THE REGISTRATION OF EARTHQUAKES AT THE BERKELEY STATION

AND

AT THE LICK OBSERVATORY STATION

FROM

April 1, 1928, to September 30, 1928

BY

VICTOR C. STECHSCHULTE

AND

KARL DYK

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CONTENTS

Symbols and Notations

1. *Character of the Earthquake—*

I. Perceptible. II. Moderately strong. III. Strong.

d (terrae motus domesticus)	Local shock (origin less than 100 kilometers distant).
v (terrae motus vicinus)	Near shock (origin from 100 to 1,000 kilometers distant).
r (terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u (terrae motus ultimus)	Very distant shock or teleseism (origin more than 5,000 kilometers distant).

2. *Phases of the Seismogram—*

P (undae primae)	Normal first phase, or first preliminary tremors (longitudinal).
P′	First preliminary tremors which have penetrated the core of the earth.
PR_n	Waves n times reflected at the earth's surface.
S (undae secundae)	Second phase, or second preliminary tremors (transverse).
SR_n	Waves n times reflected at the earth's surface.
PS	Waves changed from longitudinal to transverse oscillation or vice versa through reflection at the earth's surface.
PPS	Waves twice reflected at the earth's surface, having been longitudinal on two branches of the path and transverse on one branch.

In general a bar over two letters denoting types of waves indicates refraction. The subscript $_c$ denotes the boundary at about 2900 km. depth between the metallic core and the middle shell which surrounds it. Thus:

$\overline{S_cP_cS}$	Waves which have penetrated the core, having been transverse before entering and after leaving the core, and longitudinal within the core.
$\overline{P_cP_c}$ $\overline{P_cP}$	Waves refracted at the core boundary into the core, reflected once at this boundary while within the core and again refracted out of the core, having remained longitudinal on all branches of the path.
G	Long waves at beginning of surface phase. Velocity about $4.4\frac{\text{km.}}{\text{sec.}}$
L (undae longae)	Long waves preceding M. Velocity about $3.8\frac{\text{km.}}{\text{sec.}}$
M (undae maximae)	Shorter and more regular waves of large amplitude in the surface phase.
M_n	Greatest motion in the surface phase.
C (coda)	Tail or end portion.
F (finis)	End of discernible movement.

For local earthquakes a special notation is used:

$\overline{P}$	The longitudinal wave which has traveled its whole path in the surface layer or crust of the earth.
$\overline{S}$	The transverse wave which has traveled its whole path in the surface layer of the earth.
P*	The longitudinal wave which has penetrated only as deep as the second layer of the earth's crust.
S*	The corresponding transverse wave.

3. *Nature of the Motion—*

i (impetus)	Sudden beginning of the motion.
e (emersio)	Gradual beginning of the motion.
T (period)	Time of one complete oscillation.
A	Amplitude of the earth motion, measured from the median line in microns ($\mu=\frac{1}{1000}$mm.), + toward the north, east, or zenith, − toward the south, west, or nadir.
A_E	E–W component of A.
A_N	N–S component of A.
A_Z	Vertical component of A.

4. *Time—*

O (origin)	Time of shock at point of origin.

THE BERKELEY STATION

CONSTANTS

Latitude and longitude of the center of the seismographic room:

$\varphi=37°\ 52'\ 15\overset{s}{.}9$ N Lat.
$\lambda=122°\ 15'\ 36\overset{s}{.}6$ W from Greenwich.

Time. All determinations are reduced to Greenwich mean civil time.

Altitude, 85.4 meters (280 feet) above mean sea level.

Constants of the Seismographs

Date	Apparatus	Component	V	T_0	ϵ	$\frac{r}{T_0^2}\left(\frac{\text{cm}}{\text{sec}^2}\right)$
1928						
Apr. 16	Bosch-Omori 100 kg.	E	37	11.8	5	0.005
	"	N	43	11.7	2	0.006
	Wiechert 80 kg.	Z	40	5.4	4	0.001
Apr. 24	Bosch-Omori 100 kg.	N			9	
June 7	Bosch-Omori 100 kg.	E	35	11.8	5	0.002
	"	N	39	13.3	7	0.003
	Wiechert 80 kg.	Z	40	5.4	5	0.003
June 22	Bosch-Omori	N	44	14.3	5	0.002

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No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A$_E$	Amplitude A$_N$	Amplitude A$_Z$	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
1	Apr. 9	Iu	eP$_Z$	17 45 31	3			− 3	J. S. A. epicenter
								+ 2	12°.4 S 69°.6 W.
			eP$_N$	17 45 32	4				
			eP$_E$	17 45 32	3	< 3			
			ez	17 45 41	4			− 4	
			eS$_Z$	17 54 45					
			eS$_E$	17 54 47	6	− 2			
			eS$_N$	17 54 48	5		+ 4		
			e$_E$	18 03.5	20	− 6			
			ez	18 03.5	20			∓ 30	
			e$_E$	18 06.4	20	6			
			eL$_Z$?	18 11 5	25			∓ 50	
			F	18 50±					
2	Apr. 10	Iu	e$_E$	16 51.4±	20				Felt in Smyrna.
			ez	16 55.1±					
			F	17 01±					
3	Apr. 13	Ir	eP$_Z$	23 22 35	2			−<2	U. S. C. G. S. epi-
								+<2	center
			eP$_N$	23 22 42	3		+<2		12°.8 N 95° W.
			eS$_N$	23 27 50	5		+<2		
							−<2		
			eS$_E$	23 27 56		− 2			
			e$_E$	23 32.0	25	− 20			
			e$_N$	23 32.2	20		+ 5		
							− 5		
			eL$_E$?	23 34.2	15	− 20			
						+ 20			
			ez	23 35.0	15			− 35	
								+ 35	
			e$_N$	23 35.1	15		− 2		
							+ 4		
			F	23 56±					
4	Apr. 14	Iu	e$_E$	9 36.5	20	5			Destructive in Bul-
			e$_E$	9 41.7	45?	− 40			garia.
			e$_E$	9 47.1	30	15			
			e$_E$	9 51.8	20	+ 12			
						− 12			
			e$_N$	9 51 51	20		5		
			ez	9 52 19	20			−<30	
								+<30	

