Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Jan 1	PX	iZ	09	01	06			c	normal	
		iEZ			11			c		
		iZ			47			c		
		iZ		02	12					
		iE		11	21					
		iEZ		12	35					
		eZ		13	14					
		eLE		27	44	35				
	MW	ePE		01	07					
	R	ePNE			13					
		eN		11	27					
	SB	eE		01	09					
	T	iPNEZ			12			c		
		iNEZ			17					
		eN		11	39					
	H	iPNEZ		01	12					
		iZ			16					
Jan 1	T	eZ	09	27	17					
	H	eZ			14					
Jan 1	PX	iPZ	10	16	57			d	deep?	
	T	iPNEZ			45					
	H	iPNEZ			50					
Jan 3	P	iPZ	22	52	28			c	deep?	
	T	iPZ			19					
	H	ePE			23					
Jan 4	PX	iPEZ	01	37	07				normal	
		iSE		47	31					
		eLE	02	02.1		35				
	MW	iPNE	01	37	08					
	R	ePNE			10					
	SB	iPN			00					
	T	ePZ		36	59					
		iPNEZ		37	01					
	H	iPNE			05					
Jan 4	PX	ePEZ	04	06	06				normal	J S A: 60.3°N.,145°W.
		iE			19					0 - 03:59:43
		iE		07	36					USCGS: 62°N.,148°W,,
		eE		10	54					0 - 03:59.6
		iSE		11	24					
		eLE		15	28	20				
	MW	ePNE		06	07					
		eSN		11	25					
	R	ePNE		06	09					
		eNE			24					
		iSN		11	30					
	SB	ePN		06	02					
		eN			12					
	T	iPNEZ		05	46					
		iNEZ			57					
		iSN		10	46					
	H	iPNEZ		05	54					
		iNEZ		06	05					
		eSN		11	00					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Jan 4	P	iPNEZ	21	13	03					1000 km. S.W. of Pasadena. Roughly 28°N 126°W. First shock definitely located in that region.
		iSNEZ		14	46					
	MW	ePNE		13	09					
		iSNE		14	51					
	R	ePNE		13	09					
		eSNE		14	56					
	SB	ePNE		12	54					
		iSNE		14	31					
	T	ePNE		13	28					
		eSNE		16	02					
	H	ePNEZ		13	25					
Jan 6	PX	ePZ	19	29	26					
	T	eZ			29					
Jan 7	PX	ePZ	04	18	15				normal	Surface waves recorded.
		iSZ		27	53					
	MW	ePZ		18	15					
		iNEZ			28					
	R	eNE			30					
	T	iPNEZ			07					
		iZ			16					
		eSNE		27	40					
	H	iPNEZ		18	14					
		iNEZ			26					
Jan 7	P	ePZ	05	05	21				deep?	
	MW	iPZ			22					
	T	ePE			11					
Jan 7	P	eNEZ	19	45	08				deep	
		iNEZ			36					
	MW	eZ			09					
		eZ			37					
	T	iPNEZ		44	47					
		eZ		45	14					
	H	iZ		44	55					
		iZ		45	23					
Jan 8	P	eNZ	06	40	32				deep?	
	MW	iPZ			32					
	T	eZ			21					
Jan 8	P	ePZ	18	39	56				deep	
	MW	ePZ			57					
	T	ePZ			46			c		
Jan 9	P	ePNEZ	02	15	48				deep	Surface waves small or absent.
		eZ		19	15					
		iZ		20	21					
	MW	ePZ		15	50					
		iZ		20	03					
		iZ			21					
	T	iPZ		15	37			d		
		iZ		19	48					
		iSNEZ		25	56					
Jan 9	P	iPZ	02	30	55			d	deep	
	MW	iPZ			56			d		
	T	iPNEZ		31	05					
		eSN		41	44					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Jan 9	P	iPZ	23	56	41			d	deep	
	MW	iPNEZ			44					
	LJ	ePNE			38					
	T	iPNEZ			26					
	H	iPEZ			32					
Jan 12	P	iPNEZ	01	25	00			c	deep	
	MW	iPNEZ			00					
	T	iPNEZ			16			d		
		iSNE		35	25					
	H	ePZ		25	08					
Jan 15	P	ePNEZ	08	01	08				normal	
		iSNEZ		02	48					
	MW	iPNEZ		01	06					
		iSNEZ		02	49					
	T	iPNEZ		00	46					
		iSNEZ		02	18					
	H	ePNEZ		00	58					
Jan 15	P	iPNEZ	18	15	21			c	deep	
		iZ		16	02					
	MW	iPZ		15	22					
		iZ		16	03					
	T	eZ		15	23					
Jan 16	P	iPZ	09	40	44				deep?	
	T	ePZ			47					
Jan 17	T	iPZ	19	07	56					
Jan 18	P	iPNEZ	17	24	56			c	deep	
	T	iPNEZ			42					
	H	iPNEZ			47			c		
Jan 21	P	iP'Z	19	41	21			d	normal	J S A: 41°S 59°E
		iEZ			27					0 - 19:20:57
		eNEZ		47	02					USCGS: 37°S 59°E approx.
	PX	eLEZ	20	49						0 - 19:20,8
	R	eP'NE	19	41	22					
		eNE		46	58					
	LJ	eNE		41	28					
		iE		46	59					
Jan 23	P	iPNEZ	18	25	43				deep	
	R	ePNE			46					
		eSN		35	06					
	LJ	iPNE		25	45					
		iSN		35	02					
	T	iPEZ		25	51					
		iSN		35	17					
Jan 24	P	iPZ	03	40	24			d	deep	
Jan 24	P	iPNEZ	15	43	51			c	deep?	
	PX	iSE		51	11					
	R	ePNE		43	45					
	LJ	iN			46					
Jan 27	P	ePZ	22	27	07					
Jan 27	P	iPNEZ	22	47	54					J S A: 09.5°S 173.1 W
	P34	iN		57	59					0 - 22:36:41
		iLN	23	09	50	40				
	LJ	ePNE	22	47	53					
		iNE		48	01					
		eSE		57	41					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Feb 2	P	iPNEZ	09	42	41				deep	
		eZ		44	39					
	R	iPZ		42	47					
		eZ		44	37					
	LJ	ePNE		42	45					
	T	ePE			49					
	H	iPNEZ			52					
Feb 2	P	iPNEZ	13	15	28			c	deep	
		eZ		17	30					
	R	ePZ		15	31					
	T	iPNE			39					
Feb 3	P	iPNEZ	22	22	31			c	deep	(any.
	PX	iSNE		31	19					Surface waves very small, if
	R	iPNZ		22	33					J S A: 46° N 151°E .
	SB	ePNE			20					
	LJ	iPNE			40					
	T	iPNEZ			21			c		
		eSN		30	58					
	H	iPNEZ		22	25					
Feb 4	P	iPNEZ	06	29	35			c	deep	
	R	iPZ			35			c		
	T	iPNEZ			29			c		
	H	iPNEZ			32			c		
Feb 8	P	iPEZ	00	59	51					
	T	iPEZ	01	01	03					
Feb 8	P	iPZ	10	30	44					
	T	iPEZ			52					
Feb 9	P	iPZ	04	08	38			c	deep	
		eZ		10	04					
	R	iPZ		08	45			c		
	T	iPZ			31					
Feb 9	P	iPNZ	04	27	12					
Feb 10	P	iPZ	08	57	28			d	deep	
		iZ			58			c		
	R	eNE			24					
	LJ	eN			44					
	T	iPNEZ		57	39			d		
		iNEZ		58	08			c		
Feb 13	P	iPNEZ	03	02	43			c	deep?	
	R	ePZ			47					
	T	ePNEZ			30			c		
Feb 14	P	ePZ	05	34	41				normal	Small surface waves recorded
	R	ePZ			43					
	T	ePEZ			51					
Feb 15	P	iPZ	02	32	40			c	deep?	
	T	iPZ			43					
Feb 18	T	iPNEZ	12	13	25					
Feb 19	P	iPNEZ	04	25	18			d	deep?	
	T	iPNEZ			46					
		eSN		32	17					
Feb 19	P	iPNEZ	08	47	24			c	normal	
	PX	eLZ	09	15.7						
	MW	ePNE	08	47	24					
	T	iPNEZ			28					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Feb 20	P	eZ	11	10	50				deep?	
	T	iPNEZ			35					
Feb 20	P	iPNEZ	17	19	46			c		
	R	iPZ			40					
	LJ	ePNE			31					
	T	iPNEZ		20	11					
	H	ePZ			01					
Feb 23	P	iPNEZ	08	20	34			c	Normal?	Small surface waves recorded.
		iPRIN		23	39					USCGS: 19° S 69° W
		iSNEZ		29	51					0- 08:09:25
	R	iPNEZ		20	29			c		JSA : 19° 5 S 71° W
		iSNEZ		29	44					0- 08:09:38
	SB	ePNE		20	44					
		iSNE		30	03					
	LJ	iPN		20	19					
		iSNE		29	33					Damage at Iquique,
	T	iPNEZ		20	46			c		Chile.
		iSNZ		30	15					
Feb 24	P	iPZ	05	17	08			d	deep?	
	R	iPZ			10			d		
	T	iPNEZ			01					
Feb 25	T	iPNEZ	22	05	37			c		
Feb 28	P	iPZ	04	38	16			c	deep	
	R	iPZ			15					
	T	iPNZ			16			c		
Feb 28	P	iPNEZ	09	30	07			c	deep?	
		iZ			34					
	R	ePZ			08					
		iZ			55					
	T	iPNEZ			50					
		iZ		31	36					
Feb 28	T	ePEZ	22	29	39					

Harry O. Wood,
Research Associate in charge.
C.F.Richter,
Assistant.

SEISMOLOGICAL LABORATORY

CARNEGIE INSTITUTION OF WASHINGTON
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220 NORTH SAN RAFAEL AVENUE,
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The constants of these stations follow.

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$\Phi = 34° 08.9'$ N., $\lambda = 118° 10.3'$ W., h = 295 m., Deeply weathered granitic rock, with inclusions of gneiss and schist.

Apparatus: horizontal-component torsion seismometers with magnetic 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	"	"	"
N — S	6 sec.	800	0.8-0.9
E — W	"	"	"

vertical component seismometers with oil damping and galvanometric-optical recording. (Details shortly to be published.)

inertia-mass 100 kg. T_0=0.5 sec. Damping critical or slightly less;

galvanometers: (1) T_1=0.2 sec. Damping critical.
(2) T_1=10 to 14 sec. 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.

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$\Phi = 34° 13.5' N., \lambda = 118° 03.4' W.$, h = 1742m., Weathered granite.

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$\Phi = 33° 59.6' N., \lambda = 117° 22.4' W.$, h = 250 m. approx., Weathered granite.

Santa Barbara Seismologic Station
$\Phi = 34° 26.5' N., \lambda = 119° 42.9' W.$, h = 100 m. approx., Heavy, boulder-laden alluvium.

La Jolla (Scripps Institution Seismologic Station)
$\Phi = 32° 51.8' N., \lambda = 117° 15.2' W.$, h = 7.7 m. approx., Consolidated detrital material.

