372, where this problem is discussed and the Pasadena vertical seismogram is reproduced.	
		eP"Z		13	38			
		iZ			42			
		iEZ			45			
		iz:			48			
		iz:			54			
		ePPZ	15	25				
		iPPE			32			
		ipP"Z	16	09				
		PX	iE	18	34			
			eSKKSE	21	28			
			iPKKPZ	23	47			
		P	eE	24	09			
			iNE	28	28			
		PX	iNE	29	44			
	eN		31	16				
	iSSE				59			
	iNE		35	11				
	MW		ePZ	10	49			
			eP"Z	13	41			
			iNEZ			44		
	R		iPPNEZ	15	34			
			ipP"Z	16	09			
			iPKKPZ	23	48			
			ip"Z	13	39			
			iNEZ			48		
			iPPNEZ	15	37			
			iZ	17	49			
			iPKKPZ	23	44			
		iSKKPZ	26	30				
		SB	ip"NEZ	13	40			
	iPPNEZ		15	24				
iPKKPZ	23		53					
LJ	eP"Z	13	40					
	iPPNE	15	41					
	iPKKPZ	23	42					
T	eP"Z	13	41					
	iPKKPZ	23	53					
	eSKKPZ	26	50					
H	eP"EZ	13	45					
Aug 12	P	eZ	00	37	10			
	PX	eLN		50.7				
	MW	iPZ		37	10			
	R	ePZ			05			
Aug 12	P	iPEZ	04	01	33	c		
	MW	iPZ			33	c		
		iZ		03	19			
	R	iPZ		01	33			
		iZ		03	22			
	LJ	ePZ		01	37			
T	ePZ			32				





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PASADENA and auxiliary stations

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Date	Sta- tion	Phase	G. C. T.			c d	Remarks	
			h	m	s			
Aug 13	P	ePZ	12	00	47		Normal.	
	PX	eLN		29.4				
	MW	ePZ		00	46			
	R	eZ			47			
Aug 15	P	ePZ	04	41	10			
	MW	ePZ			09			
	R	eZ			20			
	SB	eZ			16			
Aug 15	P	eZ	10	09	34			
	MW	eZ			35			
Aug 16	P	iPNEZ	17	14	12	d	Deep?	
	MW	iPZ			14	d		
	R	iPZ			14	d		
	LJ	iPZ			11			
	T	iPZ			23	d		
	H	ePE			20			
Aug 17	P	ePNEZ	13	22	06		Normal.	
	PX	eLN		46				
	MW	ePZ		22	05			
	R	iPZ			09			
	SB	ePZ			21			
	LJ	ePZ			14			
	T	ePZ			03			
Aug 17	P	ePZ	16	25	29			
	MW	iPZ			30			
	R	iPZ			32			
Aug 18	P	ePNEZ	18	05	35		Nagoya gives: 2°N., 142.3°E.	
	MW	ePZ			34			
Aug 19	P	ePZ	07	04	47		Normal. Tucson (Courtesy USCGS) iP = 07:05:47 Nevada.	
		iZ			52			
	MW	iSNEZ		05	46			
		ePZ		04	43			
		eZ			46			
	R	iSEZ		05	43			
		ePZ		04	46			
	T	iSZ		05	42			
		iPZ		04	03			
	H	iSZ			16			
ePEZ				16				
iEZ				19				
Aug 19	MW	iSEZ			43			
		iPZ	09	53	42			
		ePZ			44			
Aug 20	P	iPZ			30		Normal? Surface waves small. Bombay gives: 24°S., 71°E. Δ = 168° approx.	
		iP <sub>2</sub> 'Z	06	58	12			
		iP <sub>2</sub> 'Z			59	26		
		iPPZ	07	03	11			
	MW	eZ		07	01			
		eZ			41			
		iP'Z	06	58	13			
		iP <sub>2</sub> 'Z			59	26		
		iPPZ	07	03	15			
		eZ		06	48			
	R	eZ		07	40			
		eP'Z	06	58	12			
		eP <sub>2</sub> 'Z			59	27		
		ePPZ	07	03	13			

Continued

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## PASADENA and auxiliary stations

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Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Aug 20	LJ	eP'Z	06	58	13	Continued	
		eP <sub>2</sub> 'Z		59	34		
	T	eP'Z		58	13		
		iP <sub>2</sub> 'Z		59	19		
		ePPZ	07	03	10		
Aug 20	P	ePZ	12	13	27		Normal. Destructive in the Phillipines. Damage at Manila. Manila gives: 14°10'N., 122°05'E., O = 11:59:13
		eZ		16	43		
	PX	iPPZ		17	47		
		iPPPNE		20	19		
		eSKSN		24	10		
		iNE			35		
	P	eE			55		
	PX	iE		27	25		
	P	ePKKPZ		29	15		
	PX	iNE			42		
		iSSN		32	47		
	P	eP'P'Z		37	26		
	PX	eLN		43			
	MW	ePZ		13	26		
		eZ		16	53		
		iPPZ		17	48		
		ePKKPZ		29	14		
	R	ePZ		13	27		
		eZ		16	54		
		ePPZ		17	58		
		iPKKPZ		29	07		
		eP'P'Z		37	14		
	LJ	ePZ		13	23		
		eZ		16	52		
		ePPEZ		17	57		
	T	ePZ		13	30		
eZ			16	52			
	ePPZ		17	45			
H	ePPE		17	38			
Aug 21	P	eZ	22	17	40		
		iZ		18	01		
	MW	eZ		17	42		
		iZ		18	03		
Aug 21	P	ePZ	23	14	14		Normal. Surface waves recorded.
	PX	eN		39	51		
	MW	ePZ		14	13		
	R	ePZ			25		
Aug 22	P	ePZ	08	21	04		
	MW	iPZ			05		
	R	ePZ			07		
	T	ePZ			12		
Aug 22	P	ePZ	12	43	48		
	MW	iPZ			46		
	R	iPZ			44		
	T	ePZ			51		
Aug 22	P	ePEZ	12	08	58		
	MW	iPZ			59		
		iZ		09	14		
	R	iPZ		08	53		
	LJ	ePZ			51		
	T	ePZ		09	05		

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Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
Aug 22	P	iPZ	17	46	52		
	MW	iPZ			53		
	R	iPZ			47		
	T	ePZ		47	04		
Aug 23	P	ePZ	16	50	10		
	MW	iPZ			11		
	R	iPZ			10		
Aug 23	P	eZ	17	04	00		
	MW	iPZ		03	55		
	R	iPZ			56		
Aug 24	P	iPNEZ	18	39	23	d	Normal. $\Delta = 74.5^\circ$ . $O = 18:27:48$ . Tonga Islands.
	PX	iSN		43	54		
		eLN			58.0		
	MW	iPZ		39	27	d	
	R	iPNEZ			29	d	
	SB	iPZ			23		
	LJ	iPNEZ			26		
	T	iPZ			35	d	
	H	ePE			35		
Aug 24	P	iPNEZ	20	21	00	c	Normal? Depth probably about 100 km. $\Delta = 41^\circ$ . $O = 20:13:20$ . Interpretation and identification of phases somewhat doubtful. Apparently off Panama.
	PX	iPPZ		22	59		
		iSNE		27	12		
		iLN		30	15		
	MW	iPNEZ		20	58	c	
		eSZ		27	07		
	R	iPNEZ		20	53	c	
	SB	iPNEZ		21	08		
	T	iPZ		11	c		
		iZ		46			
	H	iPE		09			
Aug 25	P	iPNEZ	12	20	19		
	MW	iPZ			19		
	R	iPZ			23		
Aug 26	P	iPZ	11	37	44		
	MW	ePZ			43		
	R	iPZ			41		
	T	iPZ			56		
Aug 26	P	iPZ	15	48	04		
	MW	iPZ			04		
	R	ePZ			06		
	T	iPZ		47	57		
Aug 26	P	iPZ	19	06	59		Nagoya, Hukuoka, and Zinsen give: $31.4^\circ N.$ , $131.5^\circ E.$
	MW	iPZ			58		
	R	ePZ		07	00		
	T	iPZ		06	49		
Aug 27	PX	eLNE	00	06.5		Normal.	
Aug 29	MW	iPZ	00	29	58		
	R	iPZ		30	00		
	T	iPZ			02		
Aug 29	P	ePZ	12	00	55		
	MW	ePZ			56		
	R	ePZ			54		
	T	ePZ		01	01		
Aug 30	P	iPZ	02	52	56		
	MW	iPZ			57		
	R	iPZ			53		
	T	iPZ		53	08		

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Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Aug 30	P	iPEZ	13	38	35		
	R	ePZ			39		
	T	ePZ			37		
Aug 31	P	ePZ	02	41	34		Normal?
	PX	eLN?	03	04.6			
	MW	ePZ	02	41	34		
		ePPZ?		45	01		
	R	ePZ		41	34		
	LJ	ePZ			30		
	T	ePZ			36		
Aug 31	P	iPZ	06	59	43		
	MW	iPZ			42		
	R	iPZ			39		
	T	iPZ			54		
Aug 31	P	eZ	14	33	43		Normal. Bombay gives: 25°N., 96°E.
	PX	eLN	15	03.9			
	R	eZ	14	33	54		
	LJ	eZ			49		
	T	eZ			38		

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 PASADENA, CALIFORNIA

1937

**BULLETIN**

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the California Institute of Technology and the Carnegie Institution of Washington, as a cooperative undertaking. This laboratory is the central station of a coordinated group. Auxiliary stations in southern California are maintained and operated as follows: At the Mount Wilson Observatory on Mount Wilson (a Department of the Carnegie Institution of Washington); at Riverside (in cooperation with the City of Riverside); at Santa Barbara (in cooperation with the Santa Barbara Museum of Natural History); at La Jolla (in cooperation with the Scripps Institution of Oceanography of the University of California); at Tinemaha, and at Haiwee, in the Owens Valley (in cooperation with the Department of Water and Power of the City of Los Angeles). Address all correspondence to Pasadena.

**TIME:** At all these stations the minute-marks on the seismograms are coordinated directly by means of auxiliary records written at each station on which the minute-marks are registered closely parallel with recorded dot-and-dash radiotelegraphic signals sent in ordinary course from a powerful transmitting station. This permits direct correlation of the minute-marks at all the stations of the group at practically all times with an accuracy of one second, and usually of one-fifth second.

Standard time is determined at Pasadena by comparing the station clock with automatically recorded radio time signals of the U. S. Naval Observatory, three to five times daily.

The constants of these stations follow.

**PASADENA                      SEISMOLOGICAL LABORATORY                      Central Station**

$\Phi = 34^{\circ} 08.9' N.$ ,  $\lambda = 118^{\circ} 10.3' W.$ ,  $h = 295$  m.,      Deeply weathered granite rock, with inclusions of gneiss and schist.

Apparatus: horizontal-component torsion seismometers with electromagnetic damping and optical recording. (Cf. Bull. Seis. Soc. Am., XV, 1, 1925).

Instruments, and Constants (approximate);

	$T_0$	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	“	“	“
E — W	6 sec.	800	0.8-0.9

Seismometers with electromagnetic damping and galvanometric-optical recording. (Cf. Bull. Seis. Soc. Am., XXII, 156, 1932).

N, E and Z inertia-mass 100 kg.,  $T_0 = 1.0$  sec.,  $h = 1$   
 galvanometers: (1)  $T_1 = 0.25$  sec.,  $h = 4$ .  
 (2)  $T_1 = 2$  min.,  $h = 1$ .

Horizontal strain seismometer (Cf. Bull. Seis. Soc. Am. XXV, 283, 1935) Axis in N-S line (Long period). Damping critical.

The constants of the short-period instruments do not undergo any significant changes. The constants of the instruments of longer period will be given from time to time when deviations from the values given are significant.

Experimental seismographs of various kinds are in process of development from time to time, and are used for intervals of variable duration. Information concerning these will be given when necessary.

## AUXILIARY STATIONS

Each of the auxiliary stations has equipment as follows:

Apparatus: two horizontal-component torsion seismometers with magnetic damping and optical recording;

Instruments and Constants (approximate);

	T <sub>0</sub>	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	“	“	“

one vertical component seismometer with galvanometric-optical recording;  
 inertia-mass 100 kg. T<sub>0</sub> = 1.0 or 0.5 sec. Damping critical or slightly less;  
 galvanometer: T<sub>1</sub> = 0.2 sec. h = 4.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

### Mount Wilson Seismologic Station

Φ = 34° 13.5' N., λ = 118° 03.4' W., h = 1742 m., Weathered granite.

### Riverside Seismologic Station

Φ = 33° 59.6' N., λ = 117° 22.5' W., h = 250 m. approx., Weathered granite.

### Santa Barbara Seismologic Station

Φ = 34° 26.5' N., λ = 119° 42.9' W., h = 100m. approx., Heavy, boulder-laden alluvium.

### La Jolla (Scripps Institution Seismologic Station)

Φ = 32° 51.8' N., λ = 117° 15.2' W., h = 7.7 m. approx., Consolidated detrital material.

### Tinemaha Seismologic Station

Φ = 37° 05.7' N., λ = 118° 15.5' W., h = 1180 m. approx., Basalt.

### Haiwee Seismologic Station

Φ = 36° 08.2' N., λ = 117° 57.9' W., h = 1100 m. approx., Loosely cemented tuff.

**SYMBOLS AND NOTATIONS:** in general the symbols and notation conform with the usual international practice. For the phases of deep-focus earthquakes the notation of F. J. Scrase is adopted. When surface waves are not reported no such waves are observed. c, d are abbreviations for compression and dilatation.

When measurements referring to local earthquakes are included P and S will be used without index or subscript, as no attempt will be made in these bulletins to distinguish between  $\bar{P}$ , P\*, and P<sub>n</sub>, although such complications are often clearly indicated and are the subject of study.

**SPECIAL SYMBOLS** indicating the stations of this coördinated group are as follows:

### PASADENA SEISMOLOGICAL LABORATORY

- For routine instruments of period 0.8 second . . . . . P
- For routine instruments of period 6 seconds . . . . . P<sub>6</sub>
- For instruments of different period analogous notation will be employed.
- For routine instruments, galvanometer period 0.25 second . . . . . P
- For routine instruments, galvanometer period 2 minutes . . . . . PX

- Mount Wilson Seismologic Station . . . . . MW
- Riverside Seismologic Station . . . . . R
- Santa Barbara Seismologic Station . . . . . SB
- La Jolla (Scripps Institution Seismologic Station) . . . . . LJ
- Tinemaha Seismologic Station . . . . . T
- Haiwee Seismologic Station . . . . . H

In general detailed measurements will be given only for the records of the Seismological Laboratory: those for records of the other stations will be given only to supplement the information.

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Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 1	P	ePZ	03	14	17		
	MW	iPZ			18		
	R	iPZ			17		
	T	iPZ			38		
Sept 1	P	iPZ	07	15	44		
	MW	iPZ			44		
	R	iPZ			38		
	T	iPZ		16	07		
Sept 1	P	ePZ	07	58	42		
	MW	ePZ			42		
	T	iPZ			29		
		eZ		59	08		
Sept 1	P	iPNEZ	08	51	33	c	Deep? Using data of all available stations, depth apparently about 100 km., 33°S., 180°, 0 = 08:38:59. Δ = 87°. Felt in the Kermadec Islands. USCGS: 31°S., 179°W., 0 = 08:38.9
		iNEZ			45		
	PX	iZ			54		
		eZ		53	56		
		iPPNZ		55	06		
		iZ			23		
		iSNE	09	01	58		
		eN		03	27		
		eLN		14	47		
	MW	iPNEZ	08	51	34	c	
		iPPZ		55	00		
	R	eSNEZ	09	02	00		
		iPNEZ	08	51	35	c	
		ePPZ		54	54		
	SB	eSNEZ	09	02	02		
		iPNEZ	08	51	30		
		LJ	iPNEZ			32	
T	iPNEZ			43	c		
	iZ		53	46			
	eSE	09	02	10			
H	ePE	08	51	41			
Sept 1	P	ePEZ	17	30	12		Tucson readings (Courtesy USCGS): iP = 17:29:15, i = 17:29:38, e = 17:35:37
	PX	iNE			45		
	MW	iPZ			10		
		iZ			51		
	R	ePZ			06		
		iZ			34		
	SB	eZ			27		
T	iPZ			28			
Sept 1	P	iPNEZ	21	54	02	d	Deep? Aftershock of Kermadec shock at 8 <sup>h</sup> . Hypocenter nearly identical, perhaps somewhat deeper. Surface waves smaller in proportion to P. Direction of initial motion opposite to that of principal shock.
		iZ			16		
	PX	iZ			25		
		eZ		57	14		
		ePPEZ			26		
		eSE	22	04	24		
		MW	iPZ	21	54	03	
	R	eZ		57	13		
		iPNEZ		54	04	d	
	SB	iPNEZ		53	59		
	LJ	ePNEZ			58		
	T	iPNEZ		54	11	d	
H	eSE	22	04	37			
	ePE	21	54	10			