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A$_E$	Amplitude A$_N$	Amplitude A$_Z$	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
4	Apr. 14		e$_E$	9 56.6	15	7			
	(contd.)		e$_N$	9 56 7	15		2		
			F	10 26±					
5	Apr. 15	Iu	eP$_{NZ}$	21 57 47					See note at end of
			iS$_E$	21 58 13					Bulletin.
			iS$_E$	21 58 22					
			iS$_Z$	21 58 23					
			i$_{EN}$	21 58 59					
			iz	21 59 18					
			i$_N$	21 59 20					
5	Apr. 18	Iu	eP$_E$	19 36 21	3?			+<2	U. S. C. G. S. epicen-
			eS$_E$	19 47 38	9	− 4			ter 42°.3 N 24°.8 E.
			e$_E$	19 59.4±	20	−<5			Destructive in Bul-
						+<5			garia.
			eL$_E$?	20 07.3	20	5			
			e$_N$	20 11.7	25?		+ 10		
			e$_E$	20 11 9	30	+ 30			
						− 50			
			e$_N$	20 13.0	25		+ 10		
			e$_E$	20 13.9±	20	− 15			
						+ 15			
			ez	20 15.1	20			30	May begin earlier.
			ez	20 21.3	15			− 35	
								+ 35	
			F	20 51±					
7	Apr. 18	Iv	eP$_N$	21 41 49	2		< 2		Felt slightly in Santa
			eP$_{EZ}$	21 41 55	2				Barbara and San
			ez	21 42 02	2 5			< 2	Luis Obispo, Calif.
			e$_E$	21 42 20	7	− 4			
			eS$_Z$	21 42 29	3			+ 2	
								− 8	
			eS$_N$	21 42 30	4		+ 10		
							− 2		
			ez	21 42 35	3			− 4	
								+ 2	
			e$_E$	21 42 54					
			e$_N$	21 42 56	2		+ 2		
							− 12		
			F	21 46.9±					

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
8	Apr. 27	Iu	e_E	21 13.2	20	− 6			
						+ 6			
			F	21 30±					
9	May 1	I	e_E?	18 39.7					May be microseisms.
			e_E	19 14.7±	25	− 10			Trace of distant quake.
						+ 10			
			e_Z	19 16.7±	20			− 50	
								+ 50	
			F	19 35±					
10	May 14	Ir	eP_Z	22 24 43	3			2	J. S. A. epicenter 5°4 S 78°5 W.
			eP_E	22 24 48	8?	2			
			e_Z	22 24 48	6			−• 7	
			eP_N	22 24 51	4		2		
			e_E	22 25 36	8	4			
			eS_E	22 32 51	8	4			
			eS_N	22 32 52	6		2		
			e_N	22 33.4	15		10		
			e_E	22 33.4	45?	−190			
						+380			
			e_E	22 34 53	15	7			
			e_{ENZ}	22 37 23					
			eL_E	22 44.7	30	−160			
					30	+160			
			eL_Z	22 44.7	30			+230	
					30			−300	
			eL_N	22 44.8	20		6		
			e_E	22 47.6	20	+ 75			
					20	− 90			
			e_Z	22 54.4	4?				
			F	01−29±					
11	May 27	Iu	eP_Z	10 01 44	7			− 7	U. S. C. G. S. epicenter 39° N 149° E.
								+ 3	
			eP_N	10 01 44	8		2		J. S. A. epicenter 40° N 145° E.
			eP_E	10 01 44	10	− 4			
			eS_E	10 10 49	13	+ 15			
						− 30			
			eS_N	10 10 52	10		+ 5		May begin earlier.
							− 5		
			eS_Z	10 10 53					

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
11	May 27	Iu	eSR_{2N}	10 18.8	30		15		
	(contd.)		eSR_{2E}	10 18.8	30	15			
			eSR_{2Z}	10 18.9	e.26			− 50	
			eSR_{3E}	10 20.3	18	− 25			
						+ 15			
			e_N	10 21.1	20		+ 6		
							− 6		
			e_E	10 22.8	26	− 40			
						+ 30			
			e_E	10 28.3	18	10			
			e_E	10 30.7	8	2			
			F	12 34±					
12	June 1	Ir	e_{NZ}	13 23 35					
			e_E	13 32 43	10	2			
			e_N	13 32 44	6		2		
			e_Z	13 32 45					
			F	14 24±					Lost in microseisms.
13	June 9	I	e_N	2 45 29	6±		2		May begin earlier, microseisms present.
			e_E	2 46 00					
			e_Z	2 46 15					
			e_N	2 46 19	5				
			F	2 54±					Lost in microseisms.
14	June 15	I	e_N?	6 32 15	4		+ 2		
			e_N?	6 37 14					
			e_E	6 37 16					
			e_Z	6 40 50	8			− 5	
			e_E	6 45.0	15	− 4			
			e_Z	7 00.4	25			− 50	
								+ 50	
			e_E	7 00.4	25	−10			
			e_E	7 05 5	20				
			e_Z	7 05.7	20			− 30	
			F	7 38±					
15	June 17	I	e_E	22 37.3	20	− 7			Two quakes?
						+ 7			
			e_Z	22 40.3	15			− 20	
			e_E	22 40 7±	25	− 10			
			e_N	22 40.7	15		3		
			e_Z	22 41.7	12			10	
			e_N	22 42.0	6				