Tinemaha Seismologic Station
$\Phi = 37° 05.7' N., \lambda = 118° 15.5' W.$, h = 1180 m. approx., Basalt.

Haiwee Seismologic Station
$\Phi = 36° 08.2' N., \lambda = 117° 58.6' W.$, h = 1100 m. approx., Loosely cemented tuff.

SYMBOLS AND NOTATION: 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. 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 $\overline{P}$, P*, and P_n, although such complications are often clearly indicated and are the subject of study.

AMPLITUDES, (half-ranges), are measured in millimeters of the seismographic trace.

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_6
For instruments of different period analogous notation will be employed.
For routine vertical component, galvanometer period 0.2 second . . . . . P
For routine vertical component, galvanometer period 10 to 14 seconds . . . . . 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.

PASADENA

Preliminary Notice

Earthquake of March 10,1933.

The occurrence of this shock has necessitated suspension of most of the routine and research work at this laboratory, in order to collect valuable data while still obtainable,and to attend to other emergency matters.

All timesgiven below are Pacific Standard Time (meridian of 120°W.); for G.C.T. add eight hours. The date of the principal shock is thus March 10,P.S.T., but March 11, G.C.T. (at 01^h).

The times of beginning of the large shock were well recorded at all stations of this group, as follows.

Pasadena:	05:54:19.3 p.m.,March 10, P.S.T.
Mount Wilson:	20.6
Riverside:	20.7
La Jolla:	27.4
Santa Barbara:	37.5
Haiwee:	50.2
Tinemaha:	55:03.9

These times are not in error by more than 0.2 sec., probably not more than 0.1 sec.

The differences in these times have been used to locate the epicenter (by the hyperbola method, assuming a velocity of 5.55 km./sec. to the three nearer stations, and 7.94 km./sec. for the more distant stations). This is found to be very near 33°34.5'N., 117°59' W. This point is a short distance off the coast, between the towns of Huntington Beach and Newport Beach. It is considered probable that the origin is on one of a system of faults which run parallel with the coast in that vicinity.

The time of origin is indicated as 05:54:08. The depth appears to be less than usual, probably about 10 kilometers (6 miles).

At 01:13 a.m., on March 9, occurred a small shock strong enough to be sharply felt and occasion some alarm at Huntington Beach. It appears that its origin was near that of the large earthquake.

Aftershocks have been very numerous, and still continue. Complete listing of those recorded is an impossibility, as the records of the more sensitive instruments at Pasadena show nearly continuous seismic motion for many hours after the main shock. Even a list of the larger aftershocks would be too long for inclusion here. In view of certain press reports, it should be stated that none of these was at all comparable with the main shock. The largest immediate aftershock, that at 10:59 p.m.,March 10, was registered with an amplitude less than four-hundredths that of the main shock. Most of the aftershocks originated near the point of origin of the large shock,but some appear to have had origins a few kilometers distant. Aftershocks were recorded for a few hours each at three temporary stations, one within ten kilometers of the principal epicenter.

The intensity of the main earthquake probably nowhere exceeded VIII on the modified Mercalli scale of 1931. Apparently stronger shaking at certain points where considerable destruction occurred was very probably due to the water-soaked alluvial character of the ground. Damage was most extensive at Long Beach, which happened to be the largest center of population near the origin. At all points, spectacular damage is confined almost wholly to bad or improperly designed construction.

In the region just inland from the epicenter there are some fissures in soft ground, sand-craterlets, and disturbances to ground water.

The outer limit of damage (outer limit of VII,1931 scale) appears to pass through the communities of Laguna Beach, Fullerton, Los Angeles, and Manhattan Beach. On the northeast, this limit is close to the limit of the alluvial Los Angeles basin. To the west of Long Beach is a block of compact sedimentary rock, the San Pedro Hills, on which the apparent intensity is much lower. The area of perceptibility includes most of Southern California.

Seismologists will be aware that this was not a major shock; its energy was far less than that of, say, the Nevada shock of December 20-21,1932. In magnitude and in intensity of local shaking it probably did not exceed, and may even have been less than, the Santa Barbara earthquake of June 29, 1925. The greater extent of property damage and loss of life (about 120 persons) in the present case is attributable to the more thickly settled character of the strongly shaken area.

The approximate coördinates of places mentioned follow:

	N.Lat.	W.Long.
Fullerton:	33° 52'	117° 55'
Huntington Beach:	33 40	118 01
Laguna Beach:	33 32	117 47
Long Beach:	33 46	118 12
Los Angeles:	34 03	118 15
Manhattan Beach:	33 53	118 25
Newport Beach:	33 37	117 56

Pasadena,California,
April 4, 1933.

Harry O.Wood,
Research Associate in charge.
C.F.Richter,
Assistant.

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AMPLITUDES, (half-ranges), are measured in millimeters of the seismographic trace.

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_6
For instruments of different period analogous notation will be employed.
For routine vertical component, galvanometer period 0.2 second . . . . . P
For routine vertical component, galvanometer period 10 to 14 seconds . . . . . 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.

With the following sheets of this Bulletin we resume circulation of our readings after an interruption occasioned by the earthquake of March 10, 1933. Sheets numbered 6 to 20 inclusive have been reserved for the readings of March, April, May and June. These will be issued as soon as practicable.

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
July 1	P	iPZ	07	01	39				deep	
		iZ			59					
	MW	iPEZ			38					
		iZ			58					
	R	iPZ			36					
July 1	P	iPZ	07	56	23			c	deep?	
	MW	ePZ			23			c		
	H	ePNE			29					
July 1	P	iPZ	20	27	59			d	deep?	
	MW	iPZ		28	01			d		
	H	eE		27	48					
July 3	P	iPNEZ	12	09	54			c	deep!	
		iZ		12	58					
	MW	iPNEZ		09	55			c		
		eZ		12	53					
	R	iPNEZ		09	57			c		
	LJ	iPNEZ			55			c		
	T	ePNE		10	03					
	H	iPNEZ			04					
July 6	P	eZ	04	37	04					
	MW	iZ			01					
	R	iZ		36	55					
July 6	P	ePNEZ	05	09	29					
	MW	eZ			27					
	R	iZ			14					
July 6	P	eZ	07	21	05					
	MW	eZ			00					
	R	iZ		20	58					
July 8	P	iPNEZ	22	38	26			c	deep	
	MW	iPNEZ			28					
	T	ePNE			41					
July 9	P	ePZ	01	41	02				normal	Surface waves recorded
	P6	eSE		50	00					JSA: 44.5°N 152.3°W
	MW	ePNEZ		41	02					
		eSNE		49	58					0= 01:30:13
	R	iPZ		41	12					
	SB	ePZ		40	57					
	LJ	ePZ		41	08					
		eSN		50	08					
	T	iPE		40	50					
		eSE		49	37					
	H	ePNE		41	01					
		eSE		49	48					
July 9	P	iPNEZ	05	38	59			d	normal	△= 22.4° (2490) km.)
		eSNE		42	59					0= 05:33:57
		iLN		45.0						
	MW	iPNEZ		38	58					
		eSNE		42	55					
	R	ePEZ		38	54			d		
		eSE		42	45					
	SB	iPNZ		39	10			d		
		iSZ		43	06					
	LJ	ePNEZ		38	36			d		
		eSN		42	13					
	T	ePNE		39	24					
	H	iPNEZ			18					
		eSNE		43	28					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
July 9	P	eZ	09	38	55				normal	Small surface waves recorded
	MW	iZ			59					
	R	eZ		39	03					
	LJ	ePNEZ			05					
	T	eE		38	49					
	H	ePE			55					
July 9	P	iPZ	09	59	29				normal	Small surface waves recorded
		e	10	05	46					
	MW	iPNEZ	09	59	27					
		eZ	10	05	42					
	R	eNEZ	09	59	31					
	SB	eZ			22					
	T	eE			16					
	H	eE			24					
July 9	P	eZ	11	32	34					
	T	eNE			52					
	H	eE			41					
July 9	P	iPZ	12	41	37			c	normal	
	P6	iSE		50	36					
	PX	eLN		59	37					
	MW	iPZ		41	39					
		eSNE		50	37					
	R	ePZ		41	43			c		
		eSE		50	43					
	SB	iPNEZ		41	33			c		
	LJ	ePZ			45					
		eSE		50	49					
	T	ePE		41	27					
		eSNE		50	15					
	H	ePE		41	34					
		eSE		50	26					
July 9	P	eZ	13	09	58					May be part of preceding
		eZ		10	13					
	MW	eZ			15					
	R	eEZ			13					
	SB	eZ			39					
	LJ	eZ			06					
	T	eNE			28					
	H	eE			28					
July 9	P	iZ	13	38	34					
	MW	iZ			28					
	T	eE			32					
	H	eE			39					
July 9	P	eZ	16	18	02					
	MW	eZ			05					
	SB	ePNZ		17	49					
	LJ	eZ		18	13					
	T	eNE			08					
	H	ePNE			04					
July 9	P	iZ	18	02	48					
	MW	eZ			50					
	T	eNE			49					
July 10	P	iPNEZ	00	33	12				deep	
		iZ		34	38					
		iSNE		42	44					
	MW	iPZ		33	12			c		
		eSE		42	44					
	R	iPZ		33	15			c		
		eSE		42	49					
	SB	iPZ		33	06					
	LJ	ePZ			18					
	T	ePNE			03					
		eSN		42	27					
	H	ePNZ		33	07					