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 3	P	iPZ	16	11	39		
	MW	iPZ			40		
	R	iPZ			36		
	T	eZ		12	12		
Sept 3	P	iPNEZ	18	56	27	c	Normal? $\Delta = 45^\circ$ , $O = 18:48:08$ . Surface waves large without a definite beginning. Short-period phases large and of long duration. ScP has the appearance of a superposed shock. USCGS: $52.5^\circ N.$ , $177.5^\circ W.$ , $O = 18:48.2$ h = 160 km. J.S.A: $52.5^\circ N.$ , $177.5^\circ W.$ , $O = 18:48:29$ h = 160-180 km.
		iPPNE		58	44		
		iSNE	19	03	01		
		iE		06	26		
	MW	eP'P'Z		27	22		
		iPNEZ	18	56	28		
		eScPZ	19	01	42		
		iSNZ		03	01		
	R	eP'P'Z		26	52		
		iPNEZ	18	56	31		
		iScPZ	19	01	48		
		eSN		03	04		
		iNE		06	14		
	SB	eP'P'Z		26	44		
		iPNEZ	18	56	20		
	LJ	iSNE	19	02	48		
		iPNEZ	18	56	38		
		ePPE		58	30		
		iSNE	19	03	23		
		iNE		06	18		
	T	iPNEZ	18	56	14		
		iScPZ	19	01	41		
		iSNE		02	38		
		eP'P'Z		27	36		
	H	iPEZ	18	56	19		
		iScPZ	19	01	41		
		eSE		02	49		
	Sept 3	P	iPZ	21	59		
MW		iPZ			49		
R		ePZ			47		
T		ePZ			57		
Sept 4	R	iPZ	02	59	49		
	T	iPZ	03	00	16		
Sept 4	P	iPEZ	03	13	50	d	Deep?
	MW	iPZ			51	d	
	R	ePZ			53		
	SB	ePZ			54		
	T	iPZ		14	00	d	
Sept 4	P	ePZ	06	26	46		Normal?
	PX	eSN?		37	05		
		eLN		48	09		
	MW	eZ		26	49		
	R	ePZ			47		
	LJ	ePZ			47		
	T	ePNE			51		
	H	ePE			56		
Sept 6	P	$\delta Z$	11	07	38		
	MW	eZ			37		
	R	eZ			33		
	T	eZ			42		



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## PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 7	P	eZ	22	36	10		Tucson (Courtesy USCGS): eP = 22:34:35, eS = 22:35:44 Probably Gulf of California.
	MW	ePZ		35	16		
		eZ		36	21		
	R	ePZ		35	03		
	LJ	eSZ		36	01		
		ePZ		34	48		
Sept 7	P	iSEZ	23	13	39		Tucson (Courtesy USCGS): eP = 23:12:56
	MW	ePZ		12	37		
		eSZ		13	42		
	R	ePZ		12	31		
	LJ	eSZ		13	25		
		ePZ		12	08		
Sept 8	P	iP"Z	00	58	35		Deep? Surface waves small. Depth possibly 100-200 km. South Atlantic about 55°S., 30°W. Pasadena Δ about 120°. Similar to shock of 1935, May 14, 23 <sup>h</sup> . USCGS: South Atlantic. O = 00:40.1
		iZ			54		
		iZ		59	07		
	PX	iPPZ?			56		
		iEZ	01	00	11		
		iZ			39		
	P	iSKPZ		02	02		
	PX	iSKSNE		05	19		
	P	iPKKPZ		08	57		
	MW	iP"Z	00	58	36		
		iSKPZ	01	02	03		
		iPKKPZ		08	57		
	R	eP"Z	00	58	32		
		iSKPZ	01	02	00		
		eSKSNE		05	13		
		iPKKPZ		08	57		
		eZ		09	32		
	SB	iP"Z	00	58	40		
	LJ	eP"Z			33		
	T	iP"Z			39		
		iZ	01	00	13		
		eSKPZ		02	04		
		ePKKPZ		08	48		
		eSKKPZ		11	46		
Sept 8	P	iPZ	11	03	14		
	R	ePZ			15		
	T	iPZ			22		
Sept 8	P	eZ	14	19	24		
		iZ			32		
	T	eZ			31		
Sept 8	P	ePZ	16	19	19		
	MW	ePZ			19		
	R	ePZ			11		
Sept 9	P	ePZ	05	38	58		Normal.
	PX	eLZ		52	29		
	MW	iPZ		38	58		
	R	ePZ			52		
	T	iPZ		39	13		
Sept 9	T	ePZ	10	49	35		
Sept 9	P	iPZ	16	26	39	d	
	MW	iPZ			39	d	

Continued

Date	Station	Phase	G. C. T.			c	Remarks
			h	m	s		
Sept 9	R	iPZ	16	26	36	d	Continued
		eZ		27	41		
	T	iPZ		26	51		
		eZ		27	54		
Sept 12	P	iPEZ	12	07	09	d	Deep?
	MW	iZ			44		
		iPZ			10		
		eZ			44		
	R	eZ		10	26		
		iPZ		07	12		
		eZ			50		
	T	eZ		10	29		
		iPZ		07	05		
		iZ			40		
Sept 13	P	iPZ	04	32	02		
	MW	iPZ			02		
	T	iPZ			12		
Sept 13	MW	ePZ	05	34	03		
	T	ePZ			13		
Sept 14	P	iPEZ	11	27	08	d	Deep? Tucson (Courtesy USCGS): iP = 11:27:52, i = 11:28:29 Possibly an aftershock of September 3, 18h.
	MW	iPZ			08		
		iZ			41		
		iZ		28	43		
	T	iPNEZ		26	53		
		eZ		27	17		
		iZ			28		
		iZ!		28	37		
Sept 15	P	iPNEZ	12	40	19	c	Deep? Using all available data, the best solution appears to be 11°S., 161°E. O = 12:27:34. h = 70 km. Pasadena Δ = 87.5°. Phase reported as eS may be SKS. USCGS: 9°S., 161°E. O = 12:27.5 J.S.A: 8.3°S., 162.0°E. O = 12:27:37, Normal.
	PX	ipPZ			35		
		ippZ		43	46		
		eSE		50	43		
		ine!			59		
	P	eLNEZ	13	07.2			
	MW	eP'P'P'Z		26	53		
		iPNEZ	12	40	19		
		ipPZ			37		
	R	eSNEZ		50	44		
		eP'P'P'Z	13	26	55		
		iPNEZ	12	40	20		
		iSNZ		51	04		
	LJ	eP'P'P'Z	13	26	39		
		iPEZ	12	40	22		
		eSE		50	44		
		T	iPNZ		40		
	eSNZ			50	49		
	eN			51	08		
	H	iPEZ		40	22		
eSE			51	03			
Sept 15	P	iPZ	16	18	14	c	
	MW	iPZ			14		
		iZ			27		
	R	iPZ			16		
		iZ			31		
	T	iPZ			18		

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PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 15	P	ePNZ	19	38	18		Normal.
	PX	eLN		49.2			
	MW	ePZ		38	19		
	R	ePZ			25		
	T	ePZ			51		
Sept 15	P	ePNEZ	19	54	18		Normal?
	PX	eLNE	20	06.7			
	MW	ePZ	19	54	18		
	R	ePZ			14		
	T	ePZ			40		
Sept 15	P	ePNEZ	23	55	08	c	Normal. $\Delta = 32^\circ$ . USCGS: $14^\circ\text{N.}, 92^\circ\text{W.}$ $0 = 23:48:52$ J.S.A: $14.2^\circ\text{N.}, 91.6^\circ\text{W.}$ $0 = 23:48:55$ h = 100 km. or more.
		iPPE		56	14		
		ePcPZ		58	02		
	PX	iSNE	24	00	19		
	P	iScPEZ		01	54		
	PX	eLNE		03	05		
		eScSNE		05	52		
	MW	iPZ	23	55	07		
		iPcPZ		58	03		
	R	ePNZ		55	01		
		ePPZ		56	09		
		ePcPZ		57	56		
	LJ	ePNEZ		54	57		
		eSE		59	57		
	T	iPNZ		55	22		
		iPPZ		57	20		
		iPcPZ		58	10		
		iScPZ	24	02	00		
	H	eScSNZ		05	53		
		ePEZ	23	55	16		
eScSE		24	05	58			
Sept 16	P	iPNEZ	10	08	47	d	Deep? Region of Japan. Nagoya reported: P = 10:02:04, S = 10:05:17
		iZ		09	20		
		iE			31		
	MW	iPZ		08	48		
		eZ		09	20		
LJ	iPZ		08	55			
T	iPZ			35			
Sept 16	P	iPNEZ	16	23	37	d	Deep?
	MW	iPZ			38	d	
	R	iPZ			39	d	
		eZ		25	56		
	LJ	iPZ		23	37		
	T	ePN			48		
Sept 17	P	iPZ	06	06	05		
	PX	eLN?		08.5			
	MW	ePZ		06	06		
	T	ePZ		05	41		
	eSZ?		07	27			
Sept 17	P	eP"Z	09	49	27		Normal. $\Delta = 120^\circ?$ $0 = 09:30.6?$ South Atlantic? Interpretation doubtful.
	PX	ePPZ		50	51		
		eSKSN		56	26		
		eLN	10	31			

Continued

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PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 17	MW	eP"Z	09	49	35		Continued
		ePPZ		50	54		
	T	eP"Z		49	32		
		ePPZ		51	18		
Sept 17	MW	ePZ	16	50	41		Deep?
		iZ		51	11		
		eZ			39		
	R	ePZ		50	44		
		iZ		51	13		
		eZ			40		
T	eZ		50	30			
Sept 20	P	iPNEZ	07	08	14	d	Normal. $\Delta = 19^\circ$ . $O = 07:03.8$ Probably near Colima, Mexico.
	PX	iSE		11	58		
		iSN		12	10		
		eLNE		13.1			
	MW	iPNEZ		08	15		
	R	iPNZ			09		
	LJ	iPNEZ		07	57		
	T	ePN		08	42		
	H	ePEZ			31		
Sept 21	P	ePZ	09	54	16		Normal. According to Batavia, felt in N. Celebes, Sangir Is. and Halmaheira. Bombay gives: $4^\circ N.$ , $125^\circ E.$ $O = 09:40.0$ . $\Delta$ about $110^\circ$ .
		eZ		58	17		
		ePPEZ			46		
		ePKKPZ	10	09	16		
	PX	eZ			34		
		eSSNE		13.8			
		eLN		24.6			
	MW	ePZ	09	54	17		
		eZ		58	21		
		ePPZ			44		
		iPKKPZ	10	09	34		
	R	ePZ	09	54	19		
		eZ		58	18		
		iPPZ			52		
		ePKKPZ	10	09	19		
T	ePZ	09	54	12			
	eZ		57	45			
	ePPZ		58	40			
Sept 21	P	ePZ	10	26	55		Normal? Superposed on surface waves of the preceding. Felt in the Kermadec Islands, according to Wellington.
	MW	ePZ			57		
	R	ePZ			57		
	T	ePZ		27	05		
Sept 21	P	iPNEZ	21	12	23	c	Deep?
	PX	eZ		13	02		
	MW	iPNEZ		12	23		
	R	iPNZ			26		
	LJ	iPZ			32		
	T	iPEZ			07		
	H	ePE			14		
Sept 22	PX	eLNE	03	54			Normal. Felt in the Philippines.
Sept 22	P	ePZ	09	35	11		
		iNEZ			19		
		eZ			41		
	MW	ePZ		35	12		

Continued

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## PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 22	R	ePZ	09	35	14	Continued	
	LJ	ePZ			21		
	T	iPZ			15		
		iZ			24		
Sept 22	P	eZ	12	00	59		
	MW	ePZ			48		
		eZ			51		
		iZ	01	00			
	R	eZ	00	50			
	T	eZ			38		
Sept 22	P	iPEZ	13	24	46		
	MW	iPZ			47		
	R	ePZ			48		
	T	ePZ			55		
Sept 22	MW	ePZ	23	05	51		
	R	ePZ			54		
	T	ePZ			50		
Sept 22	P	iPZ	23	58	23		
	MW	iPZ			23		
Sept 23	MW	eZ	07	42	15		
Sept 23	P	ePZ	08	43	31		
	MW	ePZ			32		
	R	ePZ			37		
	H	ePE			13		
Sept 23	P	ePEZ	11	06	02		Appears like a very distant shock.
	MW	ePZ			03		
	R	ePZ			05		
Sept 23	P	iPNEZ	13	19	06	d	Normal. $\Delta = 92^\circ$ . $O = 13:05.9$
	PX	iPPE		22	57		Solomon Islands.
		eSKSE		29.8			USCGS: $6^\circ\text{S.}, 154^\circ\text{E.}$ $O = 13:06.1$
	P	eZ		30	04		J.S.A: $6.5^\circ\text{S.}, 153.8^\circ\text{E.}$ $O = 13:06:00$
		iE			13		P very large. Aftershocks numerous.
	PX	iSNEZ			21		See list at end of this issue (page 55)
		ePSE		31	21		
		eScSScSN		43			
		iLN		44	37		
		iP'P'Z			45		
		iP'P'P'Z	14	05	30		
	MW	iPNEZ	13	19	07	d	
		eSKSE		29	49		
		eE		30	14		
		iSE			24		
		eP'P'Z		44	45		
		eP'P'P'Z	14	05	32		
	R	iPZ	13	19	09		
		eP'P'P'Z	14	05	35		
	LJ	ePNEZ	13	19	08		
		eSKSE		29	50		
	T	iPEZ		19	09		
		eE		29	11		
		eE			52		
	H	ePE		19	11		
		eSE		30	15		
Sept 23	P	eZ	14	02	18		Aftershock? Appears peculiar.
	MW	eZ			19		
	R	eZ			20		

Date	Sta- tion	Phase	G. C. T.			c	Remarks
			h	m	s		
Sept 23	P	iPNEZ	17	33	57		This aftershock reported by many other stations.
	MW	iPZ			57		
	R	iPZ		34	00		
	LJ	ePZ			02		
Sept 24	P	eZ	01	01	24		Small at all stations. Origin doubtful.
		eZ		02	08		
	MW	eZ		01	26		
		eZ		02	13		
		eZ			53		
	T	eZ			22		
Sept 24	P	eZ	02	48	46		
	MW	ePZ			20		
	R	ePZ			21		
	T	iPZ			33		
Sept 24	T	iPZ	05	31	19		Tucson: P = 05:31:29 (Courtesy USCGS)
Sept 24	P	iPNEZ	05	58	38	d	Deep?
		iZ			49		
	MW	iPNEZ			39	d	
	R	iPZ			41	d	
Sept 24	T	iPZ			39		
	P	iPEZ	16	30	01		
	MW	iPZ			01		
	R	iPZ		29	57		
Sept 24	T	ePEZ		30	12		Tucson (Courtesy USCGS): iP = 16:27:58
	P	iPNEZ	19	21	09	d	
		iEZ			41		
	PX	iZ			57		
Sept 24	MW	iPZ			08	d	Deep? South America.
		iZ			41		
		eZ		22	01		
	R	iPZ		21	05	d	
		iZ			37		
	LJ	ePZ		20	59		
	T	iPZ		21	18		
		iZ			50		
Sept 25	H	ePE			15		Tucson (Courtesy USCGS): e = 03:39:05
	P	iZ	03	38	47		
	MW	eZ			36		
		iZ			47		
	R	iPZ			39		
Sept 25	T	iPZ			40		Normal. About 45°N., 25°W., according to Strasbourg.
	P	ePZ	04	40	45		
		eZ			41 04		
	PX	eLN	05	01			
	MW	ePZ	04	40	45		
	R	eZ			53		
Sept 25	T	iPZ			44		Normal.
	P	iPNEZ	07	35	15		
	PX	eLN		48.3			
	MW	iPZ		35	14		
Sept 25	R	iPZ			09		
	P	ePZ	08	26	31		
	MW	iPZ			31		
Sept 25	R	ePZ			34		

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 25	P	ePZ	15	11	42		Tucson (Courtesy USCGS): eP = 15:11:10. Probably Gulf of California. A smaller shock from the same source 4 minutes earlier, (MW: ePZ = 15:07:02).
		eSNEZ		12	47		
	MW	ePZ		11	36		
		eSZ		12	55		
	R	ePZ		11	33		
		eSZ		12	37		
Sept 25	LJ	ePZ		11	16		
		eSZ		12	00		
	MW	iPZ	19	44	25		
Sept 25	R	iPZ			27		
	T	ePZ			18		
	Sept 26	P	iPNEZ	06	01	05	d
Sept 26	MW	iPNEZ			05	d	
	R	iPNZ			01	c	
	LJ	iPZ		00	54		
	T	iPEZ		01	18	d	
Sept 26	P	iZ	23	23	47		Very distant?
	MW	eZ			24		
		iZ			35		
		iZ			48		
	R	eZ			46		
		iZ			50		
	T	eZ			41		
Sept 27		iZ			49		
	PX	eLN	02	01.2			Normal.
	R	eZ	01	48	29		
T	eZ		49	01			
Sept 27	P	eP"Z	09	14	09		Normal? or slightly deeper, say h = 50 km. Destructive in Java (Semarang). Strasbourg: epicenter about 7°S., 110°E. Pasadena Δ = 128°. O = 08:55.3 Tucson (Courtesy USCGS): eP" = 09:14:20, iP" = 09:14:34
		iP"EZ			22		
		iZ			49		
	PX	ePPZ		16	30		
		iSKPNEZ		17	35		
		iE		23	17		
		iZ		26	24		
		iZ		28	01		
		iSSN		33	41		
		iSSE			54		
		eLN		48.5			
	MW	eP"Z		14	05		
		iP"NEZ			22		
		ePPZ		16	24		
	R	eZ		26	05		
		eP"Z		14	14		
		iP"NZ			21		
		iPPZ		16	28		
	LJ	eZ		26	12		
		eP"Z		14	07		
		iP"Z			23		
		ePPNEZ		16	23		
		eSKPNE		17	45		
T	eZ		26	04			
	iP"EZ		14	19			
	eP"EZ			21			
H	eSKPE		17	24			
Sept 27	P	eZ	11	32.0		Normal. P indefinite at all stations.	
	PX	eLN	12	03.1			
	MW	eZ	11	32.0			
	R	eZ		32.5			