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No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
15	June 17 (contd.)	I	eZ	22 42.4	4			− 2	
			eE	22 43.1	15	− 20			
						+ 20			
			eE	22 45.4	10	4			
			eZ	22 45.5	12			20	
			F	23 53±					
16	June 18	IIIr	ePN	3 25 52	10		+ 10		Pens off paper for short time on horizontal components. Destructive in state of Oaxaca, Mexico. J. S. A. epicenter 14°.5 N 96°.8 W.
							− 15		
			ePE	3 25 52	12	− 20			
						+ 45			
			iPZ	3 25 53	7			15	
			iZ	3 25 55	12?			−160	
			eN	3 27 04	10		− 12		
							+ 14		
			eE	3 27 06	12	+ 25			
						− 40			
			iZ	3 27 06	10			− 50	
								+ 50	
			iZ	3 28 49	12			− 65	
								+ 55	
			eN	3 29 57	7		10		
			eSN	3 31 04	8		− 10		
							+ 30		
			eSE	3 31 05	12	+ 25			
						− 60			
			iZ	3 32 02	20			−500	
								+330	
			eE	3 32 03	15	75			
			eN	3 32 05	20		− 75		
							+ 50		
			eZ	3 33 19	20			330	
			iN	3 34 13	40		−1350		Shorter period superposed.
							+2000		
			iE	3 34 15	25	−1300			
						+ 650			
			iZ	3 34 18	10			+ 90	
								− 75	
			iLN	3 36.2	25		+1800		
							−2400		
			iLE	3 36.2	25	+1500			
						−2000			
			iL2	3 36.2	10			− 75	
								+110	

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No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
17	June 21	Iu	ePN	10 52.2					U. S. C. G. S. epicenter 18° S 178° W.
			eSN	11 01 57	7		2		
			eSE	11 02 02	20	− 20			
			eE	11 15.3	30	35			
			eN	11 15.6					
			eN	11 17.3	10		4		
			eE	11 17.5					
18	June 21	IIr	ePE?	16 33 04	15	− 4			U. S. C. G. S. epicenter 61°.3 N 148°.7 W.
			ePN?	16 33 04	13		+ 15		
							− 25		
			eN	16 33 55	4		+ 12		J. S. A. epicenter 59°.8 N 151° W.
			eN	16 35 46	6		5		
			eE	16 35 48	12	5			Avalanches in mountains along southern coast of Alaska.
			eSN	16 37 47	15		8		
			eSE	16 37 48	17	+ 20			
						− 25			
			eE	16 39 41	17	− 5			
						+ 50			
			eE	16 40 32	24	−250			
			eN	16 40 26	27		+350		
			iE	16 40 44	20	+200			
19	June 29	I	eP2	23 02 11	4			2	J. S. A. epicenter 18° S 172° E.
			ePE	23 02 18	3	3			
			eZ?	23 03 23	7				
			eN	23 12 28	12		4		
			eE	23 13 11	35	− 90			
						+ 25			
			eN	23 13 15	25		6		
			eE	23 27 18	33	− 80			
						+100			
			eZ	23 27 20	30				
			eZ	23 29.6	8				Entrance of a short period wave.
			eE	23 50.19	15	4			
20	July 2	I	eNZ	2 13					May be microseisms.
			F	2 32±					
21	July 7	I	eE	3 47.8±	20?				
			eN?	3 49 14	4				Beginning in microseisms.
			eZ	3 50.1					
			eN	3 50.3					
			F	4 02±					

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						A_E	A_N	A_Z	
	1928			h. m. s.	s.	μ	μ	μ	
22	July 8	I	e_N	12 15.8					Microseisms present.
			F	12 18±					
23	July 9	I	eP_{EZ}	21 36 10					
			eP_N	21 36 15					
			e_N	21 46 47	6		2		
			e_{EZ}	21 46.9					
			e_N	22 00.6	20		+ 4		
			e_Z	22 02.7	30			− 75	
								+ 75	
			F	23 02±					
24	July 10	I	e_Z	2 09 07	5±				
			e_Z	2 16.7±					
			e_E	2 18.3	25	10			
			e_N	2 18.9	25±				
			e_N	2 19.7	6				Group of short period waves.
			e_Z	2 23 26	10			15	
			e_E	2 23 31	10	7			Sudden increase in amplitude.
			F	2 37±					
25	July 11	I	e_N	3 33.7±	10				Trace of distant shock.
			e_N	3 44.6	20				
			F	4 01±					
26	July 18	I	eP_E	19 15 01	4				Starts in time break.
			eP_N	19 15 07					Microseisms.
			eP_Z	19 15 07	3			2	U. S. C. G. S. and
			e_Z	19 15 12	7			15	J. S. A. epicenter
			eS_E	19 23 22	10	2			6°.5 S 79°.5 W.
			eS_N	19 23 23	8		− 6		
							+ 10		
			e_{EN}	19 23.9	40?				A half-wave of long
			e_Z	19 30.0	15			20	period.
			e_E	19 31 33	32	−100			A single sinusoidal
						+100			wave.
			e_Z	19 34.4	35			100	
			e_E	19 38.0	20	15			
			e_Z	19 44.9	3±				Group of short period waves.