Date G.C.T.	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
July 10	P	iPNEZ	03	26	36			c	normal	Large surface waves recorded
	P6	iSE		30	32					
	MW	iPNEZ		26	38			c		JSA: 17.8°N 104° W
		eSNE		30	32					0= 03:22:02
	R	iPNEZ		26	33			c		
		eSE		30	24					
	SB	ePEZ		26	49					
		eSZ		30	43					
	LJ	ePZ		26	19					
	T	ePNE		27	01					
	H-	iPNZ		26	53					
		eSN		30	59					
July 10	P	iPZ	05	13	06			c	deep?	
	MW	ePNEZ			07			c		
July 10	P	eZ	08	43	17				deep?	
	MW	ePZ			18					
	R	ePNEZ			27					
	T	ePNE		42	49					
July 10	P	ePZ	10	47	32				normal?	Large surface waves at 11:25, possibly not the same shock
		iZ		52	03					
	MW	eZ		47	49					
		eZ		52	09					
	R	eEZ			12					
	T	eNE		51	54					
July 10	P	iPZ	23	12	58			c	deep?	
	MW	eNE			59					
	R	iPZ			59					
	T	eE			47					
	H	ePN			52					
July 11	P	iPNEZ	06	27	23				deep	
	MW	iPNEZ			25			c		
	R	ePZ			27					
	LJ	eZ			25					
	T	eNE			32					
	H	ePE			34					
July 11	P	iZ	07	02	14					
	R	eZ			09					
	T	eE			11					
July 11	P	iPZ	08	39	55			c	deep?	
	MW	ePZ			57			c		
	T	eE			41					
July 11	P	iPZ	09	05	23					
	R	eZ			28					
	T	eE			10					
July 12	P	iPZ	03	12	40			d	deep	
	MW	iPZ			41					
	R	iPZ			44					
	H	eE			40					
July 13	P	iPNEZ	08	09	25			c	deep	
	MW	iPZ			25			c		
	R	iPZ			27			c		
	SB	eZ			19					
	LJ	ePZ			39					
	T	ePNE			18					
	H	ePNE			20					
July 13	P	iPZ	14	42	34			d		
		iNEZ		45	54					
	R	eZ			57					
	T	eNE			55					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
July 14	P	iPNEZ	01	50	55			c	deep	
		iZ		51	24					
		iZ		54	20					
	PX	eZ	02	03	20					
	MW	iPNEZ	01	50	55			c		
	R	iPNEZ			58			c		
		iZ		51	27					
		iZ		54	25					
	SB	iPNZ		50	50			c		
		iZ		51	29					
	T	ePNE			03					
	H	ePNE			01					
July 14	P	iPNEZ	16	14	54			c	deep	
		iZ		16	49					
		iSN		24	16					
	MW	iPZ		14	54			c		
		eSNE		24	16					
	R	ePNEZ		14	56			c		
	SB	ePZ			49			c		
	LJ	ePZ		15	08			c		
		eSNE		24	39					
	T	ePNE		14	44					
		eSN		23	57					
	H	ePNE		14	51					
		eSN		24	07					
July 15	P	iPZ	14	18	39			d	deep	
	MW	iPEZ			44			d		
	R	iPZ			44					
	T	eNE			25					
	H	eE			31					
July 18	P	eZ	11	02	12					
		iZ			28					
	LJ	ePZ			37					
	T	eNE			17					
	H	eE			12					
July 18	P	iPZ	11	37	51			c	deep?	
	R	ePZ			53			c		
	SB	eZ			47					
	LJ	ePEZ			57					
	T	eNE			47					
July 18	P	iPZ	19	18	46			c	deep	
	R	ePZ			50					
	SB	ePZ			41					
	LJ	ePEZ			51					
	T	ePNE			45					
July 19	P	iPNEZ	05	09	24			c	normal	
	PX	eLZ		12	48					
	MW	ePNEZ		09	25			c		
	R	ePNEZ			31					
	SB	iPZ			22					
	LJ	eZ			58					
	T	ePNE		08	59					
		eE		15	37					
	H	ePNE		09	07					
July 19	P	iPZ	08	14	31			c	deep	
	R	eZ			33					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
July 19	P	iPZ	10	53	33				normal	Apparently two shocks from same source
		iZ	11	02	00					
	P30	eLN		04.2						J.S.A. 50° N 170° W
	MW	iPZ	10	53	35			c		0= 10:45:36
		iZ	11	02	00					
	R	ePZ	10	53	37					
		eZ	11	02	02					
	SB	ePZ	10	53	25					
		iZ	11	02	54					
	LJ	ePZ	10	53	45					
		eZ	11	02	12					
	T	ePNE	10	53	15					
		eNE	11	01	44					
	H	ePNE	10	53	25					
		eNE	11	01	53					
July 19	P	eZ	11	26	35				normal?	
	MW	iZ			39			d		
	R	ePZ			29					
		iZ			37					
	SB	eZ			36					
	LJ	eZ			43					
	T	eE			16					
	H	eNE			29					
July 19	P	iPZ	13	40	27				normal	
		iNEZ			48					
	PX	iSN		47	14					
		eLN		51.2						
	MW	iPZ		40	29					
	R	ePZ			22					
	SB	eE			33					
	LJ	ePZ			47					
		eSE		47	43					
	T	ePNE		40	11					
		eSN		46	32					
	H	ePE		40	20					
		eSE		46	23					
July 19	P	iPNEZ	15	07	57			d	normal	
		iZ		10	03					
	PX	iSN		14	26					
	MW	iPNEZ		07	58			d		
		eSN		14	24					
	R	iPNEZ		08	00			d		
		eSE		14	32					
	SB	iPNEZ		07	49					
		eSNEZ		14	13					
	LJ	ePEZ		08	15					
		eSE		14	51					
	T	ePNE		07	41					
		eSE		13	58					
	H	ePNE		07	50					
		eSN		13	57					
July 20	P	iPEZ	23	25	35			c	deep?	Very small long waves recorded
	MW	iPNEZ			36			c		
	R	iPNEZ			38			c		
	T	ePNE			26					
	H	ePNEZ			30					
		eE		28	21					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal Depth	Remarks
July 21	P	iPNEZ	07	37	26			c		
	MW	ePNE			27					
	R	ePNEZ			21			c		
		eSNE		44	01					
	SB	iPNEZ		37	37					
	T	ePNE			31					
		eSNE		44	19					
	H	ePNEZ		37	27					
		eSE		44	14					
July 21	P	ePZ	20	25	34				normal	Surface waves recorded
		eZ		27	01					
	MW	eZ			06					
	R	eZ			28					
	SB	eE		25	48					
	T	ePNE			28					
July 22	PX	ePZ	21	02	46				normal	USCGS: 52° N 169° W
	P	eSNE		09	00					0 = 20:55.3
	P30	iSN			05					
		iLN		12	04					
	MW	eEZ		02	55					JSA: 51.9° N 166.1° W
		eSE		09	08					0 = 20:55:18
	R	ePEZ		02	57					
		eSE		09	07					
	SB	ePZ		02	51					
		eSE		08	51					
	LJ	eZ		03	09					
		eSNE		09	25					
	T	ePNEZ		02	39					
		eSNEZ		08	36					
	H	ePEZ		02	43					
		eSN		08	39					
July 23	P	ePZ	04	23	45					
	MW	ePZ			47					
	R	eZ			38					
	T	eE			45					
July 23	P	iPZ	09	48	21				normal	Small surface waves recorded
	MW	eZ			25					
	R	eZ			17					
	T	eNE			16					
	H	ePEZ			15					
July 24	P	ePEZ	00	35	52			c	deep	
	MW	iPEZ			55					
	LJ	ePZ			59					
July 24	P	iPNEZ	08	49	15			c	deep	
		iNEZ		51	14					
	MW	iPNEZ		49	18			c		
		iZ		51	17					
	SB	iPZ		49	04					
	LJ	ePNZ			24					
	H	ePZ			09			c		
		eZ		51	08					
July 24	P	iPNEZ	19	07	00			d	normal	USCGS: 15° S 170° W
	P6	eSE		16	17					0 = 18:55.7
	P30	iLN		28	09					JSA: 15.2° S 174.5° W
	MW	iPEZ		07	03					0 = 18:55:36
	R	iPNZ			03					
	LJ	ePEZ			01					
	T	iPNEZ			10					
		eNE		17	18					
	H	ePNEZ		07	08					

Date	Station	Phase	G. C. T. h m s	T sec	A mm	c d	Focal Depth	Remarks
July 26	P	iPZ	05 04 07				normal	Surface waves recorded
	H	iZ	03 58					
July 29	P	iZ	11 55 40				deep??	Source apparently to northeast
	SB	eZ	48					
	LJ	ePZ	51					
	T	eNEZ	25					
	H	iZ	28					
July 30	P	iPZ	17 27 57			c	deep	
		iZ	28 38					
	MW	iPEZ	27 58					
	T	iPEZ	28 03					
July 31	P	iPZ	03 08 00			c	deep?	
	T	eZ	07 54					
July 31	P30	eZN	12 10 00				normal	Long waves only
July 31	P	iPZ	15 33 35					
	R	iZ	28					
	T	iZ	48					

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SEISMOLOGICAL LABORATORY

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BULLETIN

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the Carnegie Institution of Washington and the California Institute of Technology 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).

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, sent from Annapolis (NSS), three to five times daily.

The constants of these stations follow.

PASADENA SEISMOLOGICAL LABORATORY — Central Station

$\Phi = 34° 08.9'$ N., $\lambda = 118° 10.3'$ W., h = 295 m., Deeply weathered granitic rock, with inclusions of gneiss and schist.

Apparatus: horizontal-component torsion seismometers with magnetic 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	"	"	"
N — S	6 sec.	800	0.8-0.9
E — W	"	"	"

vertical component seismometers with oil damping and galvanometric-optical recording. (Details shortly to be published.)

inertia-mass 100 kg. T_0=0.5 sec. Damping critical or slightly less;

galvanometers: (1) T_1=0.2 sec. Damping critical.
(2) T_1=10 to 14 sec. 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_0	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	"	"	"

one vertical component seismometer with oil damping and galvanometric-optical recording to be installed at each station;

inertia-mass 100 kg. T_0=0.5 sec. Damping critical or slightly less;

galvanometer: T_1=0.2 sec. Damping critical.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

Mount Wilson Seismologic Station
$\Phi = 34° 13.5' N., \lambda = 118° 03.4' W., h = 1742m.$, Weathered granite.

Riverside Seismologic Station
$\Phi = 33° 59.6' N., \lambda = 117° 22.4' W., h = 250 m.$ approx., Weathered granite.

Santa Barbara Seismologic Station
$\Phi = 34° 26.5' N., \lambda = 119° 42.9' W., h = 100 m.$ approx., Heavy, boulder-laden alluvium.

La Jolla (Scripps Institution Seismologic Station)
$\Phi = 32° 51.8' N., \lambda = 117° 15.2' W., h = 7.7$ m. approx., Consolidated detrital material.

Tinemaha Seismologic Station
$\Phi = 37° 05.7' N., \lambda = 118° 15.5' W., h = 1180 m.$ approx., Basalt.

Haiwee Seismologic Station
$\Phi = 36° 08.2' N., \lambda = 117° 58.6' W., h = 1100 m.$ approx., Loosely cemented tuff.

SYMBOLS AND NOTATION: 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. 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 $\overline{P}$, P*, and P_n, although such complications are often clearly indicated and are the subject of study.

AMPLITUDES, (half-ranges), are measured in millimeters of the seismographic trace.

