

THE REGISTRATION OF EARTHQUAKES
AT THE BERKELEY STATION

AND

AT THE LICK OBSERVATORY STATION

FROM

October 1, 1928, to March 31, 1929

BY

VICTOR C. STECHSCHULTE

BULLETIN OF THE SEISMOGRAPHIC STATIONS, Vol. 2, No. 17

UNIVERSITY OF CALIFORNIA PRESS
BERKELEY, CALIFORNIA

This book was donated to the ISC
from the collection of
Professor Nicolas N Ambraseys
1929-2012



THE REGISTRATION OF EARTHQUAKES
AT THE BERKELEY STATION

AND

AT THE LICK OBSERVATORY STATION

FROM

OCTOBER 1, 1928, TO MARCH 31, 1929

BY

VICTOR C. STECHSCHULTE

CONTENTS

	PAGE
Symbols and Notations Employed.....	332
The Berkeley Station.....	333
Constants.....	333
Tabulation of Shocks.....	334
The Lick Observatory Station.....	344
Constants.....	344
Tabulation of Shocks.....	315

UNIVERSITY OF CALIFORNIA PUBLICATIONS
BULLETIN OF THE SEISMOGRAPHIC STATIONS

Vol. 2, No. 17, pp. 331-360

Issued October 31, 1929

UNIVERSITY OF CALIFORNIA PRESS
BERKELEY, CALIFORNIA

CAMBRIDGE UNIVERSITY PRESS
LONDON, ENGLAND

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:

$\overline{S_c P_c S}$ Waves which have penetrated the core, having been transverse before entering and after leaving the core, and longitudinal within the core.

$\overline{P_c P_c} \overline{P_c P}$ 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:

$$\varphi = 37^\circ 52' 15.9'' \text{ N Lat.}$$

$$\lambda = 122^\circ 15' 36.6'' \text{ W from Greenwich.}$$

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						
June 22	Bosch-Omori 100 kg.	E	35	11.8	5	0.002
	"	N	44	14.3	5	0.002
	Wiechert 80 kg.	Z	40	5.4	5	0.003
1929						
Feb. 6	Bosch-Omori 100 kg.	E	41	11.7	4	0.002
	"	N	42	13.9	3	0.002
	Wiechert 80 kg.	Z	40	5.5	5	0.002

BERKELEY STATION

No.	Date	Charac- ter	Phase	Time G. M. C. T.			Period	Amplitude			Remarks		
				h.	m.	s.		μ	μ	μ			
1	1928 Oct. 2	Iv	?ePz	19	02	42	2				Beginning obscure. Reported felt in San Diego.		
			eN	19	02	51							
			eEZ	19	03	51							
			eN	19	04	14							
			eE	19	04	15							
			ez	19	04	32						3	$\pm < 3$
			eN	19	04	34							
			eN	19	04	41						4	
eLE	19	06	43										
2	Oct. 9	IIIr	iPENZ	3	07	28	25				Epicenter 15° N, 97° W. 3500 km.		
			eSNE	3	12	34							
			iSN	3	12	37							
			iN	3	12	47							
			iE	3	12	50							
			ez	3	14	51							
			eN	3	14	56							
			iE	3	15	00							
			eLN	3	15	46						14	+150 -250
			iLE	3	15	47							
			iz	3	18	53							
			iMN	3	19	14							
			eN	3	25	04							
			eN	3	27	40							
3	Oct. 19	I	ez	10	30	37							
			ez		44	42							
			eLN?		58	3							
			eLE?		59	3							
4	Oct. 25	Ir	?ePEN	12	40	44					Nicaragua.		
			ePz		40	46							
			ez		42	39							
			eNZ		46	58							
			?ez		47	46							
			eN		50	52							
			eL		53	6							
			eM		55	6							
F	13	18	\pm										
5	Oct. 30	I	ePN?	00	04	07							
			eSN	00	05	23							
			eE		06	15							

BERKELEY STATION

No.	Date	Charac- ter	Phase	Time G. M. C. T.			Period	Amplitude			Remarks		
				h.	m.	s.		μ	μ	μ			
6	1928 Oct. 30	I	ez	4	34	09	30						
			eE		35	46							
			eN		35	48							
			eE		38	00							
			ez		40	35						4	
			eN		40	51						6	4
			eE		40	55							
			ez		42	08							
			eN		42	15							
			eLz?		43	45							
			7	Nov. 1	IIr	iPENZ						4	17
ePR ₁	4	17				19							
eN	4	18				40							
eSE	4	20				25							
eSNZ	4	20				26							
iE	4	22				08	6	+ 12					
eLN	4	22				08							
iE	4	22				22	3	+ 15					
iz	4	22				35							
iz	4	22				48							
iEP ₂ S?	4	25				23	6	+ 40					
ez	4	25	26	6	+20	25							
iN	4	26	42	5									
F	5	20	\pm										
8	Nov. 6	Iu	iPz	4	17	42	6				Nov. 1 to Nov. 7, heavy microseisms		
			eEN	4	17	44							
			eSE?	4	29	19							
			eEN	4	40	49							
9	Nov. 7	Iv	EPN	2	14	24							
			eSN	2	14	50							
10	Nov. 20	Iu	?ez	20	47	01					8600 km.		
			iz	20	47	10							
			eN	20	47	19							
			iz	20	47	23							
			iSN	20	56	57							
			eSEZ	20	56	58						9	+ 10
			ez	20	58	17							
eN	20	58	19										