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No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						A_E	A_N	A_Z	
	1928			h. m. s.	s.	μ	μ	μ	
27	July 22	I	e_{NE}	6 45 20					Beginning difficult.
			e_E	6 48 48	8	4			
			e_Z	6 48 52	8			9	
			e_N	6 49 28	8		6		Sinusoidal group.
			e_N	6 53 56	8		2		
			F	23 00±					
28	Aug. 4	IIr		18 32±					Mexican earthquake recorded, but clock was disconnected.
29	Aug. 9	Id	iP_Z	6 35 02					Time may be incorrect 1 or 2 sec.
			eP_{EN}	6 35 02					Felt at Salinas, Gilroy, San Juan Bautista, Santa Clara, etc.
			e_Z	6 35 16					
			e_N	6 35 17					
			iS_N	6 35 18	1.5		− 9		
							+ 13		
			iS_Z	6 35 18	1.5			7	
			i_N	6 35 20					
			e_Z	6 35 26	2				
			eL_E	6 35 27	7	14			
			i_E	6 35 31					
			e_Z	6 36 01					
30	Aug. 24	Iu	e_N	21 56 41	6		2		Feeble trace.
			e_N	22 03 26					
			e_{NE}	22 06 02	11				
31	Sept. 2	Iu	e_N	00 12 11	20?		+<3		
			e_E	00 12 11	12	+<3			
32	Sept. 3	Iv	iP_Z	4 02 48	2			−<5	
			eP_{EN}	4 02 48					Beginning difficult.
			eS_N	4 03 25	2		− 15		
			eS_E	4 03 25					
			eS_Z	4 03 30					
			F	4 08±					
33	Sept. 5	Iv	eP_Z?	5 38 14					
			eP_E	5 38 23	2				
			eP_N	5 38 23	2		+ 4		
			e_Z	5 39 14					
			e_N	5 40 05	7				
			F	5 45±					

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_Z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
34	Sept. 5	Iv	eP_{NZ}	14 44 03	?				Phases indistinct. Felt in Los Angeles, San Diego, San Luis Obispo, Calif.
			e_{NE}	14 44 26					
			e_N	14 45 20	4				
			eS_N?	14 45 33					
			e_Z	14 45 44					
			e_N	14 45 53					
			e_E	14 46 00	4	− 5			
			F	14 50±					
35	Sept. 11	IIv	iP_{NZ}	12 38 24					J. S. A. epicenter 43° N 132° W. U. S. C. G. S. 42°N 131°9 W.
			eP_E	12 38 25	7	10			
			e_N	12 39 38					
			e_E	12 39 58					
			e_Z	12 40 14					
			i_N	12 40 14	15				
			iS_{ENZ}	12 40 29					S not perfectly definite.
			i_Z	12 40 52					
			e_N	12 41 07					
			i_N	12 41 13	11		+ 45		
							−120		
			e_N	12 41 36	6				
			iM_{ENZ}	12 41 52					
			M_{1E}	12 42 36	9	+315			
			M_{1Z}	12 42 36					
			M_{1N}	12 42 54					
			M_{2N}	12 44 14	6		275		
			M_{3N}	12 45 22	6		+105		
							−140		
			M_{4N}	12 46 12	8		+ 85		
							−105		
			F	14 10±					
36	Sept. 12	Iu	e_N	1 42 13	8		4		Trace of distant quake.
			e_E	1 42 14	6	5			
37	Sept. 19	I	eP_N	2 49 03	2				
			e_Z	2 49 41	2			− 2	
			e_N	2 49 55	5		− 2		
			e_Z	2 50 24					
			e_N	2 56 03					
			F	3 01±					

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_Z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
38	Sept. 21	Iu	eP_N	13 38 03	6		2		
			eS_N	13 46 47					
			e_Z	13 48 06					
39	Sept. 22	IIu	eP_Z?	7 43 45					U. S. C. G. S. epicenter 14° S 164° E.
			e_E?	7 47 07					
			e_N	7 50 49					
			eS_{EN}	7 54 37					
			e_Z	7 55 37					
			e_N	8 00 01					
			e_N	8 04 03	9		< 2		
			e_N	8 05 47	20		3		
			e_E	8 05 49	22	3			
			e_Z	8 09 37	30				
			e_E	8 09 38	36	24			
			e_Z	8 10 37	23			125	
			e_E	8 10 37	24	60			
			e_N	8 11 35	22		15		
			e_E	8 11 35	22	65			
			e_E	8 14 01	20	80			
			F	9 10±					
40	Sept. 27	Iu	e_Z	00 54 29	2			− 2	U. S. C. G. S. epicenter 12° N 59° W.
			e_E	00 54 47	2	− 1			
			e_Z	00 56 53	5			1	
			e_Z	00 58 09					
			e_E?	1 04 23					
			F	1 07±					

THE LICK OBSERVATORY STATION

CONSTANTS

Constants of the Station

Latitude and longitude of the center of the seismographic room:

$\varphi = 37° 20' 24''.5$ N Lat.
$\lambda = 121° 38' 34''$ W from Greenwich.

Time. All determinations are reduced to Greenwich mean civil time.

Altitude, 1281.7 meters (4202.25 feet) above mean sea level.