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_6
For instruments of different period analogous notation will be employed.
For routine vertical component, galvanometer period 0.2 second . . . . . P
For routine vertical component, galvanometer period 10 to 14 seconds . . . . . 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. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Aug 1	P	ePZ	05	16	58				deep?	
	R	ePZ			57					
	T	eZ		17	25					
Aug 1	P	ePZ	12	01	37					
	T	eZ			19					
Aug 1	P	iPNEZ	21	17	24			c	deep	
		ipPZ		19	24					
	R	iZ		17	28					
	SB	iZ			19					
	T	iPNEZ			34					
Aug 2	P	iPZ	09	37	58			c	deep?	
	T	iZ		38	07					
Aug 2	P	iPZ	13	54	31			c	deep?	
	R	iZ			34					
Aug 3	P	iPNEZ	19	15	43			c	deep	
	MW	iPNE			50					
	R	iPZ			51					
	SB	iPNEZ			43					
	LJ	iPZ			49					
	T	iPNEZ			54					
Aug 4	P	ePZ	09	44	02					
	R	iPZ			02					
	T	iPZ			18					
Aug 5	P	iPNEZ	00	57	16			d	normal	
		eSNEZ	01	08	12					
		eLZ		25	06					
	P6	eScPcSE	01	07	44					
		iSE		08	11					
		ePSE		09	04					
	MW	iNE	00	57	19					
	R	iPEZ			21					
	SB	iPNZ			12					
	T	iZ			18					
Aug 5	P	iPZ	03	23	52			c	deep?	
	T	iZ		24	00					
Aug 6	P	iPNEZ	03	04	50			d	deep	
	MW	iPNEZ			55			d		
	R	iPNEZ			52			d		
	SB	iZ		05	03					
	T	iPNEZ			09			d		
Aug 6	P	iPZ	08	31	06			d	normal?	Very small surface waves recorded.
	PX	eSZ		42	38					
	R	iPZ		31	04					
		iZ			24					
	T	iZ			25					
Aug 6	P	eZ	14	53	36					
Aug 7	P	iPZ	00	53	22					
	R	eZ			25					
	T	iPZ			23					
Aug 7	P	iPNEZ	03	08	40			d	normal	Small surface waves recorded
		iNEZ		11	55					
	PX	eN		13	32					
	MW	iPZ		08	41					
	R	iPZ			35					
	LJ	iPNEZ			24					
	T	iPNEZ			59					
		iZ		12	00					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Aug 8	P	iPZ	19	57	41			d		
	T	iZ			47					
Aug 9	P	iPZ	03	17	05			d	deep?	
	MW	iP			05			d		
	R	iPZ			07					
	T	ePNEZ			12					
Aug 9	P	iPNEZ	23	13	31			c	deep	
		iZ		14	16					
	MW	iPZ		13	31					
		iEZ		14	16					
	R	iPZ		13	28					
		iZ		14	12					
	LJ	iPNZ		13	21					
		iNZ		14	05					
	T	iPZ		13	42					
		iZ		14	26					
		eSNE		24	42					
Aug 10	P	iPZ	05	01	20				deep?	
Aug 11	PX	iZ	09	13	15				normal	Begins earlier
		eLZ	10	01						
	MW	eZ	09	11	55					
		iZ		13	14					
	LJ	iZ			26					
	T	iZ		12	58					
Aug 12	P	iPNEZ	09	11	01			d	deep	
	MW	iPEZ			01			d		
	LJ	iEZ		10	48					
	T	iNEZ		11	11			d		
Aug 12	P	iPZ	12	52	42				deep	
	MW	iPZ			40					
	R	iPZ			43					
Aug 13	P	iNZ	09	48	14			d	normal	$\Delta > 175^{0}$
		iZ		49	54					
		iZ		53	49					
		eZ		54	44					
		iZ		56	57					
		iZ		58	01					
	P30	eLN	10	54						
	MW	iZ	09	48	15					
	R	iZ			15					
		iZ		53	46					
		iZ		56	56					
	LJ	iZ		48	15					
	T	iNEZ			16					
Aug 13	P	iPNZ	12	51	16			c	deep	
		iZ		54	33					
		iZ		59	47					
	MW	iPEZ		51	17					
		iZ		53	22					
		iZ		54	33					
		iZ		59	48					
	R	iPZ		51	19					
		iZ		59	49					
	LJ	iPNEZ		51	17					
	T	iPNEZ			24					
		iZ		59	55					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Aug 13	P	iPNEZ	16	06	54			d	deep	
	MW	iPZ			55					
	R	iPZ			57					
	LJ	iPZ			56					
	T	iPNEZ		07	02					
Aug 15	P	iPEZ	03	10	04			c	normal?	Very small surface waves recorded
	MW	iPE			03					
	R	iPZ			05					
	LJ	iPNEZ			07					
	T	iNE		09	57					
Aug 15	P	ePNEZ	20	12	00					
	R	iZ		11	56					
	SB	eZ		12	10					
	LJ	iNEZ			00					
Aug 15	P	ePZ	23	38	44				normal	
	PX	eLN		44						
Aug 20	MW	iPZ	20	11	56				deep?	
	R	iPZ			58					
Aug 20	P	iPNEZ	21	28	30				deep	
	MW	iPZ			30					
	R	iPZ			33					
	T	iPZ			41					
Aug 20	P	eZ	23	09	28					
	MW	eZ			31					
	T	iZ			15					
Aug 22	P	iPNEZ	10	00	10			c	deep	
	MW	iPZ			10					
	R	iPZ			03					
	T	iPNEZ			23					
Aug 22	P	iPZ	11	17	08			c		No surface waves, but perhaps not deep
		iNEZ			16					
	MW	iPZ			13					
	R	iPZ			02					
		iZ			11					
	SB	ePNEZ			15					
	T	ePNEZ			15					
Aug 23	P	eZ	12	09	48					
		eZ		10	15					
	MW	eZ		09	51					
		eZ		10	00					
Aug 23	P	eZ	13	13	15					
		eZ			26					
	MW	eZ			14					
	T	eNEZ		12	59					
Aug 24	P	iPNEZ	09	03	59			d	deep?	
	MW	iPZ		04	01					
	R	iPZ			04					
	T	iPNEZ			08					
Aug 25	P	iPNEZ	08	04	30					Destructive in sZechwan, China
		eP'Z		08	23					J.S.A. (revised):
	PX	iPR1NZ			55					33.0° N 103.4° E
		eScPcSN		15	02					0 - 07:50:36
		iScPcPcSN			48					
		iPSNZ		17	58					USCGS 31° N. 101° E.
	P30	eSR1N		24.0						0-07:50.3
		eLN		35.1						

Continued

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
						Continued				
Aug 25	MW	ePZ	08	04	32					
		iPSZ		17	58					
	SB	eNEZ		08	47					
	T	iPFZ		04	22					
		iNEZ		08	27					
Aug 25	P	iPZ	09	43	41			d	deep?	
	MW	iPZ			39			d		
Aug 26	P	iPNEZ	08	24	00			c	deep?	
	MW	iPZ			00					
	T	iPNEZ			09					
Aug 26	P	iPNEZ	23	56	50					
	MW	eZ			50					
Aug 27	P	iPNEZ	18	05	15			c	deep	
		iZ		07	26					
	MW	iPEZ		05	15					
	R	iPZ			19					
	T	iPNEZ			23					
		iSNE		14	55					
Aug 28	P	iPEZ	08	58	41			c	deep	
		iZ		59	12					
	MW	iZ		58	43					
	R	iPZ			46					
	T	iPNEZ			31			c		
		iNEZ		59	03					
Aug 28	P	iPNEZ	13	43	29			c		
		iZ		44	14					
	MW	iPZ		43	31					
	R	iPZ			29					
	T	eNE			52					
Aug 28	P	ePZ	20	58	51					
	MW	iPZ			52					
	T	iPNEZ		59	01					
Aug 28	P	iP'Z	22	38	51			d	normal	Δ about 120°; to southeast
		iPR1Z		40	00					JSA: 23?1 N. 95? E.
	PX	iPR2Z		43	03					0 22:19:52
		iScPcSN		45	36					
		iPSN		49	50					USCGS: Probably South
	P30	iSR1N		56	48					Atlantic Ocean.
		eLN	23	11	12					0 22:19.8
		iLN		18	01					Zürich gives Δ 12000 km,
	MW	iP'Z		38	30					which fits the latter
	R	iP'Z			29			d		location.
	SB	iP'NEZ			41					
		iPR1Z		40	33					
	LJ	iP'NEZ		38	35					
	T	iP'NEZ			35					
Aug 29	P	eZ	12	43	11			c		
		iZ			26					
	MW	iZ			14					
	R	iZ			17					
	T	iEZ			06					

Date	Station	Phase	G. C. T. h m s	T sec	A mm	c d	Focal depth	Remarks
Aug 29	P	iPNEZ	15 02 11			d	deep!	Phases about 30:40 identified as P'P'. This and other related Phases appear on the records of a number of preceding earthquakes, both deep and normal. Details will shortly be published by B. Gutenberg and C. F. Richter
		iPcPZ	39					
		eZ	03 20					
		isPZ	04 14					
		iPPZ	05 16					
		iSNEZ	09 58					
		iScSNEZ	10 57					
		eZ	30 40					
	MW	iPNEZ	02 12			d		
		eS	10 00					
		eZ	30 44					
	R	iPNEZ	02 07			d		
		iPcPZ	36					
		isPZ	04 11					
		iScSNZ	10 56					
		eZ	30 44					
	SB	iPNZ	02 19			d		
		iScSNEZ	11 11					
	LJ	iPNEZ	02 04			d		
		esPNEZ	04 05					
		iSNE	09 44					
		iScSNE	10 51					
	T	iPNEZ	02 24			d		
		iSNEZ	10 25					
		eZ	30 40					
Aug 30	P	iPZ	11 40 18					
	MW	iPZ	17					
	R	iPZ	15					
	T	iPEZ	31					
Aug 31	P	ePZ	02 57 36				normal	
	PX	eLNZ	03 09					
	MW	ePZ	02 57 36					
	R	iZ	46					
	SB	ePZ	34					
	T	ePNE	14					
		eNE	03 06 32					
Aug 31	P	iPNEZ	12 37 44			c	deep?	
	MW	iPZ	44					
	R	eE	47					
	T	iPNEZ	45					
				Addendum				
Aug 20	PX	eLZ	12 33 20				normal	

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SEISMOLOGICAL LABORATORY

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BULLETIN

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the Carnegie Institution of Washington and the California Institute of Technology 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).

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, sent from Annapolis (NSS), three to five times daily.

The constants of these stations follow.

PASADENA SEISMOLOGICAL LABORATORY Central Station

$\Phi = 34° 08.9'$ N., $\lambda = 118° 10.3'$ W., h = 295 m., Deeply weathered granitic rock, with inclusions of gneiss and schist.

Apparatus: horizontal-component torsion seismometers with magnetic 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	"	"	"
N — S	6 sec.	800	0.8-0.9
E — W	"	"	"

vertical component seismometers with oil damping and galvanometric-optical recording. (Details shortly to be published.)

inertia-mass 100 kg. T_0=0.5 sec. Damping critical or slightly less;

galvanometers: (1) T_1=0.2 sec. Damping critical.
(2) T_1=10 to 14 sec. 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_0	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	"	"	"

one vertical component seismometer with oil damping and galvanometric-optical recording to be installed at each station;

inertia-mass 100 kg. T_0=0.5 sec. Damping critical or slightly less;

galvanometer: T_1=0.2 sec. Damping critical.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

Mount Wilson Seismologic Station
$\Phi = 34° 13.5'$ N., $\lambda = 118° 03.4'$ W., h = 1742m., Weathered granite.

Riverside Seismologic Station
$\Phi = 33° 59.6'$ N., $\lambda = 117° 22.4'$ W., h = 250 m. approx., Weathered granite.

Santa Barbara Seismologic Station
$\Phi = 34° 26.5'$ N., $\lambda = 119° 42.9'$ W., h = 100 m. approx., Heavy, boulder-laden alluvium.

La Jolla (Scripps Institution Seismologic Station)
$\Phi = 32° 51.8'$ N., $\lambda = 117° 15.2'$ W., h = 7.7 m. approx., Consolidated detrital material.