BERKELEY STATION

No	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						AE	AN	Az	
10	1923 Nov. 20 (cont'd)	Iu	e _{ESR₂?}	h. m. s.		μ	μ	μ	
			e _N	21 02 13					
			e _{LEN}	21 07 18					
			e _{ME}	21 13 2					
11	Nov. 28	Iu	?e _N	11 03 33					Slight trace.
			?e _E	11 03 42					
			e _Z	11 03 49					
			e _{SEnz}	11 12 43					
			e _Z	11 19 13					
			e _E	11 46 43					
12	Nov. 29	Iu	e _{PN}	18 12 41	17				
			e _{PZ}	18 12 47					
			e _N	18 15 53					
			e _Z	18 15 57					
			e _{Sz?}	18 23 03					
			e _{SNE}	18 23 12					
			e _Z	18 24 55					
			e _N	18 37 59					
			e _{LNE}	18 40 02					
			e _{LZ}	18 40 07					
			e _{ME}	18 43 7					
			e _{MN}	18 44.1					
			13	Dec. 1					
e _{PN}	4 18 54								
e _{PE}	4 18 56								
i _Z	4 19 01								
e _N	4 19 02								
i _N	4 19 50								
e _N	4 24 34								
i _{SN}	4 29 24								
e _E	4 29 24								
e _{SE}	4 29 28								
i _N	4 29 48								
i _E	4 29 56								
i _N	4 30 14								
e _Z	4 30 40								
i _E	4 30 42								
i _Z	4 31 22								
i _E	4 31 30								

BERKELEY STATION

No	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						AE	AN	Az	
13	1923 Dec. 1 (cont'd)	IIu	i _E	h. m. s.	20	- 50	μ	μ	
			e _N	4 35 16					
			e _{LNE}	4 38 50					
			i _{MN}	4 44 50					
			M _{IN}	4 49 50					
14	Dec. 2	I	?e _{PZ}	4 50.1	18				-2500
			e _{PN}	4 33 05					
			e _Z	4 33 14					
			e _{SE}	4 33 17					
			i _N	4 43 34					
			e _Z	4 43 38					
			e _N	4 43 38					
			e _N	4 43 38					
			e _N	4 59.9					
			e _N	4 59.9					
15	Dec. 7	Iu	?e _Z	5 01.4	28				Seems to be evidence of an aftershock. Trace very faint.
			e _E	5 01.4					
			e _{LE}	5 07.3					
			e _N	5 07.3					
			e _N	5 56					
16	Dec. 12	Iu	e _{PZ}	9 57 15	9				± 8
			e _E	10 01 45					
			e _{LE}	10 09 15					
			e _{PZ}	20 32 11					
			e _E	20 32 46					
			e _{SNE}	20 42 37					
			e _{LNE}	20 59 39					
17	Dec. 19	Iu	e _{MN}	18 43 38	10				Seems to be evidence of an aftershock. Trace very faint.
			e _N	18 43 38					
			e _N	18 43 38					
			e _N	18 43 38					
			e _N	18 43 38					
			e _N	18 43 38					
			e _N	18 43 38					
			e _N	18 43 38					
			e _N	18 43 38					
			e _N	18 43 38					
18	Dec. 28	Iu	e _{PZ}	21 05 31	17				U. S. C. G. S. epicen- ter 7° N, 128° E.
			e _{MNE}	21 06 30					
			F	21 30±					
			e _{PZ}	11 55.4					
			e _N	11 56 26					
			e _{NE}	12 01 54					
			e _Z	12 04 49					
			e _Z	12 07 05					
			e _Z	12 08 12					
			e _N	12 10 04					
19	Dec. 28	Iu	e _{LNE}	12 20.2	21				Feeble trace.
			e _{LZ}	12 24.4					
			e _{MZ}	12 29.2					
			i _Z	12 34.4					
			e _Z	12 58.4					
			e _Z	12 58.4					
20	Dec. 28	Iu	?e _Z	14 38.0	20	10			Feeble trace.
			e _E	15 07 30					
			e _Z	15 08 30					
24	Dec. 28	Iu	e _Z	15 08 30	24				Feeble trace.
			e _Z	15 08 30					
			e _Z	15 08 30					

BERKELEY STATION

No.	Date	Character	Phase	Time			Period	Amplitude			Remarks				
				G.	M.	C. T.		A _E	A _N	A _Z					
				h.	m.	s.	s.	μ	μ	μ					
19	1929 Jan. 5	Iv	?e _N	00	37	35	4								
			e _{NZ}	00	37	55									
			e _E	00	38	11									
20	Jan. 13	IIr	iP _{ENZ}	00	12	52	10				Coast of Kamchatka. J. S. A. epicenter 55° N, 156° E. Notably large S, the first impulses hav- ing the largest am- plitudes on the record.				
			i _{EZ}	00	13	23									
			i _N	00	13	30									
			i _E	00	14	21									
			e _N	00	14	29	8								
			i _{SE}	00	20	43		20	-500						
			e _{SZ}	00	20	43				+750					
			i _{SN}	00	20	45	14					≠ 80			
			i _E	00	22	28									
			i _N	00	22	31									
			i _E	00	24	29	12					- 25			
												+100			
						i _{NE}	00	27	19	15					≠ 180
						i _Z	00	27	54						
			i _E	00	29	31									
			e _{LN}	00	30	20									
			i _Z	00	32	21	21								
			i _E	00	38	07									
21	Jan. 17	Iu	eP _Z	11	55	59	40				Destructive in Cu- mana, Venezuela.				
			eP _N	11	55	54									
			eS _E ?	12	03	44									
			e _E	12	13	36									
			eL _{NE}	12	18	7		20							
			eL _Z ?	12	20	6									
			e _N	12	24	3									
F	12	50	±												
22	Jan. 21	Ir	iP _Z	10	37	11					Felt in Fairbanks, Alaska. U. S. C. G. S. epi- center 64° N, 152° W. 3500 km.				
			eP _{EN}	10	37	11									
			e _Z	10	37	17									
			e _E	10	38	02									
			e _Z	10	38	11									
			e _Z	10	42	15									
			e _N	10	43	56									
			eL _N	10	46	10									
			e _N	10	49	30									
			e _E	10	50	0									