Constants of the Seismographs

Date	Apparatus	Component	V	T_0	ϵ	$\frac{r}{T_0^2}$
1928						
Apr. 13	Wiechert 160 Kg.	E	99	9.5	5	.003
	" "	N	82	8.1	3.8	.007
	" 80 Kg.	Z	52	3.2	6.2	.0025
Aug. 9	Wiechert 160 Kg.	E	86	7.6	8.7	.0035
	" "	N	75	8.1	9.5	.0029
	" 80 Kg.	Z	62	3.1	8	.0012

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_Z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
1	Apr. 14	Iu	e_E	9 45					
			e_E	9 51					
			e_E	9 57					
			F	10 10±					
2	Apr. 15	Iv	eP_{EZ}	21 58 00					
			e_Z	21 58 11	2				
			e_Z	21 58 33					
			e_E	21 58 34					
			i_E	21 58 58	6	+ 2			
			e_Z	21 59 01					
			e_Z	21 59 06					
			i_E	21 59 39	3	< 2			
			e_Z	21 59 40					
			F	22 14±					
3	Apr. 18	II	eP_N	21 41 19					Phases indistinct.
			e_Z	21 41 22					
			i_{NZ}	21 41 39					
			i_N	21 42 06					
			e_Z	21 42 37					
			F	21 45±					
4	May 8	I	e_E	4 55 35					
			e_E	4 57 23					
			e_E	5 03 15	6				
5	May 19	IIu	eP_{EZ}	22 24 43					Ecuador.
			eP_N	22 24 44					
			iP_{EN}	22 24 56	5				
			i_N	22 25 12					
			i_N	22 25 50	3				
			e_E	22 32 20					
			eS_N	22 32 46					
			eS_E	22 32 50					
			e_Z	22 33 03					
			F	1 15±					
6	May 15	Iu	eP_N	2 43 45	6				
			eS_N	2 50 50	4.5				
7	May 27	Iu	e_N	10 11 01	6		2		
			e_N	10 20.3	21		7		
			e_N	10 25.3	11		2		Sinusoidal group.

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
8	June 9	I	e_E	2 44 44					
			i_E	2 45 26	5	1			
			e_E	2 46 14					
			F	2 57±					
9	June 17	IIIr	ePz	3 27 48					H components badly bumped.
			eSz?	3 33 30	18			+200	Trace amplitudes 40–50 mm.
			eLz	3 37 28					Time marks on Z hard to determine; hence, few phases recorded here.
			iz	3 39 18	5			± 2	
10	June 18	I	e_E	6 35 08	10	± 1			
11	June 18	I	e_E	7 40.1	11	± 2			
			e_E	7 44 11	4	±<2			New shock?
			eS_E?	7 46 16	5	± 1			
			F	8 00±					
12	June 21	Iu	eP_E	10 52 11	3				
			eS_E	11 02 03	13	− 3			
13	June 21	IIu	eP_E	16 33 08					Short wave, 2–3 sec., superposed on long irregular wave.
			ePz	16 33 09					
			ez	16 35 06	4			± 3	S lost in bad spot of record. Δ=29°5.
			ez	16 36 36	15				
			eM_E	16 40	18	± 18			
			eMz	16 41 01	21			±650	
			F	18 00±					
14	June 29	Iu	eP_E	22 02 06	4	< 1			
			e_E	22 13 20					
			e_E	22 27 12	18	20			10 sec. wave superposed.
			F	1 20±					
15	July 7	I	e_E	1 47 17	20	8			
			e_E	1 48 47	4	< 3			
			e_E	1 49 04					
			e_E	1 49 41					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
16	July 8	I	e_E	12 13.2					Masked by microseisms.
17	July 9	I	eP_E	21 36 10					
			eS_E	21 46 50					
			e_E	22 03±	25				
			eM_E	22 07	21	±20			
			e_E	22 30±	15	4			
			F	23 00±					
18	July 10	I	e_E	15 50±					Trace of distant shock.
19	July 18	IIu	eP_E	19 15 01					Ecuador.
			iP_E	19 15 09	5	∓ 6			
			e_E	19 15 17	3				
			e_E	19 16 20					
			e_EPR_1	19 19 14	9	< 9			
			iS_E	19 23 22	7	−<2			
			e_E	19 23 44					
			e_ESR_2?	19 29 50	12	+14			
			i_E	19 31 27					
			F	21 45±					
20	July 21	I	e_E	7 45 18	4				
			e_E?	7 48.7					
			F	8 00±					
21	July 30	I	e_E	3 07 39	20	8			
			e_E	3 15.1	15				
22	Aug. 4	IIr	eP_{EZ}	18 32 24	4				
			i_E	18 32 30					
			e_E	18 32 40	3				Series of short period waves.
			eS_E	18 37 24					Very irregular group.
			iS_E	18 37 40					
			ez	18 38 04	17?				
			eL_E	18 40 39	33				
			eM_E	18 41 19	20				
			ez	18 42 49					
			M_{1E}	18 56 19	15	+550			
			M_{2E}	18 58.8		+210			
			F	20 30±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
23	Aug. 9	Id	ePz	6 30 45					Very feeble trace.
			F	6 31 45					
24	Aug. 9	Id	iPz	6 34 49					Time marks uncertain for other phases. See Berkeley bulletin.
			F	6 38±					
25	Aug. 29	Id	iP_{EN}	7 43 01					
			iP_{EZ}	7 43 02					
			iS_E	7 43 04					
			i_N	7 43 07					
			i_{EN}	7 43 10					
			F	7 45.1±					
26	Sept. 3	Iv	ePE_Z	4 02 41	2				
			e_N	4 02 58					
			eS_{EN}	4 03 19					
			eS_Z	4 03 20					
			i_N	4 03 23					
			i_E	4 03 26	4	+ 5			
			i_N	4 03 32	1.5				
			F	4 07±					
27	Sept. 5	I	e_E	5 38 01					
			e_E	5 38 23					
28	Sept. 5	Iv	ePE_E	14 43 43					See Berkeley bulletin.
			e_Z	14 43 50					
			e_E	14 43 58					
			e_E	14 44 04					
			eS_{EN}?	14 44 55					
			e_N	14 45 11					
			e_Z	14 45 15					
			F	14 55±					
29	Sept. 11	Ir	ePz	12 38 32					H component not working.
			eSz	12 40 31					
			e_Z	12 41 16	14			± 5	
			e_Z	12 42 56	6			− 1	
			e_Z	12 44 16					
			F	13 45±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude AE	Amplitude AN	Amplitude AZ	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
30	Sept. 22	IIu	eP_N?	7 44 26					
			eP_E?	7 44 36					
			e_E	7 46 07					
			eS_E	7 54 26	9	± 1			
			e_E	7 55 17	30	50			
			e_N	7 55 20					
			eL_{EN}?	8 06					
			e_E	8 10 32	24	60			Long series of sinusoidal waves, E more regular than N.
			e_N	8 10 42	24		10		
			e_Z	8 13	20				
			e_Z	8 21	18			60	
			e_N	8 31.5	16				Another series of sinusoidal waves.
			e_E	8 59					
			F	9 50±					
31	Sept. 22	Id	iP_{EN}	12 34 37					
			i_{EN}	12 34 39					
			i_{EN}	12 34 40	.8				
			i_N	12 34 43					
			i_N	12 34 45	1		+ 2		
			F	12 35 20±					
32	Sept. 27	Iu	eP_E	4 54 24					
			e_EPR_2?	4 58 11					
			eS_E	5 02 35					
			e_E	5 15	30	90			
			F	5 45±					