Tinemaha Seismologic Station
$\Phi = 37° 05.7'$ N., $\lambda = 118° 15.5'$ W., h = 1180 m. approx., Basalt.

Haiwee Seismologic Station
$\Phi = 36° 08.2'$ N., $\lambda = 117° 58.6'$ W., h = 1100 m. approx., Loosely cemented tuff.

SYMBOLS AND NOTATION: 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. 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 $\overline{P}$, P*, and P_n, although such complications are often clearly indicated and are the subject of study.

AMPLITUDES, (half-ranges), are measured in millimeters of the seismographic trace.

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_6
For instruments of different period analogous notation will be employed.
For routine vertical component, galvanometer period 0.2 second . . . . . P
For routine vertical component, galvanometer period 10 to 14 seconds . . . . . 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. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Sept 1	P	iPNEZ	19	13	08				deep?	
	MW	iPZ			10					
	SB	iPZ			23					
	T	iPNEZ			16					
Sept 2	P	iPNEZ	16	52	57			c	deep!	h = 0.07 Δ = 82°
		ePcPZ		53	18					0 = 16:41:05
		ipPZ		54	27					
		esPZ		55	18					Kôti gives 30°7 N 139°6 E
		iSE	17	02	37					which agrees well with all
		iNZ			39					data now at hand
		iZ		07	31					Identification of phase
		eP'P'Z		19	22					at 17:22 under investi-
		iZ		22	01					gation; possibly ScPcP'
	MW	iPNEZ	16	52	58			c		
		eSNEZ	17	02	42					
		eZ		22	01					
	R	iPNEZ	16	52	57			c		
		eSNEZ	17	02	39					
		iZ		21	57					
	SB	iPNEZ	16	52	51					
	LJ	iPNEZ		53	04			c		
		iSNEZ	17	02	47					
		iZ		21	58					
	T	iPNEZ	16	52	51			c		
		iSNEZ	17	02	29					
		iZ		22	05					
Sept 2	P	iPEZ	20	14	22				deep?	
	MW	ePZ			23					
	SB	iPZ			19					
	T	iPNEZ			31					
Sept 4	P	iPNEZ	01	45	05			c	deep?	
	MW	iPEZ			06			c		
	R	iPNEZ			00					
	LJ	iPNEZ		44	50					
	T	iPNEZ		45	31					
Sept 6	P	iPNEZ	22	19	44				deep!	h = 0.10 Δ = 82°
		ipPZ		21	51					0 = 22:08:14
		isPZ		23	03					
		iPPZ			49					JSA: 24°0 S 178°0 W
		eScPcSE		29	01					0 = 22:08:29
		iSNEZ			10					h = 600 km
		iPSZ		30	01					
		isSN		32	57					USCGC: 18°0 S 179°0 W
		iP'P'Z		46	32					0 = 22:07.8
		iZ		48	53					
	MW	iPZ		19	44					Phase about 22:49 may be
		eSEZ		29	08					ScPcPP'
		eP'P'Z		46	22					cf. Sept 2, 08h
	R	iPNEZ		19	56					
		eSNE		29	21					
		iP'P'Z		46	40					
		iZ		49	10					
	SB	iPNEZ		19	40					
		iSNEZ		28	57					
		iP'P'Z		46	30					
		iZ		48	54					

Continued

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Sept 6						Continued				
	LJ	iPNEZ	22	19	44					
		iSNEZ		29	11					
		iP'P'Z		46	29					
		iZ		49	00					
	T	iPNEZ		19	48					
		iSNEZ		29	17					
		iP'P'NEZ		46	22					
		iZ		48	53					
	H	iPNEZ		19	51					
		iSNEZ		29	20					
		iP'P'NEZ		46	29					
		iZ		48	57					
Sept 7	P	iNEZ	22	48	03			c	deep?	
	MW	iEZ			04					
	T	iPEZ		47	45					
	H	iPNEZ			43					
Sept 8	P	iPNEZ	01	36	35			c	deep?	
	MW	iPEZ			37			c		
	T	iPEZ			44			c		
	H	iPNEZ			43					
Sept 9	P	iPZ	05	13	43			c	deep	Region of Japan
		iZ		15	44					
		eSNE		23	01					
	MW	iPEZ		13	44			c		
		eZ		15	45					
		eSNE		23	00					
	R	iPNEZ		13	47			c		
	SB	iPNEZ		13	38					
	LJ	iPNEZ		13	53					
		iSN		23	20					
	T	iPNEZ		13	33			c		
		eSNE		22	38					
	H	iPNEZ		13	38					
Sept 9	P	iPNEZ	21	32	27			c	deep?	Probably slightly deeper than normal Δ = 80°-90° or slightly more distant JSA: 30?0 N 141?0 E 0 = 21:19:05
		iZ			49					
		iZ		33	10					
		iZ			30					
		iZ		35	40					
		eZ		44	11					
	P6	eE		42	19					
		eE		44	04					
		eE			27					
		eLE		58	44					
	MW	iPEZ		32	28			c		
	R	iPEZ			30			c		
	SB	iPZ			23					
	LJ	ePZ			33					
	T	ePNEZ			33					
	H	iPNEZ			31					
Sept 11	P ,	eZ	07	46	12					
	R	iZ			11					
	T	iZ			16					
Sept 11	P	iPNEZ	11	51	49			c	deep	
		iZ	12	03	45					
		iZ		04	18					
						Continued				

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Sept 11						Continued				
	MW	iPNEZ	11	31	51			c		
	R	ePNZ			50					
		iZ	12	03	45					
		iZ		04	18					
	SB	iPNEZ	11	31	46					
	LJ	iPEZ			45					
	T	iPNEZ			57					
		iZ	12	03	49					
	H	iPNEZ	11	31	58					
Sept 12	P	ePZ	13	04	41					
	MW	ePZ			39					
	T	iPZ			50					
Sept 14	P	iPZ	03	42	15			c	deep?	
	MW	iPZ			16					
	R	iPZ			20					
	LJ	iPZ			27					
	T	iPNEZ			00			c		
	H	iPNEZ			06					
Sept 14	P	iPZ	08	10	31				deep?	
		iZ			55					
	MW	ePZ			31					
	R	iPZ			26					
	T	iPZ			43					
Sept 15	P	iPZ	14	05	44				deep?	
	MW	iPZ			45					
	R	iPZ			46					
	T	iPNZ			36					
	H	iPZ			37					
Sept 15	P	ePZ	23	42	24				deep?	
	MW	ePZ			26					
	T	iPZ			23					
Sept 17	P	ePZ	10	17	38					
	MW	ePZ			38					
	R	iPZ			41					
	T	iPEZ			40					
		eN		28	16					
Sept 17	P	iPZ	06	56	11				deep	
		eZ		57	04					
	MW	eEZ		56	11					
	R	iPZ			19					
	LJ	iPZ			18					
	T	iPNEZ			16					
Sept 17	P30	eLN	22	57.1					normal	
Sept 19	P	iPZ	10	33	48				deep	
		eZ		34	16					
	MW	ePZ		33	49					
	R	iPZ			50					
	T	iPZ			55					
Sept 19	P	ePNEZ	23	45	35				normal	
		eN		49	29					
		eLNEZ		55	36					
	MW	ePZ		45	31					
	R	iPZ			35					
	T	iPNEZ			09					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Sept 20	P	iPZ	04	08	17				deep?	
	MW	iPEZ			18					
	T	iPNEZ			10			c		
Sept 20	P	iPZ	04	57	37					
	MW	iPZ			36					
	R	iPZ			33					
	T	iPEZ			56					
	H	iPNEZ			51					
Sept 21	P	iPNEZ	03	26	38			c	deep	
		iZ		27	00					
	MW	ePEZ		26	38					
	R	iPZ			44			c		
	LJ	iPNEZ			45					
	T	iPNZ			28			c		
Sept 21	P	ePNEZ	09	59	46					
	MW	iPZ			46					
	R	iPZ			51					
	LJ	eZ	10	00	01					
	T	iPZ	09	59	35					
Sept 21	P	iPZ	13	55	11					
	MW	eZ			05					
Sept 22	P	iPNEZ	11	49	50			d	deep?	Apparently traces of surface waves.
	MW	ePZ			51					
	R	ePZ			53					
	LJ	iPNEZ			51					
	T	iPNEZ		50	01					
	H	ePNEZ		49	58					
Sept 23	P	iPZ	00	42	54			d	deep?	
	MW	iPZ			55					
	T	iPNEZ			52					
Sept 23	P	iPZ	14	31	57			c	deep?	
	MW	iPZ			58			c		
	R	iPZ			59			c		
	T	iPZ		32	06					
	H	iPNEZ			05					
Sept 23	P	eZ	21	04	48					
		iNEZ			54					
		iZ		06	17					
	MW	eZ		04	43					
		iZ			50					
	R	iNEZ			40					
	LJ	iPEZ			24					
		iSZ		05	29					
	T	eNEZ		06	37					
Sept 24	P	ePNEZ	15	27	52			c	normal	Δ = 44°6 (4960 km)
		eSNEZ		34	28					0 = 15:19:33
	P30	iLN		39	31	18				
	MW	ePNEZ		27	54					JSA: 51°9 N 174°4 W
		eSNEZ		34	30					0 = 15:19:50
	R	ePNEZ	15	27	57					
		iSNE		34	37					USCGS: 51°0 N 177°0 W
	SB	ePZ		27	43					0 = 15:19.6
		eSNEZ		34	15					
	LJ	iPNEZ		28	06					
		eSNEZ		34	50					
	T	ePNEZ		27	35					
		iSNEZ		34	05					
	H	ePNEZ		27	43					
		eSNE		34	15					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Sept 24	P	iZ	15	40	52			d		
	MW	iZ			53					
	R	iZ			54					
	T	iZ			53					
Sept 25	P	eZ	19	05	28					
		eZ		09	07					
	P30	eL		40.1						
	MW	iZ		05	36					
		iZ		09	27					
	R	iZ		04	50					
	T	iZ		05	22					
		iZ		09	14					
Sept 27	P	iPZ	11	28	30				deep?	
	MW	iPZ			29					
	R	iPZ			28					
	T	iPNEZ			36					
	H	iPNEZ			36					
Sept 27	P	iPNEZ	21	54	49			c	deep?	
	R	iPZ			53					
	LJ	iPZ			48					
	T	iPZ			48					
Sept 27	P	eNEZ	22	50	47				normal	
	P30	eLN	23	10	39					
	R	iPZ	22	50	43					
	LJ	ePZ			34					
	T	iPNEZ		51	03					
	H	iPNZ			00					
Sept 28	P	iPNEZ	11	54	45				normal?	Possibly slightly deeper than usual
		iSNEZ		56	23					
	P30	eLN		57	00					
	MW	iPE		54	47					Roughly 41°0 N 126°0 W
		iSE		56	25					
	R	iPZ		54	54					
		iSNZ		56	34					
	SB	iPNEZ		54	35					
	T	iPNEZ			23					
		iZ			29					
		iSNZ		55	49					
	H	iPNEZ		54	32					

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SEISMOLOGICAL LABORATORY

CARNEGIE INSTITUTION OF WASHINGTON
CALIFORNIA INSTITUTE OF TECHNOLOGY

220 NORTH SAN RAFAEL AVENUE
PASADENA, CALIFORNIA

REVISED
OCTOBER 1, 1933

BULLETIN

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the Carnegie Institution of Washington and the California Institute of Technology 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).