Date	Station	Phase	G. C. T.			c d	Remarks	
			h	m	s			
Sept 27	P	iPZ	23	36	28		Tucson (Courtesy USCGS): iP = 23:36:50	
	MW	iPZ			29			
	R	iPZ			31			
	T	iPZ			37			
Sept 28	P	ePZ	02	35	12			
	MW	iPZ			14			
	T	iPZ		34	48			
Sept 28	P	iPNEZ	06	27	13	c	Normal. $\Delta = 32^\circ$ . $O = 06:20.8$ . Felt in Guatemala. J.S.A: $14.0^\circ\text{N.}, 91.7^\circ\text{W.}$ $O = 06:20:50$	
		iPcPZ		30	07			
	PX	iSNE		32	25			
		eLNE		35	23			
		iScSE		37	48			
	MW	iPNEZ		27	13			
		R	iPNZ		08			
	LJ	iPcPZ		30	05			
		T	iPEZ		28			
			iPcPZ		30			11
		iZ		34	05			
Sept 28	P	iP"Z	13	35	58		Deep? Felt in E. Celebes, according to Batavia. Using reports of Batavia, Medan, Manila, Hong Kong, Nagoya and Palau: $1^\circ\text{N.}, 123^\circ\text{E.}$ $O = 13:17.6$ $h = 200$ km. Pasadena $\Delta = 113^\circ$ .	
		eSKPZ		39	14			
	PX	eSKSNE		42	25			
		iSKKSE		43	12			
	MW	iP"Z		35	58			
		epP"Z		36	48			
	R	eSKPZ		39	15			
		T	eP"Z		55			
		eSKPZ		39	12			
Sept 28	P	iPEZ	18	25	39	c	Normal. Aftershock of Sept. 28, 06h. S obscured by microseisms.	
		iPcPZ		28	31			
	PX	eLNE		34	03			
		P	iScSE		36			13
	MW	iPZ		25	40			
		R	iPZ		31			
	LJ	ePNEZ		34				
		T	iPEZ		54			
			iPcPZ		28			37
			eZ		32			30
		eScSEZ		36	20			
H	ePE		25	49				
Sept 28	P	ePZ	20	12	22		Tucson (Courtesy USCGS): iP = 20:11:27	
	MW	iPZ			21			
	T	iPZ			36			
Sept 29	P	ePNEZ	11	34	21	d	Normal. About $50^\circ\text{N.}, 130^\circ\text{W.}$ Using Ottawa and Fordham $\Delta = 17.5^\circ$ , $O = 11:30.2$	
		PX	ise		37			38
		eLN		38.7				
	MW	ePNZ		34	20			
		R	ePNZ		27			
	LJ	iPNEZ		41				
		T	iPEZ		33			49
H	ePEZ		34	02				
Sept 29	P	ePZ	22	21	19			
	MW	iPZ			20			
	R	ePZ			22			
	T	iPZ			30			
Sept 29	P	eZ	23	22	33			
		MW	eZ					31
	R	eZ			28			
	T	eZ?			36			
		eZ			59			



Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Sept 30	P	iPNEZ	03	46	15	c	Deep?
	MW	iPZ			16	c	
	R	iPZ			18		
	T	iPZ			24		
Sept 30	P	iPNEZ	04	48	28	d	
	MW	iPZ			30	d	
	R	iPZ			31	d	
	LJ	ePZ			33		
	T	iPZ			33	d	
Sept 30	P	ePZ	13	05	01		
	MW	ePZ			02		
	R	ePZ			03		
Sept 30	P	iPZ	14	49	42		
	MW	iPZ			43		
	R	iPZ			44		
	T	iPEZ			52		
Sept 30	P	iPNEZ	21	46	06		Normal: $\Delta = 81.5^\circ$ . $O = 21:33:51$ . South Pacific. Apparently two shocks originated near the same time. The reports of the various stations are difficult to reconcile.
	PX	iSN		56	11		
		eLN	22	06	15		
	MW	iPZ		46	05		
	R	iPZ			08		
	T	iPEZ			15		
	H	ePE			11		
Sept 30	P	iPZ	21	56	11		South Pacific? Pasadena P superposed on S of preceding shock.
	MW	iPZ			11		
	R	iPZ			12		
	T	iPZ			22		
	H	ePE			19		

#### AFTERSHOCK LIST

Immediately following the large earthquake of Sept. 23, 13<sup>h</sup>, numerous small shocks are recorded, most of which are probably aftershocks.

The subjoined list includes all such shocks recorded at Pasadena, Mount Wilson and Riverside. The time of P at Pasadena is given in each case; the times at Mount Wilson and Riverside are regularly one and two seconds later, respectively.

Shocks believed or suspected to have had a different source are included in the main list. The largest aftershock, on Sept. 23, 17<sup>h</sup>, is also included there.

Sept 23	13:42:08	Sept 23	14:36:00	Sept 23	17:18:12
	44:32		47:27		33:57
	45:32		54:25		19:24:31
	51:49		15:02:37		28:12
	59:39		42:18		23:22:47*
	14:00:40		42:41	Sept 24	09:35:35*
	11:49		16:02:55		13:33:22
			37:56	Sept 25	15:04:21

\* For these two shocks, P recorded at Tinemaha, one second later than at Pasadena.

Pasadena, California

We wish to acknowledge with thanks receipt of the following bulletins during September and October, 1937:

Adelaide	July, August, 1937
Bucarest	July-September, 1937
Florissant	April, May, 1937, No. 9-16
Hamburg	June 13-August 25, 1937, No. 9-16
Helwan	July; August; 1937
Hong Kong	July, August, 1937
India Weather Report	1936
Karlsruhe	January-June, 1937, No. 35
Kew	August; 1937
Ksara	August, 1937
La Paz	May 22-September 19, 1937, No. 23-39
Manila	July-December, 1936
Manila	July, 1937; No. 22-25
Melbourne	April-June; 1937
New Zealand Stations	July; 1937; No. E-64
Ottawa	July, 1937, No. 24-32
Perth	May 16-July 22, 1937, No. 8-10
Phu-Lien	January-May; 1937
Phu-Lien	June-August, 1937 (Preliminary)
Riverview	August, 1937, No. 13-14
Saint Louis	May, 1937, No. 10-13
Sydney	June; July, 1937
Taihoku	July, August, 1937
Tananarive	March, 1937
Uccle	April-June, 1937, No. 2
Vulk. Ereig.	1935-1936
Zinsen	1934
Zurich	August, September, 1937, No. 87-88

Pasadena, California

We wish to acknowledge with thanks receipt of the following bulletins during November, 1937.

Adelaide	September, 1937
Apia	July-September, 1937, No. 3
Beograd	Year 1936
Bucarest	October, 1937
Budapest	October, 1937, No. 25
Cape Town	August-October, 1937
Colombo	Year 1936
Goettingen	July-December, 1936
Helwan	September; October, 1937
Hong Kong	September, 1937
Kew	September; October, 1937
Ksara	September, 1937
Manila	August, 1937; No. 26-32
Nagoya	January-June, 1937
New Zealand Stations	September, 1937, No. E-65
Ottawa	August, 1937, No. 33-37
Parc St. Maur	August, September, 1937
Phu-Lien	June, 1937
Phu-Lien (Preliminary)	September, 1937
Riverview	September, October, 1937, No. 9-10
Strasbourg	
Union Geodesique	August; September, 1937; No. 98-130
Bureau Central	August; September, 1937, No. 33-45
l'Institut	August, September, 1937
Stuttgart (Preliminary)	October, 1937
Sydney	August, September, 1937
Tananarive	April, May, 1937
Upsala	January, 1934-June, 1937
U.S.C.G.S.	April, May, 1936

# SEISMOLOGICAL LABORATORY

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA

ADDRESS:  
SEISMOLOGICAL LABORATORY  
220 NORTH SAN RAFAEL AVE.  
PASADENA, CALIFORNIA

1937

## BULLETIN

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the California Institute of Technology and the Carnegie Institution of Washington, as a coöperative undertaking. This laboratory is the central station of a coöordinated group. Auxiliary stations in southern California are maintained and operated as follows: At the Mount Wilson Observatory on Mount Wilson (a Department of the Carnegie Institution of Washington); at Riverside (in coöperation with the City of Riverside); at Santa Barbara (in coöperation with the Santa Barbara Museum of Natural History); at La Jolla (in coöperation with the Scripps Institution of Oceanography of the University of California); at Tinemaha, and at Haiwee, in the Owens Valley (in coöperation with the Department of Water and Power of the City of Los Angeles). Address all correspondence to Pasadena.

**TIME:** At all these stations the minute-marks on the seismograms are coöordinated directly by means of auxiliary records written at each station on which the minute-marks are registered closely parallel with recorded dot-and-dash radiotelegraphic signals sent in ordinary course from a powerful transmitting station. This permits direct correlation of the minute-marks at all the stations of the group at practically all times with an accuracy of one second, and usually of one-fifth second.

Standard time is determined at Pasadena by comparing the station clock with automatically recorded radio time signals of the U. S. Naval Observatory, three to five times daily.

The constants of these stations follow.

### PASADENA SEISMOLOGICAL LABORATORY Central Station

$\Phi = 34^{\circ} 08.9' N.$ ,  $\lambda = 118^{\circ} 10.3' W.$ ,  $h = 295$  m., Deeply weathered granite rock, with inclusions of gneiss and schist.

Apparatus: horizontal-component torsion seismometers with electromagnetic damping and optical recording. (Cf. Bull. Seis. Soc. Am., XV, 1, 1925).

Instruments, and Constants (approximate);

	$T_n$	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	"	"	"
E — W	6 sec.	800	0.8-0.9

Seismometers with electromagnetic damping and galvanometric-optical recording. (Cf. Bull. Seis. Soc. Am., XXII, 156, 1932).

N, E and Z inertia-mass 100 kg.,  $T_0 = 1.0$  sec.,  $h = 1$   
galvanometers: (1)  $T_1 = 0.25$  sec.,  $h = 4$ .  
(2)  $T_1 = 2$  min.,  $h = 1$ .

Horizontal strain seismometer (Cf. Bull. Seis. Soc. Am. XXV, 283, 1935) Axis in N-S line (Long period). Damping critical.

The constants of the short-period instruments do not undergo any significant changes. The constants of the instruments of longer period will be given from time to time when deviations from the values given are significant.

Experimental seismographs of various kinds are in process of development from time to time, and are used for intervals of variable duration. Information concerning these will be given when necessary.

## AUXILIARY STATIONS

Each of the auxiliary stations has equipment as follows:

Apparatus: two horizontal-component torsion seismometers with magnetic damping and optical recording;

Instruments and Constants (approximate);

	T <sub>0</sub>	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	“	“	“

one vertical component seismometer with galvanometric-optical recording;  
 inertia-mass 100 kg. T<sub>0</sub> = 1.0 or 0.5 sec. Damping critical or slightly less;  
 galvanometer: T<sub>1</sub> = 0.2 sec. h = 4.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

### Mount Wilson Seismologic Station

Φ = 34° 13.5' N., λ = 118° 03.4' W., h = 1742 m., Weathered granite.

### Riverside Seismologic Station

Φ = 33° 59.6' N., λ = 117° 22.5' W., h = 250 m. approx., Weathered granite.

### Santa Barbara Seismologic Station

Φ = 34° 26.5' N., λ = 119° 42.9' W., h = 100m. approx., Heavy, boulder-laden alluvium.

### La Jolla (Scripps Institution Seismologic Station)

Φ = 32° 51.8' N., λ = 117° 15.2' W., h = 7.7 m. approx., Consolidated detrital material.

### Tinemaha Seismologic Station

Φ = 37° 05.7' N., λ = 118° 15.5' W., h = 1180 m. approx., Basalt.

### Haiwee Seismologic Station

Φ = 36° 08.2' N., λ = 117° 57.9' W., h = 1100 m. approx., Loosely cemented tuff.

**SYMBOLS AND NOTATIONS:** in general the symbols and notation conform with the usual international practice. For the phases of deep-focus earthquakes the notation of F. J. Scrase is adopted. When surface waves are not reported no such waves are observed. c, d are abbreviations for compression and dilatation.

When measurements referring to local earthquakes are included P and S will be used without index or subscript, as no attempt will be made in these bulletins to distinguish between  $\bar{P}$ , P\*, and P<sub>n</sub>, although such complications are often clearly indicated and are the subject of study.

**SPECIAL SYMBOLS** indicating the stations of this coördinated group are as follows:

### PASADENA SEISMOLOGICAL LABORATORY

- For routine instruments of period 0.8 second . . . . . P
- For routine instruments of period 6 seconds . . . . . P<sub>6</sub>
- For instruments of different period analogous notation will be employed.
- For routine instruments, galvanometer period 0.25 second . . . . . P
- For routine instruments, galvanometer period 2 minutes . . . . . PX

- Mount Wilson Seismologic Station . . . . . MW
- Riverside Seismologic Station . . . . . R
- Santa Barbara Seismologic Station . . . . . SB
- La Jolla (Scripps Institution Seismologic Station) . . . . . LJ
- Tinemaha Seismologic Station . . . . . T
- Haiwee Seismologic Station . . . . . H

In general detailed measurements will be given only for the records of the Seismological Laboratory: those for records of the other stations will be given only to supplement the information.

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PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c	Remarks	
			h	m	s			
Oct 1	P	ePZ	19	28	34		Normal. South Pacific.	
	PX	iSN		38	38			
		eLEZ		48.5				
	MW	iPZ		28	33			
	R	iPZ			36			
	T	iPEZ			45			
	H	ePE			43			
Oct 1	P	iZ	21	25	00		Tucson (Courtesy USCGS): i = 21:25:22.	
	MW	iZ			00			
	T	iZ			13			
Oct 2	PX	eLNE	05	22			Normal.	
	MW	eZ		09	53			
	T	eZ		10	11			
Oct 2	P	iPZ	16	33	17		Deep? Tucson (Courtesy USCGS): eP = 16:32:40, i = 16:33:12. The large later phase may be pP or P of a second shock. Epicenter in South America. La Paz reports iP = 16:23:02, iS = 16:23:42.	
		iNEZ!			48	c		
	MW	iZ			48	c		
	R	ePZ			13			
		iZ			45			
	LJ	eZ			39			
	T	iEZ!		34	00	c		
Oct 3	P	ePZ	03	40	45		Tucson (Courtesy USCGS): eP = 03:41:08.	
	MW	iPZ			47			
	T	iPZ			56			
Oct 3	P	iPNEZ	03	49	23	d	Deep. Near Apia, which reports iP = 03:38:59, iS = 03:39:36.	
		eEZ		50	01			
		eZ		52	04			
	MW	iPZ!		49	23	d		
		eZ		50	02			
		iZ			05			
	R	iZ		52	06			
		iPZ		49	25	d		
		eZ		50	04			
	LJ	iPZ		49	22			
iZ			50	03				
iPEZ			49	32	d			
iZ			50	14				
Oct 3	P	iPNEZ	15	07	26	d	Deep? Not far from Apia which reports iP = 14:57:15, etc.	
		iZ			52			
		iZ		08	02			
	MW	iPZ		07	27			
		R	iPZ			28		
		LJ	ePZ			24		
	T	iPEZ			37			
		iZ			49			
		H	ePE			35		
		Oct 4	P	iPZ	07	52		04
PX	eSN?		08	02	07			
	eLE			13.9				
MW	iPZ		07	52	04			
	iZ				33			
R	ePZ				22			
T	iPZ			19				
Oct 4	P	iPZ	12	33	48			
	R	iPZ			50			
Oct 4	P	iPZ	22	23	33		Tucson (Courtesy USCGS): eP = 22:23:55.	
	MW	iPZ			33			
Oct 5	P	iPNEZ	06	24	41	d	Normal. USCGS: 22°N., 108°W. O = 06:21.2. J.S.A: 22.5°N., 108.5°W. O = 06:21:17.	
	PX	iLNE		27	12			
	MW	ePNEZ		24	40			