THE LICK OBSERVATORY STATION

The following are the records obtained during the past six months from the Wood-Anderson short-period seismometers which were installed at the Observatory early this year.

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
1	Apr. 8	Id	iP_N	17 19 34	.3				May begin earlier.
			iP_E?	17 19 38	.3				
			iS_N	17 19 42	.5				
			iS_E	17 19 42	.7				
			F	17 20.5±					
2	Apr. 9	Id	iP_N	15 59 14					
			F	16 00 40±					
3	Apr. 9	I	eP_N	17 45 27	.8				E component very faint.
			eS_N	17 54 40	5				U. S. C. G. S. epicenter 13° S 69°5 W.
4	Apr. 13	Ir	e_N	23 30 20					May begin earlier.
			e_E	23 30 33	20				
			e_N	23 34 34	15				U. S. C. G. S. epicenter 12°8 N 95° W.
			e_E	23 36 40	10				
			e_N	23 37 15					
			e_N	23 39 40					
			F	23 56±					
5	Apr. 14	Iu	e_N	9 17.0					Destructive in Bulgaria.
			e_N?	9 48.3	25				
			e_E	9 49.1	25				
			e_N	9 59.3	17				
			e_E	9 59.5	15				
			F	10 11±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
6	Apr. 15	Iv	eP_E	21 57 58					
			i_E	21 58 02					
			$i\overline{P}_E$	21 58 05					
			i_E	21 58 11					
			iS_E	21 58 29					
			i_E	21 58 33					
			i_E	21 59 03					
			i_E	21 59 08					
			F	22 11±					
7	Apr. 16	I	eP_E	5 49 07	.8				
			i_E	5 49 11	.8				
			iS_E	5 49 26					
			F	5 51±					
8	Apr. 17	Ir	eP_E	3 31 27	.8				U. S. C. G. S. epicenter 16° N 95°5 W.
			eP_N	3 31 28	1				
			e_N?	3 31 31	1				
			e_E	3 31 37	1				
			eS_E?	3 36 29	6				
			e_N	3 37 47	12				
			e_N	3 41 11	3				
			F	4 02±					
9	Apr. 18	Id	$e\overline{P}_E$	14 20 39	.4				N–S illegible.
			$i\overline{S}_E$	14 20 51	1				
			F	14 21 20±					
10	Apr. 18	Iu	eP_{EN}	19 36 24					Bulgaria.
			e_E?	19 47.6	15				
			e_E	20 11.1					
			e_N	20 11.2	25				
			e_N	20 19.5	16				
			F	20 37±					
11	Apr. 18	IIv	eP_N	21 41 21					Difficult to distinguish phases.
			eP_E	21 41 21	.6				Felt at Santa Barbara and San Luis Obispo, Calif.
			i_E	21 41 26	.7				
			i_E	21 41 32	.6				
			i_E	21 41 36	.7				
			i_N	21 41 37	.9				
			i_E	21 41 40	.5				