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, sent from Annapolis (NSS), three to five times daily.

The constants of these stations follow.

PASADENA SEISMOLOGICAL LABORATORY Central Station

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

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

Instruments, and Constants (approximate);

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

vertical component seismometers with oil damping and galvanometric-optical recording. (Cf.Bull.Seis.Soc.Am.,XXII,156,1932)

inertia-mass 100 kg. $T_o = 0.5$ sec. Damping critical or slightly less;

galvanometers: (1) $T_1 = 0.2$ sec. Damping critical.
(2) $T_1 = 10$ to 14 sec. 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_o	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	"	"	"

one vertical component seismometer with oil damping and galvanometric-optical recording;

inertia-mass 100 kg. $T_o = 0.5$ sec. Damping critical or slightly less;

galvanometer: $T_1 = 0.2$ sec. Damping critical.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

Mount Wilson Seismologic Station
$\Phi = 34° 13.5'$ N., $\lambda = 118° 03.4'$ W., h = 1742 m., Weathered granite.

Riverside Seismologic Station
$\Phi = 33° 59.6'$ N., $\lambda = 117° 22.5'$ W., h = 250 m. approx., Weathered granite.

Santa Barbara Seismologic Station
$\Phi = 34° 26.5'$ N., $\lambda = 119° 42.9'$ W., h = 100m. approx., Heavy, boulder-laden alluvium.

La Jolla (Scripps Institution Seismologic Station)
$\Phi = 32° 51.8'$ N., $\lambda = 117° 15.2'$ W., h = 7.7 m. approx., Consolidated detrital material.

Tinemaha Seismologic Station
$\Phi = 37° 05.7'$ N., $\lambda = 118° 15.5'$ W., h = 1180 m. approx., Basalt.

Haiwee Seismologic Station
$\Phi = 36° 08.2'$ N., $\lambda = 117° 57.9'$ W., h = 1100 m. approx., Loosely cemented tuff.

SYMBOLS AND NOTATION: 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. 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 $\overline{P}$, P*, and P_n, although such complications are often clearly indicated and are the subject of study.

AMPLITUDES, (half-ranges), are measured in millimeters of the seismographic trace.

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_6
For instruments of different period analogous notation will be employed.
For routine vertical component, galvanometer period 0.2 second . . . . . P
For routine vertical component, galvanometer period 10 to 14 seconds . . . . . 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. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Oct 1	P	iPNEZ	02	50	21				deep	
		iNEZ			53					
	MW	iPEZ			20					
		iEZ			52					
	R	iPZ			17					
		iNEZ			48					
	SB	iNZ		51	02					
	LJ	iNEZ		50	42					
	T	iPNE			34					
		iNE		51	06					
	H	iPZ		50	29					
		iZ			55					
Oct 2	P	eZ	06	50	23					
	MW	eZ			22					
	R	eZ			27					
	T	iPEZ			07					
	H	iZ			13					
Oct 2	P	iPNEZ	09	10	24					33° 47' N 118° 08' W
	MW	iPEZ			27					O = 09:10:18
	R	iPNEZ			31					Minor damage
	SB	iPNEZ			44					
	LJ	iPNEZ			38					
	T	iPNEZ		11	10					
	H	iPNZ		10	57					
Oct 2	P	eNEZ	14	11	40				normal?	
	MW	iEZ			41			c		
	R	iZ			40					
	SB	iZ			34					
	LJ	iZ			44					
	T	iNEZ			44			c		
	H	iEZ			45					
Oct 2	P	iPNEZ	15	38	22			d	normal	Δ = 5610 km (50?5)
		iZ			28					O = 15:29:18
		iPPZ		40	09					Strong at Guayaquil,
		iSNEZ		45	35					Ecuador
		iScSZ		48	16					
	P30	iSSN		49	23					USCGS: 3° S 80° W
		iLN		54	47					O = 15:29.3
	MW	iPEZ		38	21					
		iSEZ		45	36					
	R	iPZ		38	16					
		eSNE		45	29					
	SB	iZ		38	40					
	LJ	iPEZ		38	11					
		eSE		45	18					
	T	iPNEZ		38	36					
		eSNE		45	56					
	H	iPEZ		38	31					
		eSEZ		45	53					
Oct 2	P	iPNEZ	15	47	35				normal	Probably an aftershock
	MW	iPEZ			35					
	R	iNEZ			30					
	LJ	iPEZ			24					
	T	iPNEZ			49					
	H	iPEZ			43					

Date	Station	Phase	G. C. T. h m s	T. A sec mm	c d	Focal depth	Remarks
Oct 2	P	eZ	18 12 41			normal?	
	MW	iZ	43				
	R	iZ	39				
	T	iNEZ	58				
Oct 2	MW	eZ	19 33 20			normal?	
	R	iZ	15				
	T	iEZ	35		c		
Oct 2	P	iPNEZ	22 04 20			normal?	Ecuador?
	MW	iPEZ	19		c		
	R	iPZ	14				
	LJ	iPZ	08				
	T	iPNEZ	34				
	H	iPEZ	29				
Oct 2	P	iPNEZ	23 42 36		d	normal?	Ecuador?
	MW	iPEZ	36				
	R	iPEZ	31		d		
	LJ	iPNEZ	24				
	T	iPNEZ	50		d		
	H	iPNEZ	45				
Oct 2	P	eZ	23 51 40			normal?	
	R	eZ	39				
	LJ	iZ	32				
	T	iPNEZ	58		d		
Oct 3	P	eZ	07 18 09				
	T	iZ	14				
Oct 3	P	iPNEZ	10 30 18		d	normal	Aftershock, Ecuador
		eSZ	37 36				
	P30	eLN	49 25				
	MW	iPE	30 19				
	R	iPZ	13				
	SB	iPNZ	26				
	LJ	iPNEZ	07				
	T	ePNEZ	33		d		
	H	ePNEZ	37				
Oct 3	P	iPNEZ	14 30 47		d	normal	Small surface waves recorded Ecuador?
	MW	iPE	47				
	R	iPEZ	42				
	LJ	iPNEZ	50				
	T	iPNEZ	31 01				
	H	iPEZ	30 56				
Oct 3	P	iPNEZ	18 50 55		c	normal?	Niigata Prefecture, Japan according to Kôti
	MW	iPE	57				
	R	ePZ	59				
	SB	iPNZ	49				
	T	iPNEZ	46		c		
	H	iPEZ	52				
Oct 3	P	iPZ	19 39 42				
	T	iPZ	52				
Oct 3	P	iPNEZ	21 34 13		c	deep?	
	T	iPNEZ	31				
	H	iPNEZ	26				

Date	Station	Phase	G. C. T. h m s	T sec	A mm	c d	Focal depth	Remarks
Oct 5	P	iPNEZ	15 15 18			c	deep	
		iZ	24					
		iZ	34					
	MW	iPEZ	19					
	R	iPNEZ	14					
	LJ	iPNEZ	07					
	T	iPNEZ	33					
	H	iPEZ	27					
Oct 10	P	iPNEZ	03 45 36			d	deep	
		iZ	46 02					
	MW	iPNEZ	45 35			d		
	R	iPZ	32					
		iZ	59					
	SB	ePZ	42					
	LJ	iPNEZ	25					
	T	iPNEZ	47			d		
		iZ	46 14					
	H	iPNEZ	45 42					
Oct 10	P	eZ	04 57 14					
	MW	iZ	12					
	R	iZ	07					
	T	iNEZ	30					
	H	iEZ	20					
Oct 10	P	iPNEZ	13 39 29			c	deep	
		iSZ	47 06					
	MW	iPNEZ	39 30					
	LJ	iPNEZ	11					
	T	iPNEZ	52					
		eN	44 08					
	H	iPNEZ	39 45					
		eNE	46 59					
Oct 11	P	eZ	23 57 59					
	MW	iZ	58 00					
	T	iNEZ	12					
Oct 12	P	iPNEZ	07 24 16			d	deep	h= 0.02
		iZ	43					Δ= 9100 km (82°)
		iZ	54					0= 07:12:00
		iSNE	34 25					
	MW	iPNEZ	24 16			d		(La Plata gives
	R	iPZ	13					0 = 07:11.99)
		iZ	41					
	SB	iPZ	22					From Pasadena and La
	LJ	iPNEZ	06					Plata, epicentre pro-
	T	iPNEZ	28			d		bably off the coast of
		iSNE	34 49					Chile, about 43° S lat.
	H	iPNEZ	24 25					
		eSE	34 39					
Oct 13	P	iZ	02 58 03					Begins earlier
	MW	iZ	57 44					
	R	iZ	44					
	T	iPNEZ	58 07					
	H	iPNEZ	57 56					
Oct 14	P	iPNEZ	22 26 13			d	normal	Δ = 4220 km (38°)
	P6	iSE	32 03					0 = 22:18:48
		eLE	37 33					

Continued

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Oct 14						Continued				
	R	ePZ	22	26	18					Eastern Aleutian Is.
		eSE		32	10					
	SB	ePZ		26	12					
		eSZ		31	56					
	LJ	iPNEZ		26	27					
		eSNE		32	24					
	T	iPNEZ		25	57					
		iSNEZ		31	37					
	H	iPNEZ		26	03					
		iSNE		31	45					
Oct 16	P	iPNEZ	02	52	57				normal?	
	MW	iPEZ			56					
	R	iPNEZ		53	00					
	SB	iPNEZ		52	47					
	LJ	iPNEZ		53	06					
	T	iPNEZ		52	39					
	H	iPNEZ			44					
Oct 17	P	iPZ	12	42	15				deep?	
	T	eZ			15					
Oct 17	P	iPNEZ	13	39	49			c	normal	
		eLZ		53	14					
	MW	iPEZ		39	50			c		
	R	iPZ			44					
	LJ	iPNEZ			38					
	T	iPNEZ		40	06					
	H	iPNEZ		39	59					
Oct 22	P	iPZ	02	47	39					
	MW	iPZ			40					
Oct 22	P	eZ	12	04	09					
	MW	eZ		03	59					
Oct 23	P	iPNEZ	04	08	15				normal	
	P30	eLN		42						
	MW	iPEZ		08	16					
	LJ	ePZ			13					
	T	iPNEZ			24					
	H	iPNEZ			24					
Oct 23	P	eZ	13	52	35					
		eZ		57	55					
Oct 25	P	iPNEZ	23	39	38			d	deep	h = 0.04
		iPcPZ			57					△ = 76°
		ipPZ		40	35					0 = 23:28:06
		esPZ		41	04					Northwestern border of
		iSNZ		49	03					Argentina, N-W. of Salta
		iScSE			51					USCGS: 22° S, 67° W
		ePSNE		50	44					0 = 23:28.2
		eP'P'Z	24	06	52					
		iScPcPP'Z		10	13					
	MW	iPNEZ	23	39	39					
		eSE		49	04					
	R	iPNEZ		39	35					
		eSN		48	57					
	SB	iPNEZ		39	44					
		eSNE		49	20					