BERKELEY STATION

No.	Date	Character	Phase	Time			Period	Amplitude			Remarks	
				G.	M.	C. T.		A _E	A _N	A _Z		
				h.	m.	s.	s.	μ	μ	μ		
23	1929 Jan. 24	IIr	?e _Z	20	43	52	5				4250 km. J. S. A. epicenter 12°3 N, 90°3 W.	
			iP _Z	20	43	59						
			eP _{NE}	20	43	59						
			ePR _{2E}	20	45	43						
			ePR _{2Z}	20	45	44						
			eS _{NE}	20	49	51		7				
			i _N	20	50	01						
			i _E	20	50	05						
			eSR _{1N}	20	52	29						
			eSR _{2N}	20	53	13						
			eSR _{3E}	20	53	37						
			eL _{NE}	20	54	35						
			eL _Z	20	55	30						
M _{1E}	21	00	29	15	+150							
M _{2E}	21	02	49	15	+150							
M _{1N}	21	03	09	14			-140					
24	Jan. 27	Iu	e _E	16	02	10						
			e _E	16	11	11						
			e _E	16	20	55						
			e _E	16	49							
25	Jan. 28	Iu	e _N	22	18	6						
			e _Z	22	18	8						
			e _E	22	19	2						
26	Jan. 31	Iu	e _Z	18	12	48	3				Very slight trace.	
			e _N	18	13	02						
			e _E	18	28	32						
			e _Z	18	29	9		13				
?e _{NZ}	18	33	4									
27	Feb. 1	IIu	?e _Z	17	28	05					Central Asia.	
			e _Z	17	32	19						
			e _N	17	32	20						
			i _Z	17	33	34		3				± 4
			e _Z	17	36	01		4				≠ 2
			e _{NZ}	17	36	51						
			i _{NE}	17	40	19						
			eS _Z ?	17	42	35						
			e _N	17	43	36						
			eL _E	17	57	4						
			eL _{NZ}	17	58	4						

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks		
						AE	AN	Az			
28	1929 Feb. 2	IIu	ez	h. m. s. 00 17 46	8	μ	μ	μ	U. S. C. G. S. epicen- ter 2° S, 24° W.		
			ee	00 17 56							
			ez	00 25 34							
			ene	00 27 36							
			ie	00 32 32							
			en	00 39 30							
			ee	00 50 20						28	60
			ez	00 50 25							
			en	00 50 40							
			F	1 30±							
29	Feb. 10	Irr	ePN	15 46 20	3				J. S. A. and U. S. C. G. S. epicenter 11°7 N, 90°8 W.		
			iPz	15 46 26							
			ePE	15 46 26							
			ePR _{1Z}	15 46 48							
			eSEZ	15 52 11							
			eSN	15 52 12							
			ee	15 55 27							
			eLE	15 57 33							
			eMz	16 01.2						18	
			eMN	16 01.6						18	
30	Feb. 13	Id	eENZ	4 56 25				Very slight.			
			ien	4 56 27							
31	Feb. 13	Iu	?ee	22 21 18							
			?ez	22 29 13							
			ee	22 31 53							
			eLz	22 35					24		
32	Feb. 15	Iu	ez	8 12 04							
			ene	8 12 08							
			en	8 15 33							
			eNE	8 22 16							
			eLENZ	8 25							
33	Feb. 16	I	ez	20 07 42							
			en	20 08 12							
			ee	20 09 17							
			eez	20 13 17							
			?ee	20 17 02							

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						AE	AN	Az	
34	1929 Feb. 22	IIu	ePz	h. m. s. 20 53 35	s.	μ	μ	μ	8450 km.
			iPz	20 53 39					
			ePE	20 53 41					
			ePN	20 53 43					
			eSEN	21 03 25					
			eSR _{2E}	21 12 01					
			eSR _{3Z}	21 13 52					
			eLE	21 18.0					
			eLNZ	21 18.6					
			eME	21 22.0					
			35	Feb. 26					
ene	9 07 31								
ePR _{1N}	9 08 11								
ee	9 08 1								
eSE	9 12 27								
eSN	9 12 29								
ene	9 14 48								
eEN	9 15 43								
iNS _c S?	9 17 33								
ine	9 18 05								
ee	9 25 11								
F	10 00±								
36	Mar. 1	IIr	ePN	7 34 47					1900 km. Off Cali- fornia-Oregon coast. J. S. A. epicenter 54°1 N, 130°7 W. U. S. C. G. S. 53° N, 132° W.
			iPz	7 34 48					
			ee	7 34 59					
			inz	7 35 00					
			eSE	7 37 46					
			eSz	7 37 47					
			iSR _{1N}	7 38 08					
			eSR _{2Z}	7 38 42					
			ie	7 39 00					
			eLN	7 39 30					
eLE	7 39 35								
37	Mar. 1	Iu	en	8 59 26					
			ee	9 00 06					
			en	9 01 14					
38	Mar. 3	Iv	ePE	1 10 26				300 km.	
			enZ	1 10 28					
			en	1 10 40					