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						A_E	A_N	A_Z	
	1928			h. m. s.	s.	μ	μ	μ	
11	Apr. 18	IIv	i_N	21 41 41					
	(contd.)		i_E	21 41 44	.8				
			i_E	21 42 12	.8				
			i_E	21 42 35	2				Marked change in period.
12	Apr. 21	I	e_{EN}	5 02 50					May not be seismic.
13	Apr. 22	Id	eP_E	2 51 28	.5				
			eP_N	2 51 29					
			i_E	2 51 30	.4				
			iS_N	2 51 40	1				
			iS_E	2 51 41	.8				
			F	2 52.8±					
14	Apr. 22	Id	$ei\overline{P}_{EN}$	3 28 04					
			$i\overline{S}_{EN}$	3 28 07					
			F	3 28.5					
15	Apr. 22	Id	$ei\overline{P}_E$	4 11 32					
			e_E	4 11 42					
			$i\overline{S}_N$	4 11 42					
			iS_E	4 11 43					
			F	4 12.1±					
16	Apr. 26	Id	$i\overline{P}_{EN}$	1 34 00					
			$i\overline{S}_E$	1 34 01					
			F	1 34 29					
17	Apr. 27	I	e_{EN}	20 46 13					May not be seismic.
18	Apr. 28	Id	$i\overline{P}_E$	9 45 23	.4				
			$i\overline{S}_E$	9 45 27					
			i_E	9 45 30	.4				
			i_E	9 45 33	.4				
			F	9 45 50±					
19	Apr. 30	Iv	eP_E	0 08 23	.5				
			eS_E	0 09 03	.6				
			i_E	0 09 05	.5				
			F	0 10±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						A_E	A_N	A_Z	
	1928			h. m. s.	s.	μ	μ	μ	
20	May 3	IId	$i\overline{P}_{EN}$	6 33 03					
			$i\overline{S}_E$?	6 33 05					
			F	6 34.1±					
21	May 6	Id	$i\overline{P}_{EN}$	14 34 43					
			$i\overline{S}_E$	14 34 45					
			F	14 35 30±					
22	May 7	Id	$i\overline{P}_E$	18 51 28	.4				
			$i\overline{S}_E$	18 51 29	.5				
			F	18 51 35±					
23	May 8	I	eP_{EN}	4 55 35	.7				
			e_E	4 57 23	6				
			e_E	5 03 15	5				
			e_N	5 03 19	6				
			e_{EN}	5 04 29	4				
			F	6 10±					
24	May 8	Id	eP_E	13 20 26					
			iS_E	13 20 31					
			F	13 20 53					
25	May 9	Id	$i\overline{P}_E$	12 19 50					
			$i\overline{S}_E$	12 19 53					
			F	12 20 2±					
26	May 14	IIu	eP_N	22 24 42					Guayaquil, Ecuador. J. S. A. epicenter 5°4 S 78°5 W.
			i_N	22 24 56					
			i_N	22 25 55					
			e_N	22 30.8	10				
			eS_N	22 32 57±	7				
			e_N	22 44 35±	25				
			e_N	22 54 42	4				Group of short period waves.
			F	00 09±					
27	May 27	I	eP_E	10 01 42					U. S. C. G. S. epicenter 39° N 149° E.
			eS_E	10 10 56	10				
			e_E	10 19.4	6				J. S. A. 40° N 145° E.
			F	11 45±					
28	June 3	Id	$e\overline{P}_E$	15 50 20					
			$i\overline{S}_E$	15 50 24	.5				
			F	15 50 56					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_Z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
29	June 9	I	e_E	2 44.7±					
			e_E	2 47.2					
			F	2 54±					
30	June 9	I	eP_E	8 22 42	.8				
			i_E	8 22 48	.8				
			i_E	8 22 53	.6				
			i_E	8 23 41	.5				
			F	8 27.2±					
31	June 15	I	e_E	7 06±					
			F	7 21±					
32	June 21	Iv	iP_E	2 56 55					
			iS_E	2 57 11	.5				
			F	2 58.2±					
33	June 21	Iv	eP_E	3 07 22					Beginning difficult.
			i_E	3 07 28	.5				
			i_E	3 07 31	.6				
			iS_E	3 07 40	.5				
			F	3 09±					
34	June 21	Iu	eP_E	10 52 10	2.5				U. S. C. G. S. epicenter 18° S 178° W.
			eS_E	11 02.2±	8				
			F	12 07±					
35	June 21	IIr	eP_E	16 33 07					J. S. A. epicenter 59°.8 N 151° W.
			eS_E	16 37 57	13				U. S. C. G. S. 61°.3 N 148°.7 W.
			e_E	16 41 02	20±				
			e_E?	16 45.0	12				
			F	18 15±					
36	June 25	Id	$i\overline{P}_E$	3 26 25	.4				
			$i\overline{S}_E$	3 26 29	.4				
			F	3 27.6±					
37	July 18	Iu	eP_E	19 15 01	4				
			eP_N	19 15 01					
			e_E	19 15 10	2				
			eS_E	19 22 58	6				
			eS_N	19 23 00	7				