Continued

1957

PASADENA and auxiliary stations

No. 56

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			n	m	s		
Oct 1	P	97A	19	58	54		Normal. South Pacific.
	IX	18A	38	58			
		41B2	49.8				
	MW	123	38	58			
	H	123	38	58			
	H	123	38	58			
Oct 1	P	12	21	55	04		Tucson (Courtesy USGS)
	MW	12	00				
	T	12					
Oct 2	IX	41B2	05	53			Normal.
	MW	42	08	53			
	T	42	10	11			
	P	123	14	53	14		
Oct 2	P	123	16	53	14		Tucson (Courtesy USGS): ep = 16:52:40, f = 16:53:12. The large later phase may be P or S of a second shock. Epicenter in America. La Paz reports 16:53:02, 12 = 16:53:42.
	MW	12	48				
	H	12	48				
	LJ	12	48				
	T	123	34	00			
	P	123	05	40	48		
Oct 3	P	123	05	40	48		Tucson (Courtesy USGS): ep = 05:41:08.
	MW	123	47				
	T	123	58				
	P	123	08	43	53		
	MW	123	50	04			
	T	123	49	53			
Oct 3	P	123	15	07	55		Tucson (Courtesy USGS): ep = 15:07:15, etc.
	MW	123	08	08			
	H	123	08	08			
	LJ	123	08	08			
	T	123	08	08			
	P	123	08	08			
Oct 4	P	123	07	55	04		Tucson (Courtesy USGS): ep = 07:55:04.
	MW	123	08	55	07		
	H	123	08	55	07		
	T	123	08	55	07		
	P	123	08	55	07		
	MW	123	08	55	07		
Oct 5	P	123	08	55	07		Tucson (Courtesy USGS): ep = 08:55:07.
	MW	123	08	55	07		
	H	123	08	55	07		
	T	123	08	55	07		
	P	123	08	55	07		
	MW	123	08	55	07		
Oct 6	P	123	08	55	07		Tucson (Courtesy USGS): ep = 08:55:07.
	MW	123	08	55	07		
	H	123	08	55	07		
	T	123	08	55	07		
	P	123	08	55	07		
	MW	123	08	55	07		
Oct 7	P	123	08	55	07		Tucson (Courtesy USGS): ep = 08:55:07.
	MW	123	08	55	07		
	H	123	08	55	07		
	T	123	08	55	07		
	P	123	08	55	07		
	MW	123	08	55	07		

Continued

No. 57

PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c	Remarks
			h	m	s		
							Continued
	R	ePNZ	06	24	34		
	LJ	ePNEZ			18		
		eLE		26	52		
	T	ePE		25	13		
	H	ePEZ			02		
Oct 6	P	iPNEZ	09	52	21	d	Deep. Probably $h = 125$ km. $\Delta = 23.5^\circ$ . USCGS: $18^\circ\text{N.}, 99^\circ\text{W.}$ $O = 09:47:15$ . Slightly deeper than normal. J.S.A: $17.7^\circ\text{N.}, 99.0^\circ\text{W.}$ $O = 09:47:16$ . $h =$ about 100 km.
		iEZ			37		
		ipPNEZ			44		
	PX	eSE		56	21		
		iSE			39		
	MW	eLNE		58	50	d	
		iPNEZ		52	22		
		ipPNZ			44		
		eSE		56	39		
	R	iPNZ		52	16	d	
		ipPNZ			38		
		eSN		56	25		
	LJ	iPNEZ		52	07	d	
		ippZ			30		
		iSEZ		56	10		
	T	iPE		52	38		
	H	iPEZ			34		
		eSE		56	37		
Oct 6	P	iPNEZ	17	17	59	d	Normal? May be slightly deeper than normal, as P is abnormally large. Using reports of Brisbane, Palau, Riverview, Sydney, Apia, Melbourne, Hukuoka, HongKong, and Zi-Ka-Wei: $6^\circ\text{S.}, 154^\circ\text{E.}$ $O = 17:04:48$ . Pasadena $\Delta = 92^\circ$ . Strasbourg gives $10^\circ\text{S.}, 150^\circ\text{E.}$
	PX	ePPZ		21	40		
		iSNE		29	04		
		eLEZ		45.9			
	MW	iPNEZ		18	00		
		eSE		29	05		
	R	iPNZ		18	02	d	
	LJ	iPNEZ			01		
	T	ePE			06		
		eSE		29	06		
	H	ePZ		18	08		
Oct 6	P	ePZ	21	48	44		These times are too early for the shock near $0^\circ, 25^\circ\text{W.}$ (Strasbourg) in the same hour.
	MW	iPZ			46		
	R	ePZ			45		
Oct 7	MW	iPZ	02	11	22		
	R	ePZ			16		
Oct 7	P	eNEZ	08	10	39		South Atlantic, distant about $110^\circ$ . PS, PKKP, PPS arriving close together in the 21st minute. Using La Paz and La Plata, $O = 07:51:42$ .
	PX	eN		21	11		
	P	eZ			30		
	PX	eLNE		43			
	MW	eZ		10	37		
		ePKKPZ?		21	14		
		eZ			29		
	R	eZ		10	14		
Oct 7	P	ePZ	13	03	03		
	MW	iPZ			04		
	R	ePZ		02	59		
Oct 8	P	iPZ	00	06	58		
	MW	iPZ			59		
	R	ePZ			59		
Oct 10	P	ePZ	07	43	16		
	MW	iPZ			16		
	R	iPZ			18		





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## PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c	d	Remarks	
			h	m	s				
Oct 11	P	ePZ	05	01	20			Tucson (Courtesy USCGS): i = 05:02:06, i = 05:02:17.	
		iEZ			31				
	MW	iZ			20				
		iZ			31				
	R	eZ			20				
		iZ			36				
Oct 11	LJ	iNEZ			33				
	T	eE			03				
Oct 11	P	iPZ	17	20	12				
	MW	ePZ			11				
	R	iPZ			15				
Oct 11	MW	iPZ	17	29	16			Possibly part of the preceding.	
	R	ePZ			20				
Oct 11	P	ePZ	21	35	13			Normal. South America.	
	PX	eLNE			59.8				
	MW	ePZ			35				13
	R	ePZ							13
	LJ	ePZ							09
	T	ePE							34
Oct 12	PX	eLNZ	05	25	02			Normal.	
	MW	eZ		13	46				
	R	eZ			41				
Oct 12	P	iPEZ	07	29	47			Deep?	
		iZ			58				
	MW	iPZ			49				
	R	iPZ			50				
Oct 12	P	iPNEZ	16	06	11			Normal? Central America.	
		iZ			09				05
	PX	eSNE?			11.2				
		eLNE			14.5				
	MW	iPZ			06				10
	R	iPNZ							04
		iZ			09				02
	LJ	iPZ			05				59
	H	ePEZ			06				18
Oct 12	P	iPZ	20	01	35				
	MW	iPZ			35				
	R	ePZ			31				
Oct 12	P	iPNEZ	21	02	31			Deep. $\Delta = 20:50.9$ , $h = 120$ km. Epicenter, using La Paz and La Plata, probably about $24^{\circ}$ S., $68^{\circ}$ W.	
		ipPZ			03				00
		espZ							10
	PX	iNE			06				00
		eSNE			11				58
		isSNE			12				51
		eLN			23				
	P	eP'P'Z			29				47
	MW	iPNEZ			02				30
		ipPZ			03				00
	R	eP'P'Z			29				56
		iPNEZ			02				26
		ipPZ							56
		iSPZ			03				06
		eNZ			05				45
		eP'P'Z			29				50
	LJ	iPNEZ			02				24
	T	iPE							43
		isPE			03				27
		eSE			12				05
H	iPNEZ	02	38						

1987

## PASADENA and auxiliary stations

Date	Time	Phase	Station	Amplitude	Duration	Remarks
Oct 11	05 01 30	W	02	30		Tucson (CONTRARY LOGS): I = 05:02:06, I = 05:02:17
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
Oct 11	05 01 30	W	02	30		Possibly part of the preceding.
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
Oct 11	05 01 30	W	02	30		Normal, South American.
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
	05 01 30	W	02	30		
	05 01 31	W	02	31		
Oct 12	08 25 02	W	02	02		Normal.
	08 25 03	W	02	03		
	08 25 04	W	02	04		
	08 25 05	W	02	05		
	08 25 06	W	02	06		
	08 25 07	W	02	07		
	08 25 08	W	02	08		
	08 25 09	W	02	09		
	08 25 10	W	02	10		
	08 25 11	W	02	11		
Oct 12	07 25 41	W	02	41		Normal, Central American.
	07 25 42	W	02	42		
	07 25 43	W	02	43		
	07 25 44	W	02	44		
	07 25 45	W	02	45		
	07 25 46	W	02	46		
	07 25 47	W	02	47		
	07 25 48	W	02	48		
	07 25 49	W	02	49		
	07 25 50	W	02	50		
Oct 12	10 00 11	W	02	11		Normal, Central American.
	10 00 12	W	02	12		
	10 00 13	W	02	13		
	10 00 14	W	02	14		
	10 00 15	W	02	15		
	10 00 16	W	02	16		
	10 00 17	W	02	17		
	10 00 18	W	02	18		
	10 00 19	W	02	19		
	10 00 20	W	02	20		
Oct 12	01 01 28	W	02	28		Deep, Δ = 20:50.9, h = 120 km. Epicenter, using La Paz and La Plata. Probably about 24°S, 88°W.
	01 01 29	W	02	29		
	01 01 30	W	02	30		
	01 01 31	W	02	31		
	01 01 32	W	02	32		
	01 01 33	W	02	33		
	01 01 34	W	02	34		
	01 01 35	W	02	35		
	01 01 36	W	02	36		
	01 01 37	W	02	37		
Oct 12	01 01 38	W	02	38		Normal.
	01 01 39	W	02	39		
	01 01 40	W	02	40		
	01 01 41	W	02	41		
	01 01 42	W	02	42		
	01 01 43	W	02	43		
	01 01 44	W	02	44		
	01 01 45	W	02	45		
	01 01 46	W	02	46		
	01 01 47	W	02	47		

Date	Station	Phase	G. C. T.			c	Remarks
			h	m	s		
Oct 13	P	iPEZ	19	24	35		Tucson (Courtesy USCGS): iP = 19:25:16.
	MW	iPZ			36		
	R	iPZ			38		
	T	ePE			22		
Oct 15	P	iPZ	03	51	26		Deep. La Paz reports P = 03:43:12, S = 44:57. From this $\Delta = 64^\circ$ , O = 03:40.9, h = 90 km. Probably in Peru.
	MW	iZ			49		
		iPZ			26		
	R	iPZ			21		
Oct 15	P	iPZ	16	45	10		
	MW	iPZ			10		
	R	iPZ			00		
Oct 17	P	iPNEZ	04	59	06	c	Normal. $\Delta = 79^\circ$ , O = 04:46.9. Felt in Central Japan $35.5^\circ\text{N.}$ , $141.0^\circ\text{E.}$ , according to Hukuoka and Nagoya.
	PX	iSN			02		
		eLN			19.2		
	MW	iPNEZ			06		
	R	iPNZ			08		
	LJ	iPNEZ			13		
Oct 17	P	iPZ	10	12	01		Tucson (Courtesy USCGS): iP = 10:11:52. Felt in Italy. Strasbourg gives $42^\circ\text{N.}$ , $18^\circ\text{E.}$ , approx.
	MW	iPZ			01		
	R	iPZ			59		
Oct 17	MW	ePZ	13	44	54		
Oct 18	P	iPEZ	05	31	34	d	Deep? Tucson (Courtesy USCGS): iP = 05:32:00. Near Apia, which reports iP = 05:21:14, iS = 05:21:57, $17.3^\circ\text{S.}$ , $173^\circ\text{W.}$
	MW	iPZ			35		
	R	ePZ			36		
Oct 18	P	iPNEZ	08	07	15		Deep? Tucson (Courtesy USCGS): iP = 08:07:41, eZ = 08:08:05. Near Apia, which reports iP = 07:56:36, iS = 07:57:10, $16.5^\circ\text{S.}$ , $173^\circ\text{W.}$
	MW	iPZ			17		
		eZ			38		
	R	iPZ			17		
	LJ	ePZ			17		
	H	ePE			24		
Oct 18	P	ePZ	13	40	02		
	MW	ePZ			02		
	R	ePZ			06		
Oct 18	P	eZ	14	13	15		Not a local shock; interpretation uncertain.
		eZ			19		
	MW	eZ			14		
		eZ			13		
	R	eZ			14		
		eZ			13		
Oct 18	MW	iPZ	16	08	01		
Oct 18	P	iPZ	22	33	11		Tucson (Courtesy USCGS): iP = 22:32:59.
	MW	iPZ			12		
	R	iPZ			10		
Oct 19	P	ePZ	00	30	52		Tucson (Courtesy USCGS): eP = 00:31:19.
	MW	ePZ			51		
	R	ePZ			55		
Oct 19	P	eSZ	05	10	58		Tucson (Courtesy USCGS): eP = 05:09:41, iS = 05:10:32. Gulf of California?
	MW	ePZ			09		
		iSZ			02		
	R	ePZ			10		
		eSZ			52		
Oct 19	P	iPZ	15	22	04		Felt in the province of Mendoza, Argentina.
	MW	iPZ			04		
	R	iPZ			01		



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Date	Station	Phase	G. C. T.			c	Remarks
			h	m	s		
Oct 20	P	ePZ	05	54	18		Normal? Depth probably between normal and 100 km. Surface waves small. S absent. Distance about 33°. Central America.
		eZ			33		
	PX	iScPZ	06	00	32		
		eLN			02		
	MW	iPZ	05	54	17		
		iPcPZ			56 55		
	R	iScPZ	06	00	29		
iPZ		05	54	12			
Oct 20	MW	iPcPZ			56 50		
		iScPZ	06	00	30		
	R	ePZ	11	44	34		
Oct 20	R	ePZ			25	Normal.	
	P	ePZ	20	33	52		
	PX	eLN			56		
	MW	ePZ			33 53		
Oct 22	P	ePZ			50	Normal? Distance assumed about 130°. Interpretation doubtful. Tucson (Courtesy USCGS): iP'Z = 01:03:46, iPPZ = 01:05:54.	
		iP'EZ	01	03	23		
	PX	iPPEZ			05 30		
		eE			12 40		
	MW	iN			48		
		iP'Z			03 24		
	R	iPPZ			05 29		
		iP'Z			03 25		
	LJ	iPPZ			05 31		
		iP'Z			03 23		
	T	ePPZ			05 32		
		iP'Z			03 31		
	H	ePPZ			05 41		
		eP'NEZ			03 30		
Oct 22	P	ePPNEZ			05 40	Normal? $\Delta = 132^\circ$ . Bombay gives $0.5^\circ\text{N.}, 96.0^\circ\text{E.}$	
		eP"Z	16	33	28		
	MW	eP"Z			27		
	R	eSKPZ			36 50		
		eP"Z			33 27		
Oct 23	P	eSKPZ			36 50		
		ePZ	03	29	14		
Oct 23	P	ePZ			14	Normal. Small surface waves recorded. Felt in New Zealand. Epicenter $37.9^\circ\text{S.}, 177.8^\circ\text{E.}$ , according to Wellington.	
		iPZ	17	06	36		
	MW	iPZ			37		
	R	ePPZ			10 10		
		iPZ			06 36		
LJ	ePPZ			10 17			
Oct 24	P	ePZ			06 33	Normal. $\Delta = 33^\circ$ . Felt at Seward, Alaska. USCGS: $62^\circ\text{N.}, 150^\circ\text{W.}$ 0 = 11:36.1. J.S.A: $59.7^\circ\text{N.}, 148.8^\circ\text{W.}$ 0 = 11:36:07.	
		iPNEZ	11	42	38		
	PX	eSN			48 02		
		iSE			19		
	MW	eLNE			50.3		
		iPNEZ			42 39		
	R	iPNZ			41		
		eSN			48 07		
	LJ	iPNEZ			42 53		
		iSE			48 26		
T	iPZ			42 17			
Oct 24	P	iPZ	14	23	50	Deep? South America. La Paz reports iP = 14:14:02, iS = 14:15:16.	
		iZ			24 15		
	MW	iPZ			23 50		
		iZ			24 14		

Continued



Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
	R	iPZ	14	23	47	d	Continued
		iZ		24	04		
		iZ			11		
Oct 25	P	eZ	07	43	33		
	MW	iZ			34		
	R	iZ			34		
Oct 25	P	ePZ	10	46	42		Normal. Felt in New Zealand. Aftershock of October 23, 17 <sup>h</sup> . 37.9°S., 177.8°E., according to Wellington.
	PX	eLNE	11	19			
	MW	iPZ	10	46	41		
	R	ePPZ		50	22		
	R	iPZ		46	43		
Oct 25	P	iPZ	23	31	03		Normal or nearly so. South of Kamchatka, according to Hukuoka. Using Hukuoka and Manila: 48°N., 154°E. O = 23:20.6. Pasadena $\Delta$ = 64°. Tucson (Courtesy USCGS): iP = 23:31:40, eP'P' = 23:59:55.
	MW	iPZ			03		
	R	iPZ			06		
Oct 26	P	ePZ	00	04	57		South America. La Paz reports eP = 23:58:48, S = 00:01:37 Tucson (Courtesy USCGS): iP = 00:04:16. Tucson (Courtesy USCGS): iP = 09:30:26.
	MW	iPZ			57		
	R	ePZ			52		
Oct 26	MW	iPZ	09	30	03		Tucson (Courtesy USCGS): iP = 09:30:26.
	R	iPZ			04		
Oct 26	P	iPZ	10	33	45	d	Tucson (Courtesy USCGS): P = 10:33:58. Deep?
	MW	eZ		34	06		
	R	iPZ		33	46	d	
	R	iPZ			46		
Oct 26	P	eZ	10	46	56		Tucson (Courtesy USCGS): eZ = 10:47:14. Possibly part of the preceding.
	MW	eZ			57		
	R	eZ			57		
Oct 26	P	iPNEZ	13	13	40		Normal? Tucson (Courtesy USCGS): eP = 13:14:10. Manila reports P = 13:05:47, S = 13:09:55
	MW	iPZ			40		
	R	ePZ			42		
Oct 26	P	eZ	19	10	06		
	R	eZ			04		
Oct 27	P	iPNZ	00	33	30	d	Deep. Tucson (Courtesy USCGS): iP = 00:33:02, iP = 00:33:30. Using La Plata, La Paz, and Weston, 35°S., 69°W. O = 00:21.3. h = 100 km. Pasadena $\Delta$ = 82°.
	MW	iPZ			57	d	
		iPZ!			30	d	
		iZ			40		
		iPZ!			58	c	
		eZ		36	30		
		eZ		39	30		
	R	iPZ		33	27	d	
	T	iPZ			54		
		ePE			40		
		epPE		34	10		
Oct 27	P	iPZ	04	15	29		
	MW	ePZ			27		
	R	iPZ			31		
Oct 27	P	eZ	10	44	40		
	MW	eZ			41		
Oct 27	P	ePZ	11	54	42		Tucson (Courtesy USCGS): iP = 11:55:00.
	MW	iPZ			42		
	R	ePZ			42		