Continued

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
						Continued				
Oct 25	LJ	ePNEZ	23	39	31					
		eSZ		48	48					
	T	iPNEZ		39	50			d		
		eSNEZ		49	15					
	H	iPNE		39	46					
		iSNE		49	18					
Oct 26	P	eZ	12	25	32				normal	Possibly two shocks
		iZ			52					
		iZ		28	03					
	P30	eLN		51.9						
	T	eNEZ		18	40					
		eNEZ		26	10					
	H	eNEZ		18	40					
		eNE		26	07					
Oct 27	P	iPZ	07	58	33			d	deep?	
	MW	ePZ			34					
	R	ePZ			33					
	T	iPZ			32					
	H	ePZ			33					
Oct 27	P	iPNEZ	11	00	13				normal	Nevada, about 39° N 117° W
	MW	iPNEZ			12					
	R	iPZ			15					
	SB	ePZ			16					
	LJ	ePZ			44					
	T	iPNEZ	10	59	32					
		iSNE	11	00	00					
	H	ePZ	10	59	44					
		iSZ	11	00	29					
Oct 28	P	iPNEZ	10	30	58			c	deep	
	MW	ePZ		31	00					
	R	iPZ		31	00					
	SB	iPZ		30	54					
	LJ	ePNEZ		30	57					
	T	iPNEZ		31	07					
	H	iPNEZ		31	02					
Oct 30	P	iPNEZ	07	12	39			d	deep?	Traces of small surface waves recorded
	MW	iPNEZ			39					
	R	iPZ			42					
	SB	ePZ			33					
	LJ	eZ			42					
	T	iPNEZ			44					
	H	iPEZ			40					
Oct 31	P	iPZ	16	39	27			c	deep?	
	MW	iPZ			28					
	R	iPZ			31					
	T	iPZ			29					

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Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Nov 2	P	iPNEZ	12	35	07				normal	△ = 4920 km (44° 3)
	P6	eSE		41	41					0 = 12:26:50
		eLE		45	01					
	MW	ePNEZ		35	07					USCGS: 52° N 176° W
	R	ePZ			14					0 = 12:27.0
	SB	ePZ			01					
	LJ	ePZ			28					
	T	iPNEZ		34	56					
	H	iPNEZ		35	03					
		eScSN		45	00					
Nov 3	P	iPNEZ	04	26	05			d	deep	
		iZ			24					
		iZ			32					
	MW	iPNEZ			07					
	R	iPZ			03					
	LJ	ePZ			00					
	T	iPNEZ			19					
	H	iPNEZ			14					
Nov 3	P	iPNEZ	10	44	57			c	normal	
	P30	eLN		49.4						
	MW	iPNEZ		45	00					
	R	iPZ		44	56					
	SB	ePZ		45	11					
	LJ	ePNEZ		44	36					
	T	iPNEZ		45	31					
	H	iPNEZ		45	19					
Nov 4	P	ePNEZ	08	50	08				normal	Small surface waves recorded
	MW	iPZ			09					
	LJ	ePNEZ			03					
	T	iPNZ			17					
Nov 4	P	eNEZ	12	06	01				normal?	Shock reported felt in Colombia at 11:58 G.C.T.
	T	eZ			22					
Nov 4	P	iPNEZ	20	34	54			c	normal	Small surface waves recorded
	MW	iPNEZ			55					
	SB	ePZ		35	04					
	LJ	ePZ		34	38					
	T	ePNEZ		35	16					
	H	iPNEZ			07					
Nov 5	P	eZ	08	45	02				deep?	
Nov 5	P	iPZ	09	45	32				deep?	
	MW	iPZ			33					
Nov 7	P	iPNEZ	06	52	30			c	deep	
		iZ			48					
	MW	iPEZ			30					
	T	iPNEZ			26					
	H	iPNEZ			28					
Nov 7	P	iPNEZ	12	20	44			d	deep	
	MW	iPNEZ			45					
	SB	ePNEZ			41					
	T	iPNEZ			54					
		iSN		31	16			d		
	H	iPNEZ		20	52			d		
Nov 7	P	iPZ	14	07	22				deep?	
		iZ			40					
	MW	iPZ			21					
	T	iPZ			35					

Date	Station	Phase	G. C. T. H m s	T sec	A mm	c d	Focal depth	Remarks
Nov 7	P	iPZ	21 38 34			d	deep?	
	MW	iPZ	35					
	T	iPNEZ	14					
Nov 10	P	ePZ	05 52 32			c		
	T	ePEZ	29					
Nov 10	P	iPNEZ	08 01 36			d	deep?	
	MW	iPZ	37			d		
	T	iPNEZ	02 02			d		
Nov 11	P	ePZ	18 11 23			c		
	MW	iPZ	25					
	T	iPEZ	29					
Nov 12	P	iPNEZ	22 04 06				deep?	
		iZ	19					
		eZ	32					
	MW	iPE	07					
Nov 14	P	iPNEZ	14 17 13			d	deep	h = 0.03 Δ = 9100 km (82°) Reported felt over a wide area in Chile and Argentina USCGS: 32° S 70° W O = 14:05.2
		ePcPZ	35					
		ipPZ	54					
	PX	esPN	18 18					
		iSNE	27 15					
	MW	iPNE	17 14			d		
		eSE	27 15					
	R	iPNEZ	17 09					
		ipPZ	50					
		eSE	27 09					
	SB	ePZ	17 18					
	LJ	ePZ	05					
		ePcPZ	33					
	T	iPNEZ	17 27					
		ipPN.	18 02					
		eSNE	27 39					
	H	iPNEZ	17 20					
		epPZ	18 02					
		eSNE	27 30					
Nov 17	P	eNEZ	04 10 25				normal	
	P30	eLN	14.7					
	MW	eZ	10 25					
	R	eZ	22					
	LJ	eZ	17					
	T	eZ	11 03					
Nov 17	P	eZ	08 31 44					
	MW	eZ	46					
	R	eZ	41					
Nov 18	P	iPNEZ	04 07 03			d	deep	
		iZ	15					
		iZ	32					
		iZ	41					
	MW	iPNEZ	04					
	R	iPZ	07					
		iZ	18					
		iZ	36					
		iZ	44					
	SB	ePZ	06 59					
	LJ	iPZ	07 08					
	T	eZ	06					
		eZ	34					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Nov 19	P	iPNEZ	03	24	03			c	normal	Δ = 9700 km (87°)
		ePPNEZ		27	38					Perhaps New Hebrides Is.
	P30	iLN		51	24					
	MW	iPEZ		24	06					
	R	iPEZ			07					
		eSE		34	46					
	LJ	ePZ		24	05					
	T	iPEZ			10					
		eSE		34	53					
	H	ePNEZ		24	12					
Nov 19	P	iPEZ	20	34	48			d		
	MW	ePZ			49					
	R	ePEZ			50					
	T	ePZ			58					
Nov 20	P	iPNEZ	23	29	57			c	normal	Δ = 5210 km (46.9)
		eSNEZ		36	44					0 = 23:21:20
	P30	eSN		36	40					
		iSSN		40	00					USCGS: 73° N, 69° W
		iLN		43	10					0 = 23:21.6
	MW	iPNEZ		29	56					
		eSE		36	47					Baffin Bay
	R	iPNEZ		29	55			c		
		iSZ		36	47					Maximum earth amplitude
	SB	iPNEZ		29	59			c		in E-W component,
	LJ	iPNEZ		30	09					A_E = 500 microns
		iPPZ		32	00					
		eSNEZ		37	02					
	T	iPEZ		29	34			c		
	H	iPNEZ			42			c		
Nov 21	P	iPNEZ	23	56	28			d	normal	
	MW	ePNEZ			27					
	R	ePNEZ			21					
	SB	ePNEZ			41					
	LJ	ePZ			18					
	T	iPNEZ			39					
	H	iPNEZ			38					
Nov 22	P	iPNEZ	04	59	52			d	normal	Small surface waves
	MW	iPNEZ			52					recorded
	R	iPEZ			46					
	SB	iPNEZ			59					
	LJ	iPNEZ			37					
	T	iPNEZ	05	00	04					
	H	iPNEZ		00	00					
Nov 22	P	ePZ	05	14	51					Aftershock of preceding
	MW	ePZ			51					
	R	iPZ			45					
	LJ	iPZ			36					
	T	iPNEZ		15	03					
Nov 22	P	ePNEZ	08	18	14					
	MW	ePEZ			13					
	R	eZ			09					
	SB	ePZ			31					
	T	iPNEZ			27					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Nov 22	P	iPNEZ	12	55	36			c	normal	Δ = 11,300 km (102°) approx
	P6	iScPcSE	13	06	09					East Indies
		iE			45					
		iE		07	13					
		eLE		25	01					
	MW	iPNEZ	12	55	38					
		iScPcSE	13	06	10					
	R	iPZ	12	55	40					
		iScPcSE	13	06	15					
	LJ	ePZ	12	55	39					
		eScPcSE	13	06	13					
		eN			54					
	T	iPZ	12	55	37					
		eScPcNE	13	06	12					
	H	ePNEZ	12	55	37					
		eScPcSE	13	06	11					
Nov 23	P	eNEZ	19	05	55				normal	
	P6	eNE		11	53					
	P30	eL		19.3						
	SB	eZ		05	47					
	LJ	eZ			18					
	H	eNEZ			43					
Nov 26	MW	eZ	14	11	51					
	T	eN		12	15					
Nov 28	P	iPZ	10	45	48			d	deep	
	MW	iPZ			49					
	R	iPZ			53					
	H	iPNEZ			37					
Nov 28	P	eZ	11	28					normal	Beginning indefinite
	P30	eLN	12	02						
Nov 29	P	iPNEZ	05	11	13			c	normal	
		iZ		13	07					
	P6	eLE		21	25.3					
	MW	iPZ		11	13					
	R	iPZ			07					
	SB	eZ			28					
	T	ePNEZ			32					
	H	ePZ			21					
Nov 29	P	iPNEZ	05	52	34			d	deep?	
	MW	iPZ			34					
	R	iPZ			28					
	SB	iPNEZ			46			d		
	LJ	ePZ			19					
	T	iPNEZ			59					
		eZ	06	00	35					
	H	iPNEZ	05	52	49					

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SEISMOLOGICAL LABORATORY

CARNEGIE INSTITUTION OF WASHINGTON
CALIFORNIA INSTITUTE OF TECHNOLOGY

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PASADENA, CALIFORNIA

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OCTOBER 1, 1933

BULLETIN

The SEISMOLOGICAL LABORATORY, Pasadena, California, is maintained and operated by the Carnegie Institution of Washington and the California Institute of Technology 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).

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, sent from Annapolis (NSS), three to five times daily.

The constants of these stations follow.