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_Z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
37	July 18 (contd.)	Iu	e_E	19 29.0	10				
			eL_N	19 32.8	25?				
			e_E	19 34.2	12				
			e_E	19 38.4	15				
			F	21 30±					
38	July 22	I	eP_N	5 24 36	.5				May be microseisms.
			i_N	5 24 43	.5				
			i_N	5 24 45	.5				
39	July 22	I	eP_N	7 34 32					
			e_N	7 44 43					
			e_N	7 48 25	9				
			e_N	7 51.0	8				
			F	7 58±					
40	July 22	Id•	$i\overline{P}_N$	10 48 05					
			$i\overline{S}_N$	10 48 06					
			F	10 48 50±					
41	July 22	Id	$i\overline{P}_N$	11 38 14					
			$i\overline{S}_N$	11 38 17					Very faint trace.
			F	11 39 19					
42	July 22	Id	$i\overline{P}_N$	11 44 08					
			$i\overline{S}_N$	11 44 11					
			F	11 44 52					
43	July 26	Iv	eP_N	22 03 18					
			eP_E	22 03 19					
			iS_{EN}	22 03 34					
44	July 28	Iv	eP_{EN}	2 04 42	.5				
			iS_{EN}	2 04 54	.5				
			i_E	2 04 59					
			F	2 05 40±					
45	July 28	I	e_{EN}	2 20 33					Phases indistinct.
			i_{EN}	2 21 13					
			i_E	2 21 16					
			e_E	2 21 30					
			F	2 26 30±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						A_E	A_N	A_Z	
	1928			h. m. s.	s.	μ	μ	μ	
46	Aug. 4	IIr	eP_E	18 32 24					Phases not pronounced.
			eS_E	18 37 34					Mexico City reported slightly shaken.
			eL_E	18 40 19	32				
			eM_E	18 41 19	23				
			e_E	18 42 29					Superposed on M group.
			M_{1E}	18 46 20	13				
			F	19 50±					
47	Aug. 9	Id	iP_{EN}	6 30 46					
			iS_N	6 30 53					
			i_N	6 30 55					
			i_N	6 31 15					
			F	6 33±					
48	Aug. 9	Id	iP_{EN}	6 34 45					Stronger than preceding shock.
			i_N	6 35 35					Too faint to detect S.
			i_N	6 35 47					See Berkeley bulletin.
			i_N	6 36 18					
			i_N	6 36 56					
			F	6 41.7±					
49	Aug. 17	I	i_E	21 45 40					
			i_E	21 45 43					
			F	21 45 50					
50	Aug. 18	I	$i\overline{P}_E$	0 27 17					
			$i\overline{S}_E$	0 27 19					
			i_E	0 27 28					
			F	0 27 43					
51	Aug. 19	Id	eP_E	10 59 01					
			iS_E	10 59 04					
			i_E	10 59 07					
			F	10 59 25					
52	Aug. 21	Id	iP_{EN}	11 24 54	.5				
			iS_{EN}	11 24 56	.3				
			e_{EN}	11 25 01	.6				
			e_E	11 25 06					
			F	11 25 20±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						A_E	A_N	A_Z	
	1928			h. m. s.	s.	μ	μ	μ	
53	Aug. 23	Iv	eP_{EN}	6 32 37					
			e_E	6 32 41					
			iS_{EN}	6 32 50					
			F	6 33 18±					
54	Aug. 23	Id	e_{EN}	19 46 24	.5				
			iS_{EN}	19 46 29	.7				
			e_{EN}	19 46 32					
			e_N	19 46 37					
			F	19 46 47					
55	Aug. 24	I	e_{EN}	7 25 13					
			e_{EN}	7 25 25					
			F	7 26±					
56	Aug. 24	I	e_N	7 55 37					
			e_{EN}	7 55 42					
			F	7 55 56±					
57	Aug. 24	Iu	e_E	21 55 49	1				Very slight trace.
			e_N	21 55 55					
			e_{EN}	22 07 15	5				
			F	22 30±					
58	Aug. 29	I	iP_E	7 43 00					
			iS_E?	7 43 11					
			i_E	7 43 22					
			F	7 45 30±					
59	Sept. 2	I	e_{EN}	0 00 53	1.3				
			e_E	0 15 43	15				
			F	0 20±					
60	Sept. 3	Iv	eP_E	4 02 40					
			iP_E	4 02 43					
			eS_E	4 03 19					
			i_E	4 03 32					
			i_E	4 03 35					
			e_E	4 03 53					
			e_E	4 04 08					
			F	4 07±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_Z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
61	Sept. 4	Id	eP_E	11 26 03					
			iS_E	11 26 11					
			i_E	11 26 16					
			F	11 26 57					
62	Sept. 5	Iv	eP_E	5 36 59					
			eS_E	5 38 21					
			F	5 43 30±					
63	Sept. 5	Iv	eP_E	14 43 41	.8				
			e_E	14 43 48					
			eS_E?	14 44 03					
			i_E	14 44 08					
			e_E	14 44 52	.5				
			e_E	14 45 03					
			F	14 51±					
64	Sept. 5	I	eP_E	20 13 03					
			e_E	20 14 37					
			F	20 16±					
65	Sept. 8	Iv	eP_E	17 47 43					
			iP_E	17 47 45					
			i_E	17 47 56					
			eS_E	17 48 08					
			iS_E	17 48 09					
			i_E	17 48 26					
			F	17 49 35±					
66	Sept. 10	Id	eP_E	21 48 20					
			iS_E	21 48 23					
			i_E	21 48 24					
67	Sept. 11	Id	iP_E	1 03 03					
			i_E	1 03 05					
			i_E	1 03 07					
			F	1 03 30±					
68	Sept. 11	IIr	eP_N	12 38 30	7				Very fast vibration superposed on P.
			eP_E	12 38 31					
			eS_E	12 40 21					
			e_N	12 40 28					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude A_E	Amplitude A_N	Amplitude A_Z	Remarks
	1928			h. m. s.	s.	μ	μ	μ	
68	Sept. 11 (contd.)	IIr	e_{EN}	12 41 16					
			e_N	12 41 56					
			M_{IN}	12 44 56					
			F	14 00±					
69	Sept. 12	I	e_{EN}	1 31 59	5				Sept. 14 to 16, continuous microseisms.
			e_{EN}	1 42 07	5				
70	Sept. 17	Id	iP_E	1 20 17					
			i_E	1 20 23					
			iS_E	1 20 27					
			i_E	1 20 36					
			F	1 22±					
71	Sept. 19	I	e_E	1 47 28					
			e_E	1 48 41					
			e_E	1 49 02					
72	Sept. 21	I	iP_E	8 21 39					
			i_E	8 21 40					
			F	8 22					
73	Sept. 21	I	e_E	13 38 03	.5				
			e_N	13 38 05					
			e_E	13 38 24	1				
			e_{EN}	13 47 03	4				
74	Sept. 22	I	e_E	7 44 21					
			e_E	7 47 07					
			e_E	7 55 08					
			e_E	8 10 27	20				
75	Sept. 22	Id	iP_E	12 34 36					Motion too rapid to distinguish phases.
			i_E	12 34 57					
			i_E	12 35 02					A new shock, much smaller than preceding.
			i_E	12 35 47					
76	Sept. 27	Iu	eP_E	0 54 21					Time not marked on N–S component.
			e_E	0 54 41					J. S. A. epicenter 13° N 58°2 W.
			e_E	0 58 05					
			eS_E	1 02 32					
			e_E	1 03 55					