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## PASADENA and auxiliary stations

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Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Oct 27	P	iPZ	15	54	17		Normal. Tucson (Courtesy USCGS): eP = 15:55:55, eS = 15:58:37. Felt in California at Watsonville, Santa Cruz, San Jose, etc. Epicenter not far from 37°N., 122°W. Smaller foreshock at 15:41. Aftershocks at 20:24, etc.
		iSZ		55	01		
	MW	iPZ		54	17		
		iSZ		55	03		
	R	ePZ		54	25		
	T	ePE			04		
		eSE			36		
Oct 27	P	ePZ	16	24	17		Deep? South America. La Paz reports P = 16:14:50, iS = 16:16:53. Tucson (Courtesy USCGS): P = 16:23:45.
	MW	iPZ			17		
	R	iPZ			13		
Oct 28	P	iPZ	09	53	26		Deep? Shock in this hour reported by Australian stations, may not be the same.
	MW	iPZ			27		
	R	iPZ			28		
Oct 28	P	iPZ	18	06	27	d	Deep? Tucson (Courtesy USCGS): iP = 18:06:50.
	MW	iPZ			28		
	R	iPZ			29		
Oct 29	P	ePZ	07	40	42		Deep. 36.5°N., 70.5°E. O = 07:26:30, h = 220 km. Hindu Kush. These results by comparison of all available station bulletins with data for previous shocks. Bombay reports this shock felt strongly at Lahore, etc., and gives 37°N., 70.5°E. O = 07:26:30, h = 250-300 km. Strasbourg gives 39°N., 69°E. Pasadena distant 109.5°.
		eZ		43	44		
		eZ		44	53		
		iZ		45	04		
		eZ		46	36		
		eZ		47	28		
	MW	iPKKPZ		55	48		
		ePZ		40	41		
		iZ		44	09		
		iZ			54		
		iPKKPZ		55	48		
	R	eZ		56	46		
		eZ		43	50		
		eZ		44	41		
		iPKKPZ		55	47		
	LJ H	iZ		56	58		
		iZ		45	01		
eZ			43	35			
eZ			44	27			
ePKKPZ			55	51			
		eZ		56	09		
Oct 29	PX	eLNE	19	49		Normal.	
Oct 30	P	ePZ	05	49	47		Tucson (Courtesy USCGS): iP = 05:50:14.
	MW	ePZ			49		
	R	iPZ			51		
	H	ePZ			51		
Oct 30	P	ePZ	15	26	31		
	MW	iPZ			31		
	R	iPZ			34		
	H	ePZ			32		

C. F. Richter

Date	Time	Station	Phase	Time	Remarks
Oct 29	19:04	P	193	19 04	Normal. Tucson (Coursey US028)
Oct 29	19:05	P	193	19 05	Normal. Tucson (Coursey US028)
Oct 29	19:06	P	193	19 06	Normal. Tucson (Coursey US028)
Oct 29	19:07	P	193	19 07	Normal. Tucson (Coursey US028)
Oct 29	19:08	P	193	19 08	Normal. Tucson (Coursey US028)
Oct 29	19:09	P	193	19 09	Normal. Tucson (Coursey US028)
Oct 29	19:10	P	193	19 10	Normal. Tucson (Coursey US028)
Oct 29	19:11	P	193	19 11	Normal. Tucson (Coursey US028)
Oct 29	19:12	P	193	19 12	Normal. Tucson (Coursey US028)
Oct 29	19:13	P	193	19 13	Normal. Tucson (Coursey US028)
Oct 29	19:14	P	193	19 14	Normal. Tucson (Coursey US028)
Oct 29	19:15	P	193	19 15	Normal. Tucson (Coursey US028)
Oct 29	19:16	P	193	19 16	Normal. Tucson (Coursey US028)
Oct 29	19:17	P	193	19 17	Normal. Tucson (Coursey US028)
Oct 29	19:18	P	193	19 18	Normal. Tucson (Coursey US028)
Oct 29	19:19	P	193	19 19	Normal. Tucson (Coursey US028)
Oct 29	19:20	P	193	19 20	Normal. Tucson (Coursey US028)
Oct 29	19:21	P	193	19 21	Normal. Tucson (Coursey US028)
Oct 29	19:22	P	193	19 22	Normal. Tucson (Coursey US028)
Oct 29	19:23	P	193	19 23	Normal. Tucson (Coursey US028)
Oct 29	19:24	P	193	19 24	Normal. Tucson (Coursey US028)
Oct 29	19:25	P	193	19 25	Normal. Tucson (Coursey US028)
Oct 29	19:26	P	193	19 26	Normal. Tucson (Coursey US028)
Oct 29	19:27	P	193	19 27	Normal. Tucson (Coursey US028)
Oct 29	19:28	P	193	19 28	Normal. Tucson (Coursey US028)
Oct 29	19:29	P	193	19 29	Normal. Tucson (Coursey US028)
Oct 29	19:30	P	193	19 30	Normal. Tucson (Coursey US028)
Oct 29	19:31	P	193	19 31	Normal. Tucson (Coursey US028)
Oct 29	19:32	P	193	19 32	Normal. Tucson (Coursey US028)
Oct 29	19:33	P	193	19 33	Normal. Tucson (Coursey US028)
Oct 29	19:34	P	193	19 34	Normal. Tucson (Coursey US028)
Oct 29	19:35	P	193	19 35	Normal. Tucson (Coursey US028)
Oct 29	19:36	P	193	19 36	Normal. Tucson (Coursey US028)
Oct 29	19:37	P	193	19 37	Normal. Tucson (Coursey US028)
Oct 29	19:38	P	193	19 38	Normal. Tucson (Coursey US028)
Oct 29	19:39	P	193	19 39	Normal. Tucson (Coursey US028)
Oct 29	19:40	P	193	19 40	Normal. Tucson (Coursey US028)
Oct 29	19:41	P	193	19 41	Normal. Tucson (Coursey US028)
Oct 29	19:42	P	193	19 42	Normal. Tucson (Coursey US028)
Oct 29	19:43	P	193	19 43	Normal. Tucson (Coursey US028)
Oct 29	19:44	P	193	19 44	Normal. Tucson (Coursey US028)
Oct 29	19:45	P	193	19 45	Normal. Tucson (Coursey US028)
Oct 29	19:46	P	193	19 46	Normal. Tucson (Coursey US028)
Oct 29	19:47	P	193	19 47	Normal. Tucson (Coursey US028)
Oct 29	19:48	P	193	19 48	Normal. Tucson (Coursey US028)
Oct 29	19:49	P	193	19 49	Normal. Tucson (Coursey US028)
Oct 29	19:50	P	193	19 50	Normal. Tucson (Coursey US028)
Oct 29	19:51	P	193	19 51	Normal. Tucson (Coursey US028)
Oct 29	19:52	P	193	19 52	Normal. Tucson (Coursey US028)
Oct 29	19:53	P	193	19 53	Normal. Tucson (Coursey US028)
Oct 29	19:54	P	193	19 54	Normal. Tucson (Coursey US028)
Oct 29	19:55	P	193	19 55	Normal. Tucson (Coursey US028)
Oct 29	19:56	P	193	19 56	Normal. Tucson (Coursey US028)
Oct 29	19:57	P	193	19 57	Normal. Tucson (Coursey US028)
Oct 29	19:58	P	193	19 58	Normal. Tucson (Coursey US028)
Oct 29	19:59	P	193	19 59	Normal. Tucson (Coursey US028)
Oct 29	20:00	P	193	20 00	Normal. Tucson (Coursey US028)

O. F. Richter

# SEISMOLOGICAL LABORATORY

## CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA

ADDRESS:  
 SEISMOLOGICAL LABORATORY  
 220 NORTH SAN RAFAEL AVE.  
 PASADENA, CALIFORNIA

1937

### BULLETIN

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the California Institute of Technology and the Carnegie Institution of Washington, as a coöperative undertaking. This laboratory is the central station of a coördinated group. Auxiliary stations in southern California are maintained and operated as follows: At the Mount Wilson Observatory on Mount Wilson (a Department of the Carnegie Institution of Washington); at Riverside (in coöperation with the City of Riverside); at Santa Barbara (in coöperation with the Santa Barbara Museum of Natural History); at La Jolla (in coöperation with the Scripps Institution of Oceanography of the University of California); at Tinemaha, and at Haiwee, in the Owens Valley (in coöperation with the Department of Water and Power of the City of Los Angeles). Address all correspondence to Pasadena.

**TIME:** At all these stations the minute-marks on the seismograms are coördinated directly by means of auxiliary records written at each station on which the minute-marks are registered closely parallel with recorded dot-and-dash radiotelegraphic signals sent in ordinary course from a powerful transmitting station. This permits direct correlation of the minute-marks at all the stations of the group at practically all times with an accuracy of one second, and usually of one-fifth second.

Standard time is determined at Pasadena by comparing the station clock with automatically recorded radio time signals of the U. S. Naval Observatory, three to five times daily. The constants of these stations follow.

#### PASADENA SEISMOLOGICAL LABORATORY Central Station

$\phi = 34^{\circ} 08.9' N.$ ,  $\lambda = 118^{\circ} 10.3' W.$ ,  $h = 295$  m.,      Deeply weathered granite rock, with inclusions of gneiss and schist.

Apparatus: horizontal-component torsion seismometers with electromagnetic damping and optical recording. (Cf. Bull. Seis. Soc. Am., XV, 1, 1925).

#### Instruments, and Constants (approximate);

	T <sub>0</sub>	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	“	“	“
E — W	6 sec.	800	0.8-0.9

Seismometers with electromagnetic damping and galvanometric-optical recording. (Cf. Bull. Seis. Soc. Am., XXII, 156, 1932).

N, E and Z inertia-mass 100 kg., T<sub>0</sub> = 1.0 sec., h = 1  
 galvanometers: (1) T = 0.25 sec., h = 4.  
 (2) T = 2 min., h = 1.

Horizontal strain seismometer (Cf. Bull. Seis. Soc. Am. XXV, 283, 1935) Axis in N-S line (Long period). Damping critical.

The constants of the short-period instruments do not undergo any significant changes. The constants of the instruments of longer period will be given from time to time when deviations from the values given are significant.

Experimental seismographs of various kinds are in process of development from time to time, and are used for intervals of variable duration. Information concerning these will be given when necessary.

## AUXILIARY STATIONS

Each of the auxiliary stations has equipment as follows:

- Apparatus: two horizontal-component torsion seismometers with magnetic damping and optical recording;  
 Instruments and Constants (approximate);

	T <sub>0</sub>	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	“	“	“

one vertical component seismometer with galvanometric-optical recording;  
 inertia-mass 100 kg. T<sub>0</sub> = 1.0 or 0.5 sec. Damping critical or slightly less;  
 galvanometer: T<sub>1</sub> = 0.2 sec. h = 4.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

### Mount Wilson Seismologic Station

Φ = 34° 13.5' N., λ = 118° 03.4' W., h = 1742 m., Weathered granite.

### Riverside Seismologic Station

Φ = 33° 59.6' N., λ = 117° 22.5' W., h = 250 m. approx., Weathered granite.

### Santa Barbara Seismologic Station

Φ = 34° 26.5' N., λ = 119° 42.9' W., h = 100m. approx., Heavy, boulder-laden alluvium.

### La Jolla (Scripps Institution Seismologic Station)

Φ = 32° 51.8' N., λ = 117° 15.2' W., h = 7.7 m. approx., Consolidated detrital material.

### Tinemaha Seismologic Station

Φ = 37° 05.7' N., λ = 118° 15.5' W., h = 1180 m. approx., Basalt.

### Haiwee Seismologic Station

Φ = 36° 08.2' N., λ = 117° 57.9' W., h = 1100 m. approx., Loosely cemented tuff.

**SYMBOLS AND NOTATIONS:** in general the symbols and notation conform with the usual international practice. For the phases of deep-focus earthquakes the notation of F. J. Scrase is adopted. When surface waves are not reported no such waves are observed. c, d are abbreviations for compression and dilatation.

When measurements referring to local earthquakes are included P and S will be used without index or subscript, as no attempt will be made in these bulletins to distinguish between  $\bar{P}$ , P\*, and P<sub>n</sub>, although such complications are often clearly indicated and are the subject of study.

**SPECIAL SYMBOLS** indicating the stations of this coördinated group are as follows:

### PASADENA SEISMOLOGICAL LABORATORY

- For routine instruments of period 0.8 second . . . . . P
- For routine instruments of period 6 seconds . . . . . P<sub>6</sub>
- For instruments of different period analogous notation will be employed.
- For routine instruments, galvanometer period 0.25 second . . . . . P
- For routine instruments, galvanometer period 2 minutes . . . . . PX

- Mount Wilson Seismologic Station . . . . . MW
- Riverside Seismologic Station . . . . . R
- Santa Barbara Seismologic Station . . . . . SB
- La Jolla (Scripps Institution Seismologic Station) . . . . . LJ
- Tinemaha Seismologic Station . . . . . T
- Haiwee Seismologic Station . . . . . H

In general detailed measurements will be given only for the records of the Seismological Laboratory: those for records of the other stations will be given only to supplement the information.

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
Nov 1	P	iPEZ	08	46	39	c	Deep? Northern Chile or Argentina. La Paz reports P=08:37:01, S=08:38:55. Tucson (Courtesy USCGS): P=08:46:05
	MW	iPZ			38	c	
	R	iPZ			35	c	
	T	ePE			51		
Nov 2	P	iPZ	11	08	23		Normal.
	PX	eLN		34			
	MW	iPZ		08	23		
	R	iPZ			26		
	LJ	ePZ			27		
	T	ePZ			25		
	H	ePZ			23		
Nov 2	P	ePZ	14	52	30		
	MW	iPZ			31		
	R	iPZ			33		
Nov 2	P	iPZ	15	15	28		
	MW	iPZ			28		
	R	iPZ			31		
Nov 2	P	iPNEZ	18	05	39		Normal? Tucson (Courtesy USCGS): P=18:05:00. Felt very strongly at Arica, according to La Paz, which reports iP=17:56:18, iS=17:57:20
	MW	iPZ			38	c	
	R	iPZ			34		
	LJ	ePZ			29		
	T	iPZ			52	c	
Nov 3	P	iPZ	22	57	32		Tucson (Courtesy USCGS): iP=22:54:54
	MW	iPZ			33		
	R	iPZ			35		
	T	ePZ			42		
Nov 4	P	eZ	08	02	55		
	MW	eZ			56		
	R	eZ			59		
Nov 4	P	iPNEZ	15	29	29	d	Deep? Tucson (Courtesy USCGS): iP=15:30:10
	R	iPZ			32	d	
	MW	iPZ			29	d	
	SB	ePZ			21		
	T	ePZ			06		
	H	iPZ			16		
Nov 4	P	eZ	23	00	11		
	MW	eZ			10		
	R	eZ			10		
Nov 5	P	ePZ	09	42	58		Normal? Distance about 112°, origin time about 09:28.3. Probably near Ceram, using Palau and Manila.
		iZ		43	07		
		iP"Z		47	03		
	PX	eLE	10	21			
	MW	ePZ	09	42	58		
		iZ		43	07		
		iP"Z		47	03		
	R	eZ		43	08		
		iP"Z		47	01		
	H	eZ		43	04		
	iP"Z		47	02			
Nov 5	P	iPZ	12	20	32		Tucson (Courtesy USCGS): iP=12:20:58
	MW	iPZ			32		
	R	ePZ			35		
	H	iPZ			39		
Nov 5	MW	iPZ	22	34	35		
	R	ePZ			31		
Nov 7	P	iPNEZ	09	18	55		South America. La Paz reports P=09:10:40, iS=09:12:43.
	R	iPZ			50		
	T	iPZ		19	09		
	H	iPZ			03		
Nov 9	P	ePZ	09	51	11		Tucson (Courtesy USCGS): eP=09:51:02
	MW	ePZ			10		
	R	ePZ			07		
	T	iPNEZ			14		



Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Nov 9	P	iPNEZ	10	33	15	c	Normal? South America. La Paz reports iP = 10:28:11, iS? = 10:32:45. Tucson (Courtesy USCGS): iP = 10:32:55, eP'P'? = 11:00:55.
	PX	eLN		56.0			
	MW	iPNEZ	33	15			
	R	iPNZ		12			
	LJ	iPNEZ		07			
	T	iPNEZ		31			
	H	ePNE		26			
Nov 10	P	iPNEZ	07	22	12		Depth normal? Pasadena seismograms very peculiar, long period waves simultaneous with short period P, and also 2 minutes later.
	PX	eLNEZ?			11		
		eLNE?		24	13		
	MW	ePZ		22	09		
		iPNEZ			12		
	R	ePNEZ			15		
		eZ		28	47		
	SB	ePEZ		21	50		
T	ePNEZ			42			
H	ePE			53			
Nov 10	P	ePZ	22	34	06		Deep? Near La Paz, which reports P = 22:23:54, S = 22:24:19. Hence Pasadena $\Delta = 69^\circ$ . If the second reading at Pasadena is pP, h = 120 km.
		eZ			35		
	MW	iPZ			06		
	R	iZ			34		
	iPZ			02			
	iZ			30			
Nov 10	P	iPNEZ	22	54	33	c	Deep? Tucson (Courtesy USCGS): iP = 22:55:18. No trace of shock about 1 hour later, recorded at European stations.
	MW	iPZ			35		
	R	iPZ			37		
	SB	iPZ			27		
	T	ePE			20		
Nov 11	P	ePZ	14	31	48		Tucson (Courtesy USCGS): eP = 14:31:22.
	MW	iPZ			50		
	R	iPZ			45		
Nov 12	P	ePZ	22	55	56		Normal? Tucson (Courtesy USCGS): P = 22:55:52.
	MW	ePZ			58		
	R	ePZ			58		
Nov 13	P	ePNEZ	10	03	08		Normal? Near New Zealand. S? may be SKS.
	PX	iSN?		13	48		
		eLNE		26.4			
	MW	iPZ		03	10		
	R	iPNEZ			10		
	SB	ePZ			02		
	T	ePE			20		
	H	ePNE			26		
Nov 13	P	ePZ	10	13	02		Aftershock of the preceding.
	MW	ePZ			06		
	R	ePZ			02		
	T	ePE			12		
Nov 13	P	ePZ	12	31	40		Tucson (Courtesy USCGS): eP = 12:31:58.
	MW	ePZ			41		
	R	ePZ			42		
Nov 13	P	ePZ	17	47	28		
	MW	ePZ			29		
	R	ePZ			31		
Nov 13	P	ePZ	18	06	33		Normal. Tucson (Courtesy USCGS): iP = 18:06:50. Southwest Pacific.
	PX	eLN		32			
	MW	iPZ		06	34		
	R	ePNEZ			35		
	T	ePE			46		
	H	ePN			46		





No. 65

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks	
			h	m	s			
Nov 14	PX	ePZ	11	12	15		Deep. By comparison of all available reports with the data of previous shocks: 36.5°N., 70.5°E. 0 = 10:58:12, h = 220 km. This agrees exactly with determination at Strasbourg. Pasadena $\Delta = 109.5^\circ$ . J.S.A: 35.2°N., 72.8°E. 0 = 10:58:05, h = 250 km. Bombay (tentative): 37.3°N., 72.0°E., 0 = 10:58:05, h = 200 km. Damage in Chitral and Kashmir.	
		eEZ		15	32			
		ePPZ		16	43			
		iNEZ			52			
		iZ		17	02			
		iZ			47			
		isPPZ		18	08			
		eSKPZ		20	00			
		iPKSZ			29			
		iZ		25	52			
		iZ		27	10			
		P	iPKKPZ					24
		P <sub>30</sub>	iPPSN		27.5			
		P	iZ		28			38
			iZ		32			32
		eZ		35	40			
	MW	iPZ		12	18			
		iZ		15	32			
		iP''Z		16	00			
		iPPZ			42			
		iZ			54			
		isPPZ		18	06			
		iZ			16			
		iSKPZ		20	03			
		iPKSZ			27			
		eSKSZ		22	14			
		eSPZ		25	56			
		eZ		26	57			
		iPKKPZ		27	25			
		iZ		28	39			
		iSKKPZ?		30	47			
	iZ		32	24				
	iZ			32				
	iP'P'Z		36	10				
	iZ			17				
	R	ePZ		12	16			
		iP''Z		16	01			
		iZ			54			
		esPPZ		18	10			
		iPKSZ		20	21			
iPKKPZ			27	24				
iZ			28	37				
iZ			32	29				
eP'P'Z			36	09				
SB	ePZ		11	57				
	iZ		16	44				
	ePKKPZ		27	30				
LJ	eZ		32	31				
	eZ		16	49				
	iZ		17	00				
T	ePKKPZ		27	21				
	eZ		32	17				
	ePE		12	07				
	eE		16	05				
	eNE		22	27				
	iNE		24	11				
eE		28	50					

Continued

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Nov 14	H	ePNE eN eN eN eN eN	11	12	12 14 20 07 27 17		Continued
Nov 14	MW R	iPZ iPZ	13	47	09 09		Tucson (Courtesy USCGS): iP = 13:47:29.
Nov 14	P MW R LJ T	iPNEZ iZ eZ iPZ iZ iZ ePZ iPE	14	10	57 26 39 57 26 39 48 09	d  d  d	Deep.
Nov 14	P MW R	ePZ iPZ iZ ePZ iZ	19	18	02 01 54 56 49		Tucson (Courtesy USCGS): iP = 19:17:08. Possibly two shocks.
Nov 14	P MW R	iPZ iZ ePZ ePZ	20	51	31 49 31 32		Deep?
Nov 15	P MW R	iPZ iZ iZ	00	24	58 59 01		
Nov 15	P MW R	eZ iZ iZ iZ	01	01	06 16 06 01		Deep? Tucson (Courtesy USCGS): iZ = 01:00:23.
Nov 15	P MW R	ePZ ePZ iPZ	06	41	08 10 12		
Nov 15	R	eZ	09	23	18		
Nov 15	R	iZ	15	05	06		
Nov 15	P PX MW R	eZ eLZ eZ eZ	21	56	23 39 07 30		Normal? Surface waves small. Strasbourg: 35°N., 82°E., O = 21:37.0, h = 200 km. Bombay: 34.5°N., 77.5°E. Felt at Srinagar.
Nov 16	P MW R LJ T H	iPNEZ iSNEZ iPNEZ iSNE iSNE iPEZ ePNE eSNE ePNE eSNE	10	58	23 48 22 47 28 07 03 02 47 30		Normal. Tucson (Courtesy USCGS): eP = 02:58:55. 33°10'N., 116°10'W. O = 10:57:48. Reported felt at Campo, Garnet and Mecca. (USCGS).
Nov 16	P MW	iPEZ iSNEZ iPNEZ	12	28	03 20 02		Normal. Tucson (Courtesy USCGS): eP = 12:28:53. 33°50'N., 116°42'W. O = 12:27:39. Felt at Palm Springs, etc.

Continued

1907

PARAMETER and auxiliary stations

No. 66

Phase	Time	Phase	G. S. T.	c	d
Nov 14	H	03M2	11 12 12		
		04	12 12 12		
		05	13 12 12		
		06	14 12 12		
		07	15 12 12		
		08	16 12 12		
		09	17 12 12		
		10	18 12 12		
		11	19 12 12		
		12	20 12 12		
		13	21 12 12		
		14	22 12 12		
		15	23 12 12		
		16	24 12 12		
		17	25 12 12		
		18	26 12 12		
		19	27 12 12		
		20	28 12 12		
		21	29 12 12		
		22	30 12 12		
		23	31 12 12		
		24	01 13 13		
		25	02 13 13		
		26	03 13 13		
		27	04 13 13		
		28	05 13 13		
		29	06 13 13		
		30	07 13 13		
		31	08 13 13		
		32	09 13 13		
		33	10 13 13		
		34	11 13 13		
		35	12 13 13		
		36	13 13 13		
		37	14 13 13		
		38	15 13 13		
		39	16 13 13		
		40	17 13 13		
		41	18 13 13		
		42	19 13 13		
		43	20 13 13		
		44	21 13 13		
		45	22 13 13		
		46	23 13 13		
		47	24 13 13		
		48	25 13 13		
		49	26 13 13		
		50	27 13 13		
		51	28 13 13		
		52	29 13 13		
		53	30 13 13		
		54	31 13 13		
		55	01 14 14		
		56	02 14 14		
		57	03 14 14		
		58	04 14 14		
		59	05 14 14		
		60	06 14 14		
		61	07 14 14		
		62	08 14 14		
		63	09 14 14		
		64	10 14 14		
		65	11 14 14		
		66	12 14 14		
		67	13 14 14		
		68	14 14 14		
		69	15 14 14		
		70	16 14 14		
		71	17 14 14		
		72	18 14 14		
		73	19 14 14		
		74	20 14 14		
		75	21 14 14		
		76	22 14 14		
		77	23 14 14		
		78	24 14 14		
		79	25 14 14		
		80	26 14 14		
		81	27 14 14		
		82	28 14 14		
		83	29 14 14		
		84	30 14 14		
		85	31 14 14		
		86	01 15 15		
		87	02 15 15		
		88	03 15 15		
		89	04 15 15		
		90	05 15 15		
		91	06 15 15		
		92	07 15 15		
		93	08 15 15		
		94	09 15 15		
		95	10 15 15		
		96	11 15 15		
		97	12 15 15		
		98	13 15 15		
		99	14 15 15		
		100	15 15 15		

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## PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c d	Remarks
			h	m	s		
Nov 16	MW	iSNEZ	12	28	18		Continued
	R	iPNEZ		27	51		
		iSNEZ		28	00		
	LJ	iPZ		28	01		
		iSNEZ			16		
Nov 16	P	ePZ	16	06	48		
	MW	eZ			51		
	R	eZ			39		
Nov 17	P	iPZ	14	51	08	c	Tucson (Courtesy USCGS): iP = 14:51:29.
	MW	iPZ			08		
	R	iPZ			09		
Nov 17	P	iPNEZ	23	52	04	c	Normal? Tucson (Courtesy USCGS): eP = 23:53:17.
		iZ			13		
	PX	eLNEZ		55.	1		
	MW	ePNEZ		52	04		
	R	iPNEZ			11		
H	ePNE		51	49			
Nov 18	P	iPNEZ	03	01	39	d	Normal? or probably slightly deeper. Eastern New Guinea?
		ePPZ		05	37		
	PX	eLE		33			
	MW	iPNEZ		01	40		
		eZ		02	27		
	R	iPZ		01	41		
	ePPZ		05	41			
LJ	iPZ		01	43			
Nov 18	P	eZ	16	22	06		Tucson (Courtesy USCGS): iZ = 16:22:32.
	R	eZ			12		
Nov 18	P	ePZ	21	51	09		Normal. Tucson (Courtesy USCGS): eZ = 21:50:24.
	PX	eLNE	22	02.	3		
	MW	ePZ	21	51	10		
	R	ePZ			03		
Nov 18	P	ePZ	22	56	52		
	MW	iPZ			53		
	R	iPZ			55		
Nov 19	P	iPNEZ	00	52	52		Normal. Tucson (Courtesy USCGS): eP = 00:53:19. Reported felt in northern Nevada and northwestern Utah.
	PX	iSNEZ		54	44		
	MW	iSNEZ			40		
	R	iPZ		52	52		
		iSZ		54	42		
	SB	ePZ		52	59		
	H	iSEZ		54	52		
	ePNE		52	28			
	eSNE		53	46			
Nov 19	P	ePZ	01	16	14		
	MW	ePZ			16		
	R	ePZ			13		
Nov 19	P	ePZ	03	47	07		Tucson (Courtesy USCGS): iP = 03:46:18.
	MW	ePZ			06		
	R	iPZ			03		
Nov 19	MW	iPZ	22	43	25		Tucson (Courtesy USCGS): iP = 22:43:46.
Nov 21	P	ePZ	20	41	04		Damage on Santa Maria (Azores). Strasbourg: 36°47'N., 26°15'W. O = 20:29:36.7.
	MW	ePZ			02		
	R	ePZ			01		
Nov 22	P	iPEZ	04	13	27		Normal. 34.5°N., 120.8°W. Santa Barbara: iS - iP = 13 sec; clock correction unavailable. Tucson (Courtesy USCGS): eP = 04:15:00, eS = 04:17:09.
		iSNE			55		
	MW	iPNEZ			29		
	iSNE			57			

Continued

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Nov 22	R	iPNEZ	04	13	36		Continued
		iSNE		14	10		
	LJ	iPZ		13	44		
	H	ePNE			39		
		iSN		14	13		
Nov 22	P	iPZ	05	04	46	d	Deep. Near Kyoto, Japan; deep focus, according to Hukuoka and Nagoya.
	MW	iPZ			47	d	
	R	iPZ			49		
Nov 22	P	ePZ	06	58	04		
	MW	ePZ			06		
	R	ePZ			09		
Nov 22	P	ePZ	12	26	32		
	MW	ePZ			34		
	R	iPZ			36		
Nov 22	P	iPZ	17	51	29		Normal? Central Japan. 35.8°N., 138.2°E., according to Hukuoka and Nagoya.
	MW	iPZ			30	c	
	R	iPZ			33		
Nov 23	P	eZ	07	40	56		Probably very distant.
		iZ		41	09		
	MW	iZ		40	57		
		iZ		41	10		
		iZ			24		
	R	eZ			05		
		iZ			14		
Nov 23	P	iPNEZ	08	27	12	d	Deep? Region of New Zealand. Wellington reports P = 08:17:23, S = 08:19:11.
		eZ		30	43		
	MW	iPNEZ		27	12	d	
		iZ			32		
	R	iPNEZ			12	d	
		eZ		30	50		
	LJ	ePNEZ		27	12		
	H	ePNE			20		
Nov 23	P	ePZ	14	04	53		Normal.
	PX	eLE		28			
	MW	iPZ		04	53		
	R	ePZ			47		
Nov 24	P	eZ	01	59	26		Normal.
	PX	eLN		02	25		
	MW	ePZ		01	58	33	
	R	ePZ			30		
Nov 24	P	iPZ	03	38	40		Deep? Tucson (Courtesy USCGS): iP = 03:39:18
	MW	iPZ			41		
		iZ		39	24		
	R	iPZ		38	44		
Nov 24	P	iPZ	07	40	44		P may be P'. Tucson (Courtesy USCGS): iP = 07:40:11
	MW	iPZ			47		
	R	iPZ			41		
Nov 25	P	iPZ	00	40	28		Deep? Tucson (Courtesy USCGS): iP = 04:41:49
	R	iPZ			30		
Nov 25	MW	iPZ	04	42	13		Tucson (Courtesy USCGS): iP = 04:43:03.
Nov 25	P	iPZ	04	54	18		Normal. South Pacific.
	PX	eN		05	04.7		
		eLZ			24		
	MW	iPZ		04	54	20	
	R	iPZ			20		
	H	ePE			25		



No. 69

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Nov 25	P	iPZ	11	42	16		Deep. Tucson (Courtesy USCGS): iP = 11:41:41
		iZ			44		
	MW	iPZ			16		
		iZ			45		
	R	iPZ			12		
		iZ			41		
Nov 26	MW	eZ	03	55	59		P is probably earlier. Very small. Tucson (Courtesy USCGS): eP = 03:56:07. Nagoya gives 42.3°N., 142.4°E.
Nov 26	P	ePZ	10	58	40		Normal? or slightly greater depth. North of Formosa (= Taiwan). Nagoya and Hukuoka give 24.1°N., 123.1°E. Bombay gives 27.5°N., 122°E. Pasadena distant about 95°.
		iZ			57		
		ePPZ	11	02	01		
	MW	eZ			47		
		iPZ	10	58	40		
		ePPZ	11	02	04		
R	iPZ	10	58	42			
Nov 26	P	ePZ	15	48	48		35.7°N., 141.0°E., according to Nagoya.
	MW	ePZ			49		
Nov 27	P	ePZ	08	24	24		
	MW	ePZ			25		
	R	ePZ			26		
Nov 27	P	iPNZ	20	21	41	c	Deep?
	MW	iPZ			39	c	
	R	iPZ			39	c	
	T	iPNEZ			23		
	H	iPNEZ			29		
Nov 28	P	iPZ	00	13	13		
	MW	iPZ			13		
	R	iPZ			14		
	T	iPZ			23		
Nov 28	P	iP"Z	05	43	18		Normal? Small surface waves recorded. Distance about 133°. Bombay gives 2.0°S., 96.6°E. O = 05:24:00.
		ePPZ			45 48		
		iSKPNZ			46 48		
	MW	eP"Z			43 14		
		ePPZ			45 40		
	R	eP"Z			43 14		
	T	ePPZ			45 53		
		eP"Z			43 14		
Nov 28	P	iPZ	12	49	24		
	MW	ePZ			24		
	R	iPZ			18		
	T	iPZ			52		
Nov 28	P	iZ	22	11	09		Small motion about 30 sec. earlier at these stations.
	MW	iZ			11		
	R	iZ			11		
	T	eZ			02		
Nov 28	P	iPZ	22	53	44	c	Deep? Tucson (Courtesy USCGS): iP = 22:54:08
	MW	iPZ			45	c	
	R	iPZ			46	c	
	T	iPZ			53		
Nov 29	P	iPEZ	12	20	35		Tucson (Courtesy USCGS): iP = 12:20:59.
	MW	iPZ			35		
	R	iPZ			38		
	T	iPZ			44		