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
38	1929 Mar. 3 (cont'd)	Iv	ez	1	10	41					
			in	1	10	48					
			ez	1	11	04					
			iS _{NE}	1	11	05					
			ez	1	11	17					
			eN	1	11	37					
			eL _N	1	11	57					
39	Mar. 7	IIIr	iP _N	1	41	38	6?	+ 20		At end of Aleutian Islands chain.	
			iP _E	1	41	38					
			iE	1	43	38					
			iz	1	43	53					
			eN	1	46	57					
			iS _{NE}	1	47	18					
			iz	1	47	42					
			in	1	47	59	16				
			iN _E	1	50	04	12				
			M _{IN}	1	51	07	12	- 65			
			in	1	51	27	15	- 35			
			ieZ	1	51	27					
			iz	1	52	42					
			in	1	54	06					
			in	2	05	27					
40	Mar. 9	IIu	eN	6	02	2	9			Entrance of wave with period of 10 sec.	
			?ez	6	02	2					
			?cN	11	04	49					
			?cN	11	08	41					
			eNZ	11	09	19					
			eN	11	10	34					
			?cNE	11	14	54					
			eN	11	17	43					
			eE	11	20	39					
			eE	11	32	3	40				
41	Mar. 12	Iv	eL _{ENZ}	11	36	6	40			Epicenter near Kern Lake, Calif.	
			eN	11	39	8					
			eM _{NZ}	11	44	3	20				
			eN	11	59	3					
			eN	2	41	10					
			iz	2	41	14	2				
			eE	2	41	24					
			eE	2	41	27	2				
			eN	2	41	30					
			eN	2	41	30					

BERKELEY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks			
				h.	m.	s.		AE	AN	Az				
42	1929 Mar. 13	Iv	?ez	23	11	57				Epicenter near Idria, California. 220 km. R. F. VI at Idria. Felt slightly at Fresno and other places in the San Joaquin Valley.				
			ez	23	11	59								
			eNZ	23	12	01								
			ieZ	23	12	02								
			eE	23	12	17								
			iS _{EN}	23	12	29								
			iz	23	12	32								
			iEN	23	12	44								
			eN	23	12	53								
			43	Mar. 19	I	iP _Z	21	01	00					U. S. C. G. S. epicenter 12° N, 90° W.
						?eNE	21	01	00					
ez	21	02				0								
eN	21	11				26								
eL _{NE}	21	12				20								
eL _Z	21	13				30	30							
eM _N	21	15				40	18							
eE	21	22				0								
F	21	40				±								
44	Mar. 21	Ir				iP _Z	2	44	14				U. S. C. G. S. epicenter 12° N, 90° W.	
			eP _N	2	44	14								
			ez	2	45	31								
			iS _N	2	50	04	8							
			eS _{EZ}	2	50	1								
			iN _S S	2	54	32	8							
			eL _E	2	55	24								
			eL _N	2	55	34								
			eL _Z	2	57	0								
			eM _Z	2	59	0								
45	Mar. 28	I	iM _Z	2	59	0				Very feeble trace.				
			eE	2	59	44								
			eN	3	03	0								
			F	3	20	±								
			eE	3	25	0								
			eN	3	25	5								
			eNZ	3	29	0								
			eN	3	30	3								
			46	Mar. 31	I	eN	20	50	8		8			Very feeble trace.

THE LICK OBSERVATORY STATION

CONSTANTS

CONSTANTS OF THE STATION

Latitude and longitude of the center of the seismographic room:

$$\varphi = 37^\circ 20' 24.5'' \text{ N Lat.}$$

$$\lambda = 121^\circ 38' 34'' \text{ W from Greenwich.}$$

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						
Aug. 9	Wiechert 160 kg.	E	86	7.6	8.7	0.003
	" "	N	75	8.1	9.5	0.003
	" 80 kg.	Z	62	3.1	8	0.001
1929						
Mar. 13	Wiechert 160 kg.	E	97	6.4	9.7	0.004
	" "	N	88	6.3	4.5
	" 80 kg.	Z	56	3.1	7	0.001

The constants of the two horizontal Wood-Anderson Seismometers in operation at the Lick Observatory Station have not been determined in the period covered by this Bulletin.



LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time			Period	Amplitude			Remarks
				G.	M.	T.		A _E	A _N	A _Z	
	1928			h.	m.	s.		μ	μ	μ	
1	Oct. 2	Id	eP _E	17	28	12					
			e _E	17	28	14					
2	Oct. 2	Iv	eP _E	19	02	09					
			e _{EZ}	19	02	22					
			e _E	19	02	58					
			iS _Z	19	03	51					
			e _E	19	03	58					
			F	19	12±						
3	Oct. 5	Id	e _E	11	32	49					
			eS _E	11	32	51					
4	Oct. 6	Id	eP _E	14	12	08					
			eS _E	14	12	18					
			i _E	14	12	19					
			e _E	14	12	55					
			F	14	13	5					
5	Oct. 9	IIIr	eP _E	3	07	20					
			iP _N	3	07	22					
			eP _Z	3	07	22					
			iN _E	3	07	28					
			i _E	3	08	30					
			eS _{NZ}	3	12	23	18				
			iS _N	3	12	27	35				
			e _Z	3	12	58	27				
			eL _E	3	15	36				+1080	
			eL _N	3	15	56				-1250	
			F	4	45±						
6	Oct. 10	Id	iP _{EN}	22	32	17					
			F	22	35						
7	Oct. 12	Id	iP _{EN}	23	03	16					
			iS _{EN}	23	03	21					
			F	23	04.2						
8	Oct. 13	Id	iP _{EN}	8	15	16					
			iS _{EN}	8	15	17					
9	Oct. 13	Id	iP _{EN}	10	48	27					
			iS _{EN}	10	48	28					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						AE	AN	Az	
	1928			h. m. s.	s.	μ	μ	μ	
10	Oct. 13	Id	iP _{EN} iS _{EN} F	11 02 38 11 02 47 11 04					
11	Oct. 15	I	eENZ iENZ iENZ iEN F	2 03 42 2 03 45 2 03 47 2 03 52 2 04 4					
12	Oct. 16	Iv	iP _E iP _N eNE iS _{EN} iE F	4 17 17 4 17 18 4 17 48 4 17 52 4 18 12 4 19.5±					
13	Oct. 17	I	iE F	17 29 59 17 30.3±					
14	Oct. 18	Id	iP _{EN} iS _{EN}	5 06 06 5 06 13					
15	Oct. 18	Id	iP _E iS _E	17 40 22 17 40 30					
16	Oct. 19	Iu	e	10 32					Slight trace of distant shock.
17	Oct. 25	Ir	eE eEZ eS _E eL _E F	12 40 36 12 40 41 12 46.6 12 52.6 13 30±	30				Nicaragua.
18	Oct. 27	Id	iP _E iS _E	10 05 27 10 05 29					Very slight.
19	Oct. 27	Id	iEN iEN	11 28 33 11 28 35					
20	Oct. 30	I	?eE eE eE	4 34 34 4 38 24 4 40 04					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.	Period	Amplitude			Remarks
						AE	AN	Az	
	1928			h. m. s.	s.	μ	μ	μ	
21	Nov. 1	I	eP _N eS _N eP _N ? eS _N ?	00 01 59 00 03 33 00 02 40 00 04 02					Apparently a new shock.
22	Nov. 1	IIr	eP _{EN} eP _Z iN iS _{EN} iE eEN iE M _{1E} M _{1N} M _{2E} iE F	4 16 54 4 16 54 4 17 58 4 20 18 4 21 27 4 21 58 4 22 01 4 22 04 4 22 22 4 22 37 4 26 46 5 00±	9 3				With 3 sec. period superposed.
23	Nov. 4	Id	eP _E iE iEN iS _{EN} iE iE F	17 21 14 17 21 18 17 21 24 17 21 26 17 21 29 17 21 31 17 22.4±					
24	Nov. 4	Id	eEN iEN iE F	22 49 41 22 49 49 22 49 51 22 50.3					
25	Nov. 5	Id	eN iE iEN	3 30 58 3 31 04 3 31 06					
26	Nov. 6	I	eP _Z eEN eS _E ? eL _E eEZ	4 17 42 4 17 45 4 29 18 4 41.5 4 45					Long series of sinusoidal waves.

LICK OBSERVATORY STATION

No.	Date	Charac- ter	Phase	Time G. M. C. T.			Period s.	Amplitude			Remarks
				h.	m.	s.		A _E	A _N	A _Z	
27	1928 Nov. 7	Iv	e _{EN}	2	13	39		μ	μ	μ	
			i _{PE}	2	13	41					
			e _{PN}	2	13	42					
			i _{EN}	2	13	55					
			i _E	2	14	04					
			i _{SEN}	2	14	16					
			i _N	2	14	20					
28	Nov. 17	Id	e _E	10	43	20					Followed by two very slight shocks at 2:16.5 and 2:17.5.
			i _{EN}	10	43	21					
			i _{SEN}	10	43	24					
			i _E	10	43	25					
29	Nov. 18	I	e _{EN}	6	32	00					
			e _{SEN?}	6	32	09					
30	Nov. 18	Id	i _{PN}	18	07	37	5				40 km.
			e _E	18	07	37					
			i _{SEN}	18	07	43					
			i _N	18	07	45					
			i _E	18	07	48					
			F	18	08	5					
31	Nov. 20	Id	i _{PE}	16	14	14					
			i _{SE}	16	14	16					
32	Nov. 20	Id	i _{PE}	16	21	57					Largest of this group of shocks. All slight.
			i _{SE}	16	21	59					
33	Nov. 20	Id	i _E	16	22	04					
34	Nov. 20	Id	i _{PE}	16	23	47					
			i _{SE}	16	23	49					
35	Nov. 20	Id	i _{PE}	16	39	18					
			i _{SE}	16	39	20					
36	Nov. 20	Iu	e _{PENZ}	20	47	04					Northern Chile.
			e _E	20	48	46					
			e _{SEN}	20	56	48					
			e _E	21	02	0					
37	Nov. 22	Id	e _{PEN}	7	30	44					
			i _E	7	30	46					
			i _{SEN}	7	30	50					
			i _E	7	30	54					
			F	7	32	±					