PASADENA SEISMOLOGICAL LABORATORY Central Station

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

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

Instruments, and Constants (approximate);

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

vertical component seismometers with oil damping and galvanometric-optical recording. (Cf.Bull.Seis.Soc.Am.,XXII,156,1932)

inertia-mass 100 kg. $T_o = 0.5$ sec. Damping critical or slightly less;

galvanometers: (1) $T_1 = 0.2$ sec. Damping critical.
(2) $T_1 = 10$ to 14 sec. 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_o	V	h
N — S	0.8 sec.	2,800	0.8-0.9
E — W	"	"	"

one vertical component seismometer with oil damping and galvanometric-optical recording;

inertia-mass 100 kg. $T_o = 0.5$ sec. Damping critical or slightly less;

galvanometer: $T_1 = 0.2$ sec. Damping critical.

The Station Constants follow.

Coördinates are geodetic positions referred to the North American Datum.

Mount Wilson Seismologic Station
$\Phi = 34° 13.5'$ N., $\lambda = 118° 03.4'$ W., h = 1742 m., Weathered granite.

Riverside Seismologic Station
$\Phi = 33° 59.6'$ N., $\lambda = 117° 22.5'$ W., h = 250 m. approx., Weathered granite.

Santa Barbara Seismologic Station
$\Phi = 34° 26.5'$ N., $\lambda = 119° 42.9'$ W., h = 100m. approx., Heavy, boulder-laden alluvium.

La Jolla (Scripps Institution Seismologic Station)
$\Phi = 32° 51.8'$ N., $\lambda = 117° 15.2'$ W., h = 7.7 m. approx., Consolidated detrital material.

Tinemaha Seismologic Station
$\Phi = 37° 05.7'$ N., $\lambda = 118° 15.5'$ W., h = 1180 m. approx., Basalt.

Haiwee Seismologic Station
$\Phi = 36° 08.2'$ N., $\lambda = 117° 57.9'$ W., h = 1100 m. approx., Loosely cemented tuff.

SYMBOLS AND NOTATION: 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. 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 $\overline{P}$, P*, and P_n, although such complications are often clearly indicated and are the subject of study.

AMPLITUDES, (half-ranges), are measured in millimeters of the seismographic trace.

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_6
For instruments of different period analogous notation will be employed.
For routine vertical component, galvanometer period 0.2 second . . . . . P
For routine vertical component, galvanometer period 10 to 14 seconds . . . . . 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. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Dec 1	P	iPNEZ	10	38	58			c	deep	
	MW	ePNEZ		39	00					
	R	ePZ			00			c		
	SB	iPNE		38	55					
	LJ	ePNEZ		39	00					
	T	iPNEZ			05					
	H	iPNEZ			06					
Dec 2	P	eZ	03	08	16				normal?	
	MW	eZ			17					
	R	eZ			13					
	T	eZ			27					
Dec 2	P	eZ	05	26	37					
	MW	eZ			40					
	R	eZ			40					
	T	eZ			48					
	H	eZ			47					
Dec 2	P	eZ	05	35	58				normal	
	P30	eLN	06	04.1						
		eN		10.8						
Dec 2	P	eZ	20	22	59				normal	
		eN		29	57					
		eN		31	01					
	P30	iLN		57	20					
	MW	eZ		23	19					
Dec 3	P	iPNEZ	12	31	54			c	normal	
	P30	eLN		41.9						
	MW	iPNEZ		31	55			c		
	R	iPZ			58					
	LJ	ePZ		32	08					
	T	ePNE		31	35					
	H	ePNEZ			43					
Dec 4	P	iPNEZ	19	44	38			c	deep	Δ = 7900 km, (71°) h = 0.06
		iPcPZ			56					0 = 19:33:50
		ipPEZ		46	00					
		iSNEZ		53	24					
		iNE		54	07					
		iP'P'Z	20	12	26					
		iScPcPP'Z		15	33					
	MW	iPNEZ		44	39			c		
		iSNEZ		53	24					
	R	iPNEZ		44	41			c		
		eSNEZ		53	31					
	SB	iPNE		44	32					
		eSNE		53	12					
	LJ	ePNEZ		44	46					
		eSNE		53	41					
	T	iPNEZ		44	27			c		
		iSNE		53	04					
	H	iPNEZ	19	44	31			c		
		iSNEZ		53	10					
Dec 9	P	eNE	13	50	40					
	MW	eZ			41					
	R	eZ			35					

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Dec 9	P	iZ	14	40	43					
		iZ		42	49					
	MW	iZ		40	44					
		eZ		42	54					
	R	iZ		40	45					
		eZ		42	52					
	LJ	eZ		40	46					
		eZ		42	54					
	T	eNEZ		40	52					
		eZ		43	03					
	H	eNEZ		40	49					
		eZ		43	01					
Dec 10	P	eZ	08	00	54					
	MW	eZ			53					
	R	eZ			51					
	T	eZ?		01	06					
		eZ			12					
	H	eZ			08					
Dec 12	P	ePZ	11	02	18					
	MW	ePZ			20					
	R	ePZ			21					
	T	iPNEZ			28			c		
	H	ePZ			27					
Dec 12	P	iPNEZ	14	24	20			c	normal	
		iN		26	15					
		iEZ		27	58					
		iZ		28	13					
	P6	eE		32	26					
		eLE		53.0						
	MW	iPZ		24	21			c		
		iZ		27	59					
	R	iPZ		24	23					
	LJ	iPZ			24					
	T	iPZ			21			c		
		iEZ		28	00					
	H	iPZ		24	22					
		eE		28	02					
Dec 13	P	iPNEZ	21	28	13			c	normal	JSA = 18°5 N, 103°5 W.
		iSEZ		32	04					O = 21:23:47
		iLE		34	19					
	MW	iPNEZ		28	15					
		eSNE		32	10					
	R	iPNEZ		28	08					
		eSZ		31	55					
	SB	ePZ		28	25					
	LJ	ePNEZ		27	56					
		iSNE		31	32					
	T	iPNZ		28	38					
		iSN		32	55					
	H	iPNEZ		28	29					
		eSN		32	34					
Dec 14	P	iPNEZ	07	21	07			c	normal	JSA = 18° N, 103°5 W
	P6	iSNE		25	09					O = 07:16:30
		iNE			17					
		eLE		27	45					
	MW	iPNEZ		21	08					
		eE		25	17					

Continued

Date	Station	Phase	G. C. T. h m s	T sec	A mm	c d	Focal depth	Remarks
				Continued				
Dec 14	R	iPZ	07 21 02					
	SB	ePZ	21 20					
	LJ	iPNEZ	20 51					
		eN	24 45					
	T	iPNZ	21 32					
		eSN	25 54					
	H	iPNEZ	21 21					
		eSNE	25 35					
Dec 14	P	iPZ	20 19 42			c	deep?	
	MW	iPZ	41					
	R	iPZ	45					
	T	iPNEZ	37			c		
	H	iPZ	41					
Dec 15	P	iZ	07 52 09				normal	JSA: 54?2 N. 35° W
	P30	eL	08 13 41					0 = 07:42:14
		iL	15 09					
	MW	eZ	52 08					
	R	iZ	07					
	T	iPNEZ	51 54					
	H	eZ	58					
Dec 17	P	iPZ	02 40 54					
	R	iPZ	50					
	T	iPZ	41 05					
Dec 17	P	eZ	12 48 05					
	MW	eZ	07					
	R	iZ	08			c		
	T	iZ	15					
Dec 18	P	iPZ	20 38 15			c	deep?	
	MW	iPZ	18			c		
	R	iPZ	19			c		
	LJ	iPNEZ	16			c		
	T	iPNEZ	27			c		
	H	iPNEZ	25			c		
Dec 19	P	ePZ	05 50 02				normal	Small surface waves recorded
	MW	iPZ	01					
	R	iPZ	06					
	LJ	iPZ	10					
	T	ePZ	49 35					
	H	iPZ	49					
Dec 19	P	iP(?)NEZ	17 56 52				deep??	Seismograms of a type
		iZ!	57 01					unusual at Pasadena
		eNZ	18 12 54					
		iSS(?)NZ	16 40					
	MW	iNEZ	17 56 53					
		eNEZ	18 12 49					
	R	iEZ	17 56 52					
		eEZ	18 12 45					
	SB	iPZ	17 56 55					
		eE!	18 12 36					
	LJ	iPZ	17 57 01					
		iZ	58 50					
		eZ	18 13 11					
	T	iNEZ	17 56 30					
				Continued				

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
						Continued				
Dec 19	T	eN	17	58	14					
		iNZ	18	11	14					
		eN		14	45					
	H	iNEZ	17	56	42					
		eNE	18	11	32					
		eN		15	20					
Dec 19	P	eZ	22	23	09					
		iZ			46					
		iZ		29	05					
	MW	iZ		23	11					
		iZ			47					
		iZ		29	06					
	R	iZ		23	49					
	LJ	iPNEZ			59					
	R	eZ		22	49					
		iZ		28	56					
	H	iZ		23	31					
Dec 21	P	eZ	00	09	34					
	MW	iZ			34					
	T	eZ			44					
	H	eZ			47					
Dec 21	P	iPNEZ	04	43	52			d	deep	
		eZ		44	21					
	MW	iPEZ		43	52			d		
	R	iPZ			48			d		
	SB	iPNEZ			58			d		
	LJ	iPNEZ			43			d		
	T	iPNEZ		44	03			d		
	H	iPNEZ		43	59			d		
Dec 21	P	eZ	23	21	03					
	MW	iZ			07					
	R	iZ			09					
	T	iEZ			00					
	H	iNEZ			07					
Dec 22	P	iPNEZ	19	19	24			d	deep	
		eZ		20	18					
	MW	iPNEZ		19	25			d		
		iZ		20	16					
	R	iPZ		19	27			d		
	LJ	iPNEZ			26					
	T	iPNEZ			30					
	H	iPEZ			29			d		
		iZ		20	18			d		
Dec 23	P	iPZ	01	13	53			d	deep?	
	MW	iPZ			53					
	R	iPZ			55					
	T	iPNEZ		14	01					
	H	iPNEZ		13	59					
Dec 23	P	iPZ	02	00	26			c	deep	
	MW	iPNEZ			27			c		
	R	iPZ			28			c		
	SB	iPZ			20			c		
	T	iPNEZ			34			c		
	H	iPNEZ			31			c		

Date	Station	Phase	G. C. T. h	m	s	T sec	A mm	c d	Focal depth	Remarks
Dec 24	P	iPZ	10	59	08					Probably two shocks
		eZ	11	08	25					
	MW	iPZ	10	59	11			c		
		eZ	11	08	30					
	R	iPZ	10	59	10					
		eZ	11	08	29					
	T	ePZ	10	59	09					
		eZ	11	08	36					
Dec 27	P	iPZ	11	37	25			c		
	MW	iPEZ			26			c		
		iZ		44	30					
	R	iPZ		37	26			c		
	T	iPZ			29					
	H	ePE			29					
Dec 27	MW	iPZ	11	49	50					
	R	iPZ			51					
Dec 29	MW	iPZ	08	26	08					
	R	iPZ			03			d		
	T	iPZ			23					
Dec 29	P	iPZ	22	25	16			d	deep?	
	MW	iPNEZ			17			d		
	R	iPZ			19			d		
	T	iPEZ		24	56					
	H	iPNZ		25	03					

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