1957

## PARAGUAY and auxiliary stations

No. 82

Date	Time	Phase	Station	Remarks
Nov 25	19:52	MW	195	
Nov 25	19:53	MW	195	
Nov 25	19:54	MW	195	
Nov 25	19:55	MW	195	
Nov 25	19:56	MW	195	
Nov 25	19:57	MW	195	
Nov 25	19:58	MW	195	
Nov 25	19:59	MW	195	
Nov 25	20:00	MW	195	
Nov 25	20:01	MW	195	
Nov 25	20:02	MW	195	
Nov 25	20:03	MW	195	
Nov 25	20:04	MW	195	
Nov 25	20:05	MW	195	
Nov 25	20:06	MW	195	
Nov 25	20:07	MW	195	
Nov 25	20:08	MW	195	
Nov 25	20:09	MW	195	
Nov 25	20:10	MW	195	
Nov 25	20:11	MW	195	
Nov 25	20:12	MW	195	
Nov 25	20:13	MW	195	
Nov 25	20:14	MW	195	
Nov 25	20:15	MW	195	
Nov 25	20:16	MW	195	
Nov 25	20:17	MW	195	
Nov 25	20:18	MW	195	
Nov 25	20:19	MW	195	
Nov 25	20:20	MW	195	
Nov 25	20:21	MW	195	
Nov 25	20:22	MW	195	
Nov 25	20:23	MW	195	
Nov 25	20:24	MW	195	
Nov 25	20:25	MW	195	
Nov 25	20:26	MW	195	
Nov 25	20:27	MW	195	
Nov 25	20:28	MW	195	
Nov 25	20:29	MW	195	
Nov 25	20:30	MW	195	
Nov 25	20:31	MW	195	
Nov 25	20:32	MW	195	
Nov 25	20:33	MW	195	
Nov 25	20:34	MW	195	
Nov 25	20:35	MW	195	
Nov 25	20:36	MW	195	
Nov 25	20:37	MW	195	
Nov 25	20:38	MW	195	
Nov 25	20:39	MW	195	
Nov 25	20:40	MW	195	
Nov 25	20:41	MW	195	
Nov 25	20:42	MW	195	
Nov 25	20:43	MW	195	
Nov 25	20:44	MW	195	
Nov 25	20:45	MW	195	
Nov 25	20:46	MW	195	
Nov 25	20:47	MW	195	
Nov 25	20:48	MW	195	
Nov 25	20:49	MW	195	
Nov 25	20:50	MW	195	
Nov 25	20:51	MW	195	
Nov 25	20:52	MW	195	
Nov 25	20:53	MW	195	
Nov 25	20:54	MW	195	
Nov 25	20:55	MW	195	
Nov 25	20:56	MW	195	
Nov 25	20:57	MW	195	
Nov 25	20:58	MW	195	
Nov 25	20:59	MW	195	
Nov 25	21:00	MW	195	
Nov 25	21:01	MW	195	
Nov 25	21:02	MW	195	
Nov 25	21:03	MW	195	
Nov 25	21:04	MW	195	
Nov 25	21:05	MW	195	
Nov 25	21:06	MW	195	
Nov 25	21:07	MW	195	
Nov 25	21:08	MW	195	
Nov 25	21:09	MW	195	
Nov 25	21:10	MW	195	
Nov 25	21:11	MW	195	
Nov 25	21:12	MW	195	
Nov 25	21:13	MW	195	
Nov 25	21:14	MW	195	
Nov 25	21:15	MW	195	
Nov 25	21:16	MW	195	
Nov 25	21:17	MW	195	
Nov 25	21:18	MW	195	
Nov 25	21:19	MW	195	
Nov 25	21:20	MW	195	
Nov 25	21:21	MW	195	
Nov 25	21:22	MW	195	
Nov 25	21:23	MW	195	
Nov 25	21:24	MW	195	
Nov 25	21:25	MW	195	
Nov 25	21:26	MW	195	
Nov 25	21:27	MW	195	
Nov 25	21:28	MW	195	
Nov 25	21:29	MW	195	
Nov 25	21:30	MW	195	
Nov 25	21:31	MW	195	
Nov 25	21:32	MW	195	
Nov 25	21:33	MW	195	
Nov 25	21:34	MW	195	
Nov 25	21:35	MW	195	
Nov 25	21:36	MW	195	
Nov 25	21:37	MW	195	
Nov 25	21:38	MW	195	
Nov 25	21:39	MW	195	
Nov 25	21:40	MW	195	
Nov 25	21:41	MW	195	
Nov 25	21:42	MW	195	
Nov 25	21:43	MW	195	
Nov 25	21:44	MW	195	
Nov 25	21:45	MW	195	
Nov 25	21:46	MW	195	
Nov 25	21:47	MW	195	
Nov 25	21:48	MW	195	
Nov 25	21:49	MW	195	
Nov 25	21:50	MW	195	
Nov 25	21:51	MW	195	
Nov 25	21:52	MW	195	
Nov 25	21:53	MW	195	
Nov 25	21:54	MW	195	
Nov 25	21:55	MW	195	
Nov 25	21:56	MW	195	
Nov 25	21:57	MW	195	
Nov 25	21:58	MW	195	
Nov 25	21:59	MW	195	
Nov 25	22:00	MW	195	
Nov 25	22:01	MW	195	
Nov 25	22:02	MW	195	
Nov 25	22:03	MW	195	
Nov 25	22:04	MW	195	
Nov 25	22:05	MW	195	
Nov 25	22:06	MW	195	
Nov 25	22:07	MW	195	
Nov 25	22:08	MW	195	
Nov 25	22:09	MW	195	
Nov 25	22:10	MW	195	
Nov 25	22:11	MW	195	
Nov 25	22:12	MW	195	
Nov 25	22:13	MW	195	
Nov 25	22:14	MW	195	
Nov 25	22:15	MW	195	
Nov 25	22:16	MW	195	
Nov 25	22:17	MW	195	
Nov 25	22:18	MW	195	
Nov 25	22:19	MW	195	
Nov 25	22:20	MW	195	
Nov 25	22:21	MW	195	
Nov 25	22:22	MW	195	
Nov 25	22:23	MW	195	
Nov 25	22:24	MW	195	
Nov 25	22:25	MW	195	
Nov 25	22:26	MW	195	
Nov 25	22:27	MW	195	
Nov 25	22:28	MW	195	
Nov 25	22:29	MW	195	
Nov 25	22:30	MW	195	
Nov 25	22:31	MW	195	
Nov 25	22:32	MW	195	
Nov 25	22:33	MW	195	
Nov 25	22:34	MW	195	
Nov 25	22:35	MW	195	
Nov 25	22:36	MW	195	
Nov 25	22:37	MW	195	
Nov 25	22:38	MW	195	
Nov 25	22:39	MW	195	
Nov 25	22:40	MW	195	
Nov 25	22:41	MW	195	
Nov 25	22:42	MW	195	
Nov 25	22:43	MW	195	
Nov 25	22:44	MW	195	
Nov 25	22:45	MW	195	
Nov 25	22:46	MW	195	
Nov 25	22:47	MW	195	
Nov 25	22:48	MW	195	
Nov 25	22:49	MW	195	
Nov 25	22:50	MW	195	
Nov 25	22:51	MW	195	
Nov 25	22:52	MW	195	
Nov 25	22:53	MW	195	
Nov 25	22:54	MW	195	
Nov 25	22:55	MW	195	
Nov 25	22:56	MW	195	
Nov 25	22:57	MW	195	
Nov 25	22:58	MW	195	
Nov 25	22:59	MW	195	
Nov 25	23:00	MW	195	

No. 70

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Nov 29	P	iPEZ	12	20	35		Tucson (Courtesy USCGS): iP = 12:20:59.
	MW	iPZ			35		
	R	iPZ			38		
	T	iPZ			44		
Nov 30	P	eP'Z	00	59	35		Normal. $\Delta = 140^\circ$ approx. Strasbourg gives $5^\circ\text{N.}$ , $90^\circ\text{E.}$ $0 = 00:40.5$ . Bombay gives $5^\circ\text{N.}$ , $89^\circ\text{E.}$ $0 = 00:40:28$ .
		iP'Z			41		
		eZ	01	02	02		
		iPPZ		03	03		
		iZ			19		
	PX	eLN			37		
		MW	eP'Z	00	59	36	
	R	iP'Z			42		
		iPPZ	01	03	03		
		iZ			21		
		eP'Z	00	59	35		
		iP'Z			42		
		iZ	01	02	07		
		eFPZ		03	04		
	T	eSKPZ			48		
		iP'NEZ	00	59	36		
		eZ	01	01	46		
		eFPZ		02	55		
		H	eP'E	00	59	40	
Nov 30	P	iPZ	06	33	37		Tucson (Courtesy USCGS): eP = 06:32:36, e = 06:37:06.
	MW	iPZ			38		
	R	iPZ			31		
Nov 30	P	eP''Z	13	17	15		Normal? Abyssinia. $\Delta = 135^\circ$ approx. Strasbourg: $7.5^\circ\text{N.}$ , $45.0^\circ\text{E.}$ Bombay: $6.5^\circ\text{N.}$ , $37.5^\circ\text{E.}$ $0 = 12:57.9$ .
		iP''Z			35		
		eP''Z		19	38		
	PX	eLNE	14	02.6			
		MW	eP''Z	13	17	15	
	iP''Z				35		
	iPPZ			19	43		
	T	eSKPZ		20	10		
		eP''Z		17	05		
		eZ			28		
ePPZ			19	37			
Nov 30	P	iPEZ	16	25	49	c	Tucson (Courtesy USCGS): iP = 16:25:19. La Plata reports P = 16:15:39.
	MW	iPZ			48	c	
	R	iPZ			45		

C. F. Richter

No. 71

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Dec 1	MW	eZ	19	35	48		
Dec 1	P	iPZ	23	35	14		Peculiar. Tucson (Courtesy USCGS): iP = 23:35:41
	MW	iPZ			15		
	R	ePZ			18		
Dec 2	P	ePEZ	16	39	50		Tucson (Courtesy USCGS): eP = 16:40:05.
	MW	ePZ			50		
	R	ePZ			49		
Dec 2	P	iPEZ	23	13	26		Tucson (Courtesy USCGS): eP = 23:44:39.
	MW	iPZ			26		
	R	ePZ			32		
	H	ePE			13		
Dec 3	P	iPNEZ	15	28	40		Normal. 34.6°N., 120.8°W. O = 15:28:12. Tucson (Courtesy USCGS): eP = 15:30:21.
		iSNEZ		29	15		
	MW	iPNEZ		28	50		
		eSN		29	17		
	R	iPZ		28	57		
		eSNE		29	30		
	SB	iPNEZ		28	30		
		iSNE			43		
	H	eE		29	02		
		iSE			41		
Dec 3	P	ePZ	23	27	40		South America? Tucson (Courtesy USCGS): iP = 23:27:26
	MW	iPZ			41		
	R	ePZ			38		
	T	ePZ		28	00		
Dec 3	P	ePZ	23	44	36		South America? Similar to the preceding. L may belong to either shock. Tucson (Courtesy USCGS): eP = 23:44:24.
	PX	eLN	24	03.3			
	MW	ePZ	23	44	38		
	R	ePZ			35		
	T	ePNEZ			56		
Dec 4	P	iPZ	00	56	06		Normal. 36.1°N., 114.8°W. O = 00:55:03. Near Boulder City. Felt there. Tucson (Courtesy USCGS): iP = 00:56:19 iS = 00:57:38
		iSZ			55		
	MW	ePZ		55	56		
		iPZ		56	05		
		eSZ			48		
	R	ePZ		55	50		
		eSN		56	31		
	T	ePZ		55	56		
		iSZ		56	44		
Dec 5	P	iPNEZ	05	48	34		(Deep.) Approximately $\Delta = 33^\circ$ , $h = 80$ km. Central America. Tucson (Courtesy USCGS): eP = 05:47:40
		iPcPZ		51	12		
		ipPcPZ			27		
		eScPZ		54	51		
		iPcSZ			54		
	MW	ipPcSZ		55	22		
		iPZ		48	32		
		ipPZ			48		
		iPcSZ		54	53		
	R	iPZ		48	27		
		ipPZ			52		
		iPcPZ		51	09		
		ipPcPZ			21		
		iPcSZ		54	50		
		ipPcSZ		55	22		
	LJ	ePNEZ		48	21		

Continued



No. 72

## PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c	Remarks			
			h	m	s					
Dec 5	T	ipZ	05	48	52		Continued			
		ipPZ						49	08	
		iPcPZ						51	15	
		eScPZ						54	56	
		iPcSZ							59	
		epPcSZ						55	22	
		iScSEZ						59	01	
Dec 5	P	ipZ	08	27	35		Tucson (Courtesy USCGS): iP = 08:27:56			
	MW	ePZ							34	
	R	ipZ							37	
	T	ipZ							45	
Dec 5	P	iPNEZ	15	30	49		Normal.			
	PX	eN						42	29	
		eLN						57		
	MW	ipZ						30	58	
	R	ePZ						31	00	
	T	ePZ							08	
Dec 6	P	ePZ	04	46	17		Normal. Off Cape Imbo, Japan. 34.8°N., 142.5°E., according to Hukuoka.			
	MW	ipZ							17	
	R	ipZ							16	
Dec 6	P	ipZ	21	14	47		Central America. Tucson (Courtesy USCGS): eP = 21:13:52			
	MW	iZ							52	
		ipZ							47	
		eZ							46	
	T	ipZ						15	08	
Dec 6	P	ipZ	21	50	36		Normal? Small surface waves recorded. Central America.			
	MW	iZ							52	12
		ePZ							50	29
		iZ								36
	R	iZ							52	10
		ePZ							50	24
		ipZ								42
Dec 6	P	ipZ	23	29	28	c	Deep?			
	MW	iZ							35	
		iZ							57	
		ipZ							28	
		ipZ							30	
	LJ	iZ							39	
		ePZ						30	00	
	T	ipZ						29	32	
		iZ							24	
	Dec 7	P						ipZ	03	42
MW		ipZ		46	d					
R		ipZ		43	d					
T		ipNEZ		57	d					
Dec 7		P	ipZ	09	40	52		Tucson (Courtesy USCGS): iP = 09:42:14		
	MW	ipZ							52	
	R	ipZ							53	
	T	ipZ							59	
Dec 7	P	ipZ	10	35	17		Deep? Tucson (Courtesy USCGS): eP = 10:35:42, i = 10:36:18			
	MW	iZ							53	
		ipZ							17	
		ipZ							18	
	R	iZ							55	
		ipZ							22	
	T	eZ							59	



No. 73

PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks			
			h	m	s					
Dec 7	MW	iPZ	14	39	46		Deep? Tucson (Courtesy USCGS): iP = 14:40:25, i = 14:40:01. Readings at 45 <sup>m</sup> may be P of a second shock.			
		iZ		40	20					
		iZ			27					
	R	iZ		41	13					
		iZ		45	44					
		iPZ		39	49					
	T	iZ		40	24					
		iZ		45	44					
		iPZ		39	25					
Dec 7	P	iPZ	18	08	05		Normal. Central America.			
		eLN		22.4						
	MW	ePZ		08	02					
		iZ			11					
	R	ePZ		07	58					
	Dec 7	P	iPZ	19	26			17		Tucson (Courtesy USCGS): iP = 19:26:35
		MW	ePZ					18		
		R	ePZ					18		
	Dec 8	P	iPNEZ	02	32			44		Normal. Central America. USCGS: 13.5°N., 82.5°W., approx. O = 02:25.2
eLN				45.4						
MW		iPZ		32	44					
		eZ		33	34					
R		eZ		34	18					
		iPZ		32	38					
SB		ePZ			48					
LJ		eNE			31					
T		ePE			56					
Dec 8	PX	eSSE	09	04.3		Normal. USCGS: 26°N., 119°E., approx. O = 08:32.4. According to Taihoku, felt in the whole island of Formosa (= Taiwan); Epicenter 23.2°N., 121.3°E. Damage in the epicentral area.				
		eLN		12.6						
	MW	eZ		48			56			
		eZ		49			59			
	R	eZ		45			58			
Dec 8	P	iPNEZ	16	58	39		Normal? Surface waves absent. Solomon Islands; Δ = 91° approx.			
		iPEZ			40					
	MW	eZ		17	03			30		
		iPZ		16	58			42		
	R	eZ		17	03			29		
		iPNEZ		16	58			41		
H	ePNE			42						
Dec 11	MW	iPZ	13	51	27		According to Nagoya, 40.2°N., 142.3°E. Felt in Tohoku and Hokkaido.			
	R	iPZ			30					
	T	iPZ			17					
Dec 12	P	iPNEZ!	04	14	35		Deep!			
		iPNZ!			36					
	MW	iPZ			37					
		iZ		17	42					
	R	iPZ		14	30					
		iPNEZ			44					
	SB	iZ		16	46					
		iZ		17	50					
H	iPNEZ		14	40						
Dec 12	P	iZ	08	09	37		South Pacific. Tucson (Courtesy USCGS): iP = 08:09:59			
		iPZ			42					
	MW	iPZ			43					
		iPZ			51					