LICK OBSERVATORY STATION

No.	Date	Charac- ter	Phase	Time G. M. C. T.			Period s.	Amplitude			Remarks
				h.	m.	s.		A _E	A _N	A _Z	
38	1928 Nov. 22	Iu	e _E	9	33	38		μ	μ	μ	
39	Nov. 28	Iu	e _E	1	37	7	18				
			e _E	1	39	7		10			
			e _E	1	42	7					
40	Nov. 28	I	e _E	11	02	59					
			e _E	11	12	29					
			e _E	11	40	6					
41	Nov. 29	Iu	e _E	18	23	09					
			e _{LE?}	18	40	09					
			e _E	18	45			18	+ 6		
42	Dec. 1	IIu	e _{PE}	4	18	47					Chile.
			e _{PZ}	4	18	52					
			i _E	4	19	00					
			e _E	4	23	46		3			
			e _{SE}	4	28	56					
			i _{SEZ}	4	29	32		6			
			i _E	4	29	53					
			i _E	4	30	52		9			
			i _E	4	35	12					
			e _{LZ}	4	47	20		21			
			i _Z	4	47	40					
e _{MEZ}	4	49	40	18							
43	Dec. 2	Iu	e _{PEZ}	4	33	16					Chile.
			e _{SE}	4	43	28					
			i _E	4	43	51		8			
			e _E	4	44	15			6		
44	Dec. 5	Iv	e _{PEN}	3	43	33					220 km.
			e _E	3	43	36					
			e _{SEN}	3	44	05					
			F	3	44	7					
45	Dec. 5	I	e _{EN}	21	04	0					
46	Dec. 5	Iv	e _{PEN}	21	35	04					
			i _{SEN}	21	35	33					
			?i _N	21	35	36					
			i _E	21	35	47					
			F	21	36	2±					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period s.	Amplitude			Remarks
				h.	m.	s.		A _E μ	A _N μ	A _Z μ	
47	1928 Dec. 7	Iu	ee eL _E ?	9	49	7					
48	Dec. 7	Id	iP _{EN} i _{EN}	21	54	22				Record too faint to determine S.	
49	Dec. 9	I	ee eS _E	3	04	17					
50	Dec. 10	Iv	eP _{EN} iS _N iS _E i _E i _S	8	30	36				140 km.	
51	Dec. 10	I	ee i _{EN} F	15	16	51				May be 2 or 3 shocks close together.	
52	Dec. 10	Iv	ee eS _E	19	04	58					
53	Dec. 10	Iv	eP _{EN} i _E iS _{EN} i _N i _N F	19	26	47				Evidence of another slight shock at 19:42, but phases indistinct.	
54	Dec. 12	I	eP _{EN} eS _{EN} ? eL _{EN} eM _N	20	32	20					
55	Dec. 19	Iu	ee e _N e _Z e _N eL _N eL _E e _Z eM _{IV}	11	54	51				A sinusoidal group.	

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period s.	Amplitude			Remarks
				h.	m.	s.		A _E μ	A _N μ	A _Z μ	
56	1928 Dec. 26	I	i _{EN} ee e _N	21	40	04					
57	Dec. 28	I	e _N i _{EN} i _{EN} i _E	12	50	57					
58	Dec. 28	Iu	ee ee ee	15	07	34	30				
59	Dec. 29	I	e e	22	15	30					
60	Dec. 30	Id	iP _{EN} i _S i _{EN} i _E i F	00	35	11					
61	Dec. 30	Id	iP _{EN} i _N iS _N i F	4	10	33					
62	Dec. 30	I	e _N i _N	5	43	12					
63	1929 Jan. 1	Id	i _{EN} e _N i _E	9	26	20					
64	Jan. 2	Id	iP _{EN} iS _{EN} ee	8	02	24					
65	Jan. 2	I	i _N	15	26	35					
66	Jan. 3	Id	e _{EN} i _{EN}	18	29	19					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
67	1929 Jan. 5	Iv	iP _N	00	36	55		μ	μ	μ	
			i _N	00	37	11					
			i _E	00	37	12					
			i _N	00	37	20					
			i _{EN}	00	37	24					
			i _N	00	37	38					
			i _{EN}	00	37	51					
			i _{NZ}	00	37	59					
			i _E	00	38	15					
			F	00	47	±					
68	Jan. 7	Id	iP _E	11	59	29					First of a group of very slight shocks.
			iS _E	11	59	31					
69	Jan. 7	Id	iP _E	11	59	37					
			iS _E	11	59	39					
70	Jan. 7	Id	iP _E	12	00	51					
			iS _E	12	00	53					
			i _E	12	00	57					
71	Jan. 7	Id	iP _E	12	01	19					
			iS _E	12	01	21					
72	Jan. 8	Id	i _E	3	49	41					
			i _E	3	49	42					
73	Jan. 11	Iv	e _E	8	23	40					160 km.
			e _E	8	23	59					
			iS _E	8	24	05					
			i _E	8	24	12					
74	Jan. 12	Iv	e _E	20	30	08					
			e _E	20	30	16					
			i _E	20	30	18					
			i _E	20	30	20					
75	Jan. 13	IIu	eP _{EZ}	00	12	54	15?	≈280			Remarkably large S.
			i _{EZ}	00	12	58					
			i _{EZ}	00	13	29					
			i _{EZ}	00	13	36					
			i _E	00	16	30					
			eS _E	00	20	50					
			iS _E	00	20	53					



LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
75	1929 Jan. 13 (cont'd)	IIu	i _E	00	22	26		μ	μ	μ	
			i _E	00	24	46					
			i _E	00	25	08					
			L _E	00	28	20					
76	Jan. 14	Id	iP _E	5	23	08					
			iS _E	5	23	10					
			i	5	23	14					
			i	5	23	16					
77	Jan. 15	Id	iP _{ENZ}	16	03	45					
			iS _{ENZ}	16	03	47					
			i _{EN}	16	03	51					
78	Jan. 17	Iu	eP _{EN}	11	55	34	20				6500 km.
			e _E	11	56	10					
			e _E	12	01	27					
			eS _N	12	03	37					
			e _N	12	04	15					
			e _N	12	19	44					
79	Jan. 21	Ir	iP _{EN}	10	37	17	12				3500 km.
			e _E	10	38	32					
			e _E	10	40	05					
			eS _N ?	10	42	21					
			e _N	10	44	28					
			e _N	10	49	29					
80	Jan. 22	Id	iP _N	23	23	57					Strongest of group. All very slight.
			i	23	24	09					
81	Jan. 22	Id	iP _N	23	24	26					
			iS _N	23	24	27.5					
82	Jan. 22	Id	eP _N	23	25	44					
			i _N	23	25	46					
			i _N	23	25	47.5					
83	Jan. 22	Id	eP _N	23	26	10					
			i _N	23	26	11					
			i _N	23	26	12.5					
84	Jan. 22	Id	i _N	23	26	58					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks
				h.	m.	s.		A _E	A _N	A _Z	
85	1929 Jan. 22	Id	e _N	23	28	31		μ	μ	μ	
			i _N	23	28	32					
			i _N	23	28	33.5					
86	Jan. 22	Id	e _N	23	29	52					
			i _N	23	29	53.5					
			i _N	23	29	55					
87	Jan. 22	Id	i _N	23	55	50					
			i _N	23	55	51.5					
88	Jan. 24	IIr	eP _N	20	43	49					4250 km.
			i _Z	20	43	54					
			i _Z	20	44	06					
			e _N	20	45	08					
			e _N	20	47	08					
			eS _{NZ}	20	49	38					
			eL _N	20	54	30					
eM _N	20	57	16								
89	Jan. 27	I	e _N	00	48	20					
			i _N	00	48	26					
			i _N	00	48	38					
			i _N	00	48	46					
90	Jan. 27	I	e _N	3	55	27					
			e _N	3	55	49					
			e _N	3	56	26					
			e _N	3	56	50					
91	Jan. 27	Iu	e _{EN}	16	19	30					
92	Jan. 28	I	e _N	3	20	19					
			i _N	3	20	41					
			i _N	3	20	43					
93	Jan. 28	I	eP _N	12	29	46					
			i _N	12	29	53					
			i _N	12	30	03					
94	Jan. 30	Id	e _N	22	12	23					
			i _N	22	12	34					
			i	22	12	36					
			F	22	13	7					



LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks
				h.	m.	s.		A _E	A _N	A _Z	
95	1929 Jan. 31	Iu	e _{EN}	18	12	42		μ	μ	μ	
			eL _N ?	18	27	2					
96	Feb. 1	Iu	e _N	17	28	28					Beginning obscured by microseisms.
			e _N	17	32	37					
			e _N	17	43	2					
97	Feb. 1	I	e _N	22	52	34					Seismic?
			e _N	22	53	10					
			e _N	22	53	20					
98	Feb. 2	Iu	?e _N	00	14	11				45	
			e _N	00	18	22					
			e _N	00	31	2					
			e _L	00	42	2					
			e _N	00	50	2					
99	Feb. 5	Id	iP _N	20	05	00					15 km.
			iS _N	20	05	03					
			i _N	20	05	06					
			i _N	20	05	07					
			F	20	05	8					
100	Feb. 8	Iu	e _E	2	30					Very slight trace.	
101	Feb. 10	Ir	iP _N	15	46	20					
			eS _N	15	52	01					
			eL _N	15	57	06					
102	Feb. 13	I	e _{EN}	4	55	57					
			i _N	4	55	58					
			i _E	4	56	00					
			i _E	4	56	05					
			iS _{EN}	4	56	11					
			i _E	4	56	16					
			i _N	4	56	17					
F	4	58	5								
103	Feb. 13	Ir	e _N	22	20	36					
			e _N	22	26	17					
			e _N	22	30	47					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period s.	Amplitude μ			Remarks
				h.	m.	s.		A _E	A _N	A _Z	
104	Feb. 15	Ir	e _N	8	12	03					
			e _N	8	15	32					
			e _E	8	18	05					
			eL _{EN}	8	24	5					
			e _E	8	38						
			F	8	45±						
105	Feb. 16	Iu	e	20	06						
106	Feb. 18	I	e _N	3	37	03					
			e _N	3	37	06					
107	Feb. 18	Id	iP _N	7	33	08					
			iS _N	7	33	10					
108	Feb. 19	Id	eP _E	7	24	46					
			i _E	7	24	47					
			i _E	7	24	47.5					
109	Feb. 20	Iu	e _N	21	15	07					
			e _N	21	16	03					
			e _N	21	24	7					
110	Feb. 22	Iu	eP _Z	20	52	07				8600 km.	
			e _Z	20	52	22					
			e _E	20	53	32					
			e _N	20	53	33					
			e _E	20	59	17					
			e _{EN}	21	03	10					
111	Feb. 26	Ir	eP _{EN}	9	07	19					
			e _Z	9	07	31					
			i _E	9	08	30					
			eS _{EN}	9	12	39					
			eL _Z	9	15	8					
			eL _E	9	16	4					
			eE _{S_cS?}	9	17	43					
112	Feb. 27	Id	iP _{EN}	17	44	38					
			iS _{EN}	17	44	39					
			i _{EN}	17	44	42					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period s.	Amplitude μ			Remarks
				h.	m.	s.		A _E	A _N	A _Z	
113	Mar. 1	IIr	eP _N	7	34	53				1800 km.	
			eP _E	7	34	57					
			eS _N	7	38	14					
			eS _E	7	38	17					
			eL _N	7	40						
			eL _E	7	40.2		8				
114	Mar. 1	Id	iP _E	8	10	18					
			iS _{EN}	8	10	20					
			i _E	8	10	29					
			i _E	8	10	30					
115	Mar. 1	I	e _N	8	56	4					
116	Mar. 2	Id	e _{EN}	12	17	54					
			e _E	12	17	57					
			i _N	12	17	57					
			i _N	12	17	58					
			i _N	12	18	01					
117	Mar. 3	Iv	e _{EN}	1	10	14					
			i _{EN}	1	10	15					
			i _E	1	10	17					
			i _N	1	10	21					
			i _E	1	10	25					
			i _E	1	10	36					
			i _{EN}	1	10	41					
			e _{EN}	1	26	27				Apparently a very slight aftershock.	
e _{EN}	1	26	37								
118	Mar. 4	I	e _{EN}	13	47	10					
			i _{EN}	13	47	23					
			i _{EN}	13	47	26					
			i _E	13	47	31					
119	Mar. 7	IIIr	iP _{EZ}	1	41	46				N not working well.	
			i _E	1	41	51					
			i _E	1	42	02					
			i _E	1	42	51					
			i _Z	1	43	10					
			i _E	1	44	27					
			eS _Z	1	47	27	3			A group of short period waves.	

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
119	Mar. 7 (cont'd)	IIIr	iSE	1	47	32	20	μ	μ	μ	
			iE	1	48	39					
			iE	1	48	36					
			iLE	1	49	6					
			iM	1	50	7					
			iz	1	52	24					
			ez	1	53	09					
			iE	1	53	12					
120	Mar. 9	Iu	?eE	11	05						
			eE	11	09.4						
			eE	11	11.3						
			eE	11	22 0						
			eLE	11	32 0						
			eME	11	39 0						
			eEZ	11	43 0						
			eE	11	58 5						
121	Mar. 12	I	iN	2	41	24					
			eE	2	41	25					
			iN	2	41	38					
			iN	2	41	49					
122	Mar. 13	Iv	eEN	2	23	56					
			iE	2	23	57					
			iE	2	24	06					
			iEN	2	24	12					
			iEN	2	24	36					
123	Mar. 13	Iv	iEN	23	11	46				140 km. Epicenter near Idria, Calif.	
			iEN	23	11	48					
			iEN	23	11	51					
			iEN	23	11	57					
			iSEN	23	12	05					
			iN	23	12	34					
			iEN	23	12	47					
F	23	19±									
124	Mar. 15	I	eN	21	22	35					
			eEN	21	22	45					
			eE	21	22	55					
125	Mar. 15	I	e	21	42	25					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time G. M. C. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
126	Mar. 15	Id	iPEN	23	22	26		μ	μ	μ	
			iSE	23	22	28					
			iE	23	22	30					
			iE	23	22	33					
127	Mar. 17	I	eEN	17	52	45					
			iE	17	52	49					
			iEN	17	52	55					
			iE	17	53	09					
			iE	17	53	11					
128	Mar. 17	Id	eEN	22	15	06					
			iSEN	22	15	16					
			iEN	22	15	18					
			iEN	22	15	21					
			iE	22	15	47					
129	Mar. 18	Id	iPEN	1	28	38					
			iSEN	1	28	42					
			iN	1	28	44					
130	Mar. 19	I	ePEN	21	00	53					
			ePz	21	00	58					
			iN	21	01	57					
			eSN?	21	07	05					
			eLN	21	12	10					
131	Mar. 20	Id	iPEN	11	48	50					
			iSEN	11	48	51					
132	Mar. 20	Id	iN	13	56	39					
133	Mar. 21	Ir	iPN	2	44	10					
			ePE	2	44	11					
			eSEN	2	49	51					
			eN	2	54	26					
			eLE	2	55	2					
			eLN	2	55	5					
			eMN	2	58	6					
134	Mar. 21	Id	iPEN	20	48	01	16				
			iSEN	20	48	03					
			iEN	20	48	05					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time			Period	Amplitude			Remarks
				G.	M.	C. T.		A _E	A _N	A _Z	
				h.	m.	s.	s.	μ	μ	μ	
135	1929 Mar. 23	Id	iP _{EN}	13	08	00					A new shock.
			iS _{EN}	13	08	02					
			iE	13	08	04					
			iEN	13	08	18					
136	Mar. 23	Id	iP _{EN}	14	03	21					
			iS _{EN}	14	03	23					
			iEN	14	03	24					
137	Mar. 24	Id	iP _{EN}	14	49	13					
			iEN	14	49	15					
			iS _{EN}	14	49	17					
			iEN	14	49	19					
138	Mar. 28	Iu	eEN	3	25	00					
139	Mar. 31	Id	eP _E	23	38	03					
			iS _E	23	38	04					