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PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks	
			h	m	s			
Dec 12	P	iPZ	14	15	27		Deep? Probably h = 50 km. South America. Tucson (Courtesy USCGS); iP = 14:14:54, i = 14:15:08.	
		iZ			41			
		iZ			48			
	MW	iPZ	16	00	26			
		iPZ			24			
		iZ			38			
	T	iZ			45			
		iPZ			39			
		iZ			54			
Dec 14	P	iPZ	10	13	36		Tucson (Courtesy USCGS): iP = 10:14:26	
	R	iPZ			41			
	T	iPZ			08			
Dec 15	P	iPNEZ	09	59	26		Normal. Tucson (Courtesy USCGS): eP = 09:59:48. 33.1°N., 116.0°W., O = 09:58:44. Felt in Imperial Valley.	
		iSNE			56			
		iPNEZ			26			
	MW	iSNEZ			55			
		iPNEZ			12			
		iSNE			37			
	LJ	iPNEZ			07			
		eSNE			22			
	T	ePZ			54			
eSNE		10			01	13		
eZ		09			59	54		
H	eSNE				39			
Dec 15	P	iPZ	11	44	26		Japan. According to Nagoya, 41.6°N., 142.0°E. Felt in Tohoku and Hokkaido.	
		iPZ			30			
		iPZ			16			
Dec 15	MW	iPZ	23	55	38		Tucson (Courtesy USCGS): eP = 23:56:02.	
		ePZ			39			
Dec 16	P	iPZ	05	59	24		Deep? Tucson (Courtesy USCGS): iP = 05:59:47	
		iPZ			24			
		iPZ			26			
		iPZ			31			
Dec 16	P	iZ	08	46	55		Normal? Felt in the Philippines.	
		iZ			47			20
		iZ			46			54
Dec 16	P	iPZ	09	48	00		Normal? Japan. Nagoya and Hukuoka give 34.3°N., 140.1°E.	
		iZ			24			
		iPZ			02			
	MW	iZ			24			
		iZ			34			
		iPZ			05			
	T	iZ			27			
		ePZ			47			53
		iZ			48			16
Dec 16	P	iPZ	15	20	03		Deep? Tucson (Courtesy USCGS): iP = 15:19:32. Felt in San Juan province, Argentina, according to La Plata.	
		iPZ			19			58
		iPZ			20			15
Dec 17	P	iPNZ	07	31	13	c	Deep? Felt in Chile and Argentina, according to La Plata.	
		iPNEZ			14			
	MW	iPNEZ			10	c		
		iPNEZ			18			
	T	ePE			26			
	H	iPNEZ			21			



Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Dec 17	P	iZ	09	49	58		Normal. Felt in the whole island of Formosa (= Taiwan). 22.9°N., 121.4°E., according to Hukuoka and Nagoya.
	PX	eLN	10	19.4			
	MW	eZ	09	49	46		
	R	eZ		50	02		
Dec 17	P	iPNZ	19	12	23		Deep? Tucson (Courtesy USCGS): iP = 19:13:08
	MW	iPZ			28		
	R	iPZ			31		
	T	iPZ			13		
Dec 18	P	ePZ	13	32	02		Normal. Turkestan. Δ = 104°. Strasbourg: 41°N., 72.5°E. Bombay: 42.0°N., 71.6°E., 0 = 13:18:05.
		eZ		36	14		
		iPPZ			21		
		ePKKPZ		47	53		
	PX	eLN	14	20.0			
		ePZ	13	32	02		
	MW	iZ		36	00		
		iPPZ			19		
		ePKKPZ		47	54		
		R	ePZ		32		
		eZ		36	06		
Dec 18	P	iPNEZ	20	57	08		Normal? Central America. Tucson (Courtesy USCGS): eP = 20:56:16.
	MW	iPZ			07		
	SB	ePZ			17		
	T	iPNEZ			21		
Dec 19	P	iPZ	14	42	36	d	Deep.
		eZ		43	12		
	MW	iPZ		42	37		
		iZ		43	15		
	R	iPZ		42	39		
		eZ		43	13		
T	iPZ		42	36			
Dec 20	P	iPNEZ	03	43	45	c	Deep? South Pacific.
	MW	iPZ			45		
	R	iPNEZ			47		
	T	ePZ			45		
Dec 20	P	iPZ	12	42	46		Tucson (Courtesy USCGS): eP = 12:41:44.
	R	ePZ			30		
	T	ePZ			05		
Dec 22	P	iPNEZ	03	41	47	d	Normal. USCGS: 17°N., 106°W. 0 = 03:37:17. J.S.A: 17.2°N., 105.7°W. 0 = 03:37:15
		isN		45	42		
		eLN		47.0			
	MW	iPNEZ		41	47		
		ePNEZ			39		
	R	iPZ		42	12		
		eSN		46	29		
H	ePEZ		42	04			
Dec 22	P	iPNEZ	04	01	10		Aftershock.
	MW	iPNEZ			09		
	R	iPNEZ			02		
	T	iPNZ			34		
Dec 22	P	ePZ	05	47	46		Aftershock.
	R	ePZ			38		
	T	ePZ		48	06		
Dec 22	P	iPNEZ	07	39	40		Normal. Aftershock.
	PX	isN		43	40		
		eLN		44.7			
	MW	ePNE		39	41		

Continued



No. 76

## PASADENA and auxiliary stations

1937

Date	Station	Phase	G. C. T.			c	Remarks
			h	m	s		
							Continued
Dec 22	R	ePZ	07	39	33		
	T	ePNZ		40	04		
	H	ePZ		39	57		
Dec 23	P	iPZ	03	10	32		Tucson (Courtesy USCGS): iP = 03:10:57 South Pacific?
	MW	iPZ			33		
	R	iPZ			35		
	T	iPZ			40		
Dec 23	P	iPNEZ	13	23	23		Normal. Destructive in Mexico. USCGS: 15.5°N., 98.5°W., approx. O = 13:17:56 J.S.A: 16.6°N., 98.0°W., O = 13:17:56, normal or nearly normal. Strasbourg: 17.5°N., 97.5°W. O = 13:17:56 Tacubaya (according to Strasbourg): 16°18'N., 98°33'W.
	PX	iSE		27	56		
		iLE		30	23		
	MW	ePNEZ		23	18		
		iZ			30		
		eSNE		28	02		
	R	ePNEZ		23	10		
		iSNE		27	51		
	T	iPNZ		23	37		
		eSNZ		28	31		
	H	ePNEZ		23	31		
		eSNE		28	13		
Dec 23	MW	iPZ	14	25	42		Aftershock.
	R	iPZ			37		
	T	iPZ		26	01		
Dec 23	P	iPZ	16	52	32		Aftershock. Epicenter 16°24'N., 98°39'W., by Tacubaya, according to Strasbourg.
	T	ePZ			55		
Dec 23	R	eZ	18	09	22		Aftershock.
	T	ePZ			49		
Dec 23	P	iPZ	20	43	22		Tucson (Courtesy USCGS): iP = 20:42:23, iZ = 20:45:26. Possibly two shocks 3 minutes apart.
		iZ		46	22		
	MW	iPZ		43	23		
		iZ		46	24		
	R	iPZ		43	14		
	T	iPZ		46	12		
		iZ		43	49		
		iZ		46	51		
Dec 23	P	iPNEZ	23	26	44		Normal. Aftershock. USCGS: 15.5°N., 98.5°W., O = 23:21.1 J.S.A: 16.0°N., 98.0°W., O = 23:21:18 Tacubaya (according to Strasbourg): 16°24'N., 98°39'W.
	PX	iSN		31	13		
		eLNE		33.3			
	MW	ePNEZ		26	38		
	R	iPNEZ			33		
	T	iPNZ			57		
	H	ePNZ			55		
Dec 23	MW	eZ	23	30	07		Involved in the preceding.
	R	eZ			03		
	T	eZ			20		
Dec 24	MW	iPZ	01	35	16		Aftershock.
	R	iPZ			11		
	T	iPZ			34		
Dec 24	P	iPZ	02	36	55		Aftershock.
	MW	iPZ			49		
	R	ePZ			43		
	T	ePZ		37	10		



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PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Dec 24	P	iPZ	03	35	59		Deep? Tucson (Courtesy USCGS): iPZ = 03:35:30, iZ = 03:35:47 South America; Andes, according to La Plata, which reports P = 03:26:28, S = 03:28.7?
		iZ		36	15		
	MW	iPZ		35	59		
		iZ		36	15		
	R	iPZ		35	55		
		iZ		36	11		
Dec 24	T	iPZ		36	09		
		iZ			26		
Dec 24	MW	iPZ	03	52	48		
	R	iZ			32		
Dec 24	P	iPZ	04	40	48		Aftershock.
	PX	eSNE		45	19		
		eLNE			49.2		
	MW	iPZ		40	50		
	R	ePNEZ		40	42		
	T	ePZ		41	03		
Dec 24	P	iPNEZ	06	30	51	c	Normal? Destructive in Peru. $\Delta = 61^\circ$ . USCGS: $10.5^\circ\text{S.}$ , $75.5^\circ\text{W.}$ , $O = 06:20.7$ Surface waves rather small.
		iPPZ		33	00		
	PX	iSNEZ		39	10		
		eScSE		40	36		
		iN		41	20		
		eSSN		43.6			
		eLN		50			
	P	eP'P'Z	07	00	22		
	MW	iPNEZ	06	30	52	c	
		iPPZ		33	02		
	R	iPNEZ		30	47	c	
		iPPZ		32	57		
		eSN		39	02		
	T	iPNEZ		31	00	c	
iPPZ			33	14			
eP'P'Z		07	00	18			
H	ePNEZ	06	30	58			
Dec 24	P	iPZ	06	44	20		Tucson (Courtesy USCGS): iP = 06:43:39
	MW	iPZ			21		
	R	iPZ			16		
	T	iPZ			33		
Dec 24	P	iPZ	11	57	48		Approximately $34.5^\circ\text{N.}$ , $120.8^\circ\text{W.}$ . $S-P = 13$ sec; clock correction not available. Tucson (Courtesy USCGS): eP = 03:59:22
		iSNEZ		58	15		
	MW	ePNE		57	50		
		iSNE		58	17		
	R	ePZ		57	57		
T	iPZ		58	05			
Dec 25	P	iPZ	04	40	58		Tucson (Courtesy USCGS): iP = 04:40:00
	MW	iPZ			57		
	R	iPNEZ			51		
Dec 25	P	ePZ	10	08	08		Tucson (Courtesy USCGS): eP = 10:08:30
	MW	iPZ			08		
	R	ePZ			10		
Dec 25	P	iPZ	14	04	52		Tucson (Courtesy USCGS): iP = 14:05:22. Japan, $32.9^\circ\text{N.}$ , $132.2^\circ\text{E.}$ Felt in Kyusyu and part of Sikoku, according to Hukuoka and Nagoya.
	MW	iPZ			53		
	R	ePZ			55		
Dec 25	P	eZ	15	21	53		Tucson (Courtesy USCGS): eP = 15:21:37
	R	eZ			51		

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PASADENA and auxiliary stations

1937

Date	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Dec 25	MV	iPZ	17	48	42		Aftershock, Mexico. Tucson (Courtesy USCGS): iP = 17:47:42. Tacubaya (according to Strasbourg): 16°08'N., 98°19'W.
	R	iPZ			36		
Dec 25	P	iPZ	18	32	46		Tucson (Courtesy USCGS): iP = 18:33:10.
	MW	iPZ			47		
	R	iPZ			48		
Dec 25	P	iZ	21	19	34		Normal. Small surface waves recorded.
	MW	iZ			35		
		eZ			23 08		
	R	eZ			19 34		
Dec 26	P	iPNEZ	06	08	52		Tucson (Courtesy USCGS): iP = 06:07:53. Mexico?
	R	iPNEZ			47		
	T	ePN		09	13		
	H	ePNEZ			02		
Dec 26	R	ePZ	12	57	14		Tucson (Courtesy USCGS): eP = 12:56:20
Dec 26	P	iPZ	18	01	22		Mexico. Tacubaya, according to Strasbourg: 15°55'N., 98°05'W.
	R	iPZ			17		
Dec 27	P	iPEZ	15	20	22		Mexico. Destructive. Tacubaya (according to Strasbourg): 16°24'N., 98°39'W.
	MW	iPZ			19		
	R	iPZ			13		
	T	ePN			38		
	H	ePZ			33		
Dec 28	P	iZ	03	28	04		East Indies.
	MW	iZ			05		
	R	iZ			06		
		eZ			29 09		
Dec 28	P	eZ	04	55	37		Deep? Tucson (Courtesy USCGS): eZ = 04:56:10, iZ = 04:57:00
		iZ			56 26		
		iNEZ:			28		
	MW	eZ			55 39		
		iZ			56 25		
		iZ			29		
	R	eZ			55 41		
	H	iZ			56 31		
	eNEZ			21			
Dec 28	P	ePNEZ	06	32	21		Normal. Central Atlantic. USCGS: 1°N., 28°W., approx. 0 = 06:19.5 Strasbourg: 1.8°S., 22.0°W. 0 = 06:19.6
		ePPZ			35 47		
	P6	eLE	07	04			
	MW	ePZ	06	32	19		
	R	ePPZ			35 39		
	ePZ			32 15			
Dec 29	P	ePZ	05	18	47		
	MW	ePZ			50		
	R	ePZ			51		
Dec 29	P	iPEZ	09	01	59	c	Tucson (Courtesy USCGS): iP = 09:02:38
	MW	iPZ			02 01	c	
	R	iPZ			03		
Dec 29	P	iPZ	15	42	30		Deep.
	MW	iPZ			30	c	
		iZ			43 35		
	R	iPZ			42 33		
		eZ			43 37		



Day	Sta- tion	Phase	G. C. T.			c d	Remarks
			h	m	s		
Dec 30	P	ePEZ	11	00	27		Normal. Tucson (Courtesy USCGS): eP = 10:59:32
	PX	eLNE		04	08		
	MW	ePZ		00	25		
	R	ePZ			21		
	T	eZ			54		
Dec 30	P	iPNEZ	11	46	30	c	Normal. Mexico. USCGS: 15.5°N., 98°W., approx. O = 11:40.8. Tacubaya (according to Strasbourg): 16°11'N., 98°36'W.
	PX	iSNE		51	09		
		eLNE		52.5			
	MW	iPZ		46	30	c	
		eSZ		51	08		
	R	iPZ		46	27	c	
	T	iPNEZ			48	c	
	H	ePEZ			41		
Dec 30	P	iPNEZ	13	16	35	d	Deep? Tucson (Courtesy USCGS): iP = 13:17:05
	MW	iPZ			35	d	
	R	iPZ			40	d	
	T	iPZ			35	d	
Dec 30	P	iPZ	23	32	23		Deep? Felt at Mendoza, Argentina, according to La Plata, which reports P = 23:22:40, S = 23:24.2?
		iZ			53		
	MW	iPZ			22		
		iZ			54		
	T	iPZ			34		
		iZ		33	05		
Dec 31	P	iPZ	06	40	30		Tucson (Courtesy USCGS): iP = 06:39:32
	MW	iPZ			29		
Dec 31	P	iPZ	16	03	45		Tucson (Courtesy USCGS): iP = 16:04:09
	MW	iPZ			46		
	T	iPZ		04	02		
Dec 31	P	iPNEZ	17	46	50	c	Normal. Mexico. USCGS: 15°N., 98°W., approx. O = 17:41.2 J.S.A: 16.2°N., 98.7°W., O = 17:41:21. Tacubaya (according to Strasbourg): 15°47'N., 98°14'W.
	PX	iSNE		51	24		
		eLNE		53.5			
	MW	iPNEZ		46	51	c	
	T	iPNEZ		47	08	c	
	H	ePNE			02		
Dec 31	P	eZ	21	55	03		Tucson (Courtesy USCGS): eZ = 21:54:50. Apia reports iP = 12:44:21, iS = 12:45:25
	MW	eZ		54	27		
		eZ			59		
	T	eZ		54	38		
		eZ		55	10		

C. F. Richter

1937

## PARADISE and auxiliary stations

No. 17

Day	Time	Phase	Amplitude	Period	Station	Remarks
Dec 30	11 00	1937	11	00	1937	Normal, Mexico. USCGS: 18°N., 98°W., approx. C = 11:40.8. Tsunami (according to Stansbourg): 18°11'N., 98°36'W.
	05 00	1937	05	00	1937	
	00 25	1937	00	25	1937	
	00 21	1937	00	21	1937	
Dec 30	11 48	1937	11	48	1937	Normal, Mexico. USCGS: 18°N., 98°W., approx. C = 11:40.8. Tsunami (according to Stansbourg): 18°11'N., 98°36'W.
	01 09	1937	01	09	1937	
	00 30	1937	00	30	1937	
	00 27	1937	00	27	1937	
Dec 30	12 16	1937	12	16	1937	Deep? Tsunami (Contrary USCGS): C = 12:17:00
	00 35	1937	00	35	1937	
	00 40	1937	00	40	1937	
	00 31	1937	00	31	1937	
Dec 30	00 25	1937	00	25	1937	Deep? Tsunami (according to La Plata, which reports according to USCGS, S = 12:21:30 C = 12:22:40, S = 12:21:30
	00 25	1937	00	25	1937	
	00 24	1937	00	24	1937	
	00 24	1937	00	24	1937	
Dec 31	00 30	1937	00	30	1937	Tsunami (Contrary USCGS): C = 00:30:00
	00 22	1937	00	22	1937	
Dec 31	00 45	1937	00	45	1937	Tsunami (Contrary USCGS): C = 00:45:00
	00 45	1937	00	45	1937	
Dec 31	12 45	1937	12	45	1937	Normal, Mexico. USCGS: 18°N., 98°W., approx. C = 12:41.2. T.S.A.: 18°24'N., 98°37'W., C = 12:41:31. Tsunami (according to Stansbourg): 18°47'N., 98°34'W.
	01 24	1937	01	24	1937	
	00 24	1937	00	24	1937	
	00 08	1937	00	08	1937	
Dec 31	01 28	1937	01	28	1937	Tsunami (Contrary USCGS): C = 01:28:00 This reports T = 12:44:31, S = 12:42:30
	00 24	1937	00	24	1937	
	00 28	1937	00	28	1937	
	00 10	1937	00	10	1937	

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