

THE REGISTRATION OF EARTHQUAKES  
AT THE BERKELEY STATION

AND

AT THE LICK OBSERVATORY STATION

FROM

April 1, 1931, to September 30, 1931

BY

PERRY BYERLY

BULLETIN OF THE SEISMOGRAPHIC STATIONS, Vol. 3. No. 1

UNIVERSITY OF CALIFORNIA PRESS  
BERKELEY, CALIFORNIA

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### BULLETIN OF THE SEISMOGRAPHIC STATIONS

BERKELEY STATION, UNIVERSITY CAMPUS

LICK OBSERVATORY STATION, MOUNT HAMILTON, CALIFORNIA

Editor, **GEORGE D. LOUDERBACK.** Volumes 1 and 2 complete, Volume 3 in progress (1932-). Price per volume, \$5.00. Single numbers, 25 cents.

Beginning in January, 1912, the records of the two seismographic stations have been published for two six-month periods of a year, namely April 1 to September 30, and October 1 to March 31. A list is here printed as a guide to the *Bulletin* covering each respective period since the records have been kept.

VOLUME 1. 1912-1924

Records from October, 1910, to September, 1920 inclusive

#### THE REGISTRATION OF EARTHQUAKES—

##### AT THE BERKELEY STATION ONLY:

- No. 1. From October 30, 1910, to March 31, 1911.
- No. 2. From April 1 to September 30, 1911.

##### AT THE BERKELEY STATION AND THE LICK OBSERVATORY STATION:

- No. 3. From May 23 to September 30, 1911.
- No. 4. From October 1, 1911, to March 31, 1912.
- No. 5. From April 1 to September 30, 1912.
- No. 6. From October 1, 1912, to March 31, 1913.
- No. 7. From April 1 to September 30, 1913.
- No. 8. From October 1, 1913, to March 31, 1914.
- No. 9. From April 1, 1914, to September 30, 1914.
- No. 10. From October 1, 1914, to March 31, 1915.
- No. 11. From April 1, 1915, to September 30, 1915.
- No. 12. From October 1, 1915, to March 31, 1916.
- No. 13. From April 1, 1916, to September 30, 1916.
- No. 14. From October 1, 1916, to March 31, 1917.
- No. 15. From April 1, 1917, to September 30, 1917.
- No. 16. From October 1, 1917, to March 31, 1918.
- No. 17. From April 1, 1918, to September 30, 1918.
- No. 18. From October 1, 1918, to March 31, 1919.
- No. 19. From April 1, 1919, to September 30, 1919.
- No. 20. From October 1, 1919, to March 31, 1920.
- No. 21. From April 1, 1920, to September 30, 1920.



## THE REGISTRATION OF EARTHQUAKES AT THE BERKELEY STATION

AND

## AT THE LICK OBSERVATORY STATION

FROM

APRIL 1, 1931, TO SEPTEMBER 30, 1931

BY

PERRY BYERLY

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## 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<sub>n</sub> Waves n times reflected at the earth's surface.  
 S (undae secundae) Second phase, or second preliminary tremors (transverse).  
 SR<sub>n</sub> 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 <sub>c</sub> 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.

L (undae longae) Long waves of surface phase preceding M.  
 M (undae maximae) Shorter and more regular waves of large amplitude in the surface phase.

M<sub>n</sub> 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 traveled the horizontal portion of its path in the intermediate layer.

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 Trace amplitude measured from the media line, + earth motion toward east, north, or zenith, - toward west, south, or nadir.

A<sub>E</sub> E-W component of A.

A<sub>N</sub> N-S component of A.

A<sub>Z</sub> 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:

$\phi = 37^\circ 52' 15''$  N Lat.

$\lambda = 122^\circ 15' 36''$  W from Greenwich.

Time. All determinations are reduced to Greenwich mean time (Universal Time).

Altitude, 85 meters (280 feet) above mean sea level.

## CONSTANTS OF THE SEISMOGRAPHS

Apparatus	Component	V	T <sub>0</sub>	$\epsilon$	$\frac{r}{T_0^2}$
Bosch-Omori 100 kg.	E	45	14	10	0.0008
	N	50	14	10	0.0014
Wiechert 80 kg.	Z	44	4	5	0.005
Wood-Anderson	E	3000	0.9	15	
	N	3000	0.9	15	
Galitzin		K	T	T <sub>1</sub>	$\mu_2$
	E	126	12	12	0
	N	125	12	12.1	0
	Z	121	12	11.8	0

The letter G before a reading designates that the seismogram was from the Galitzin instrument; W, Wiechert; B, Bosch-Omori; A, Wood-Anderson.

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
				h. m. s.	s.		A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
							mm.	mm.	mm.	
1	1931 April 1	I	e <sub>E</sub>	G	13 31.0	28				
			e <sub>Z</sub>	G	13 34.5	22				
			e <sub>N</sub>	G	13 34.7	22				
			F		13 55					
2	April 2	Id	e <sub>P<sub>N</sub></sub>	A	12 36 23	0.3		-0.1		
			e <sub>S<sub>NE</sub></sub>	A	12 36 25.5	0.6	-0.3	+0.3		
			e <sub>N</sub>	A	12 36 28.5	0.5		-0.2		
			F		12 36 51.5					
3	April 3	I	i <sub>E</sub>	G	2 15 02	8	+1			Earthquake reported felt in Argentina during night
			e <sub>E</sub>	G	2 21 58	16				
			F		3 30					
4	April 3-4	IIu	e <sub>E</sub>	A	23 30 25					
			e <sub>P<sub>EZ</sub></sub>	B&W	23 30 26	4.7	+0.1	<+0.1	Very weak Beginning obscured by microseisms	
			e <sub>P<sub>ENZ</sub></sub>	G	23 30 27	4	-0.5	-1		
			e <sub>E</sub>	A	23 30 30					
			i <sub>Z</sub>	G	23 32 45	8			-1.5	
			e <sub>Z</sub>	W	23 32 48				<+0.1	
			i <sub>S<sub>E</sub></sub>	G	23 39 37	10	-5			
			e <sub>S<sub>E</sub></sub>	B	23 39 37	5.2	-0.3			Strong wave
			e <sub>E</sub>	A	23 39 38					
			i <sub>S<sub>N</sub></sub>	G	23 39 39	6		-10		
			i <sub>S<sub>Z</sub></sub>	G	23 39 42	8			-4	
			e <sub>E</sub>	B	23 39 58	6.0	-0.3			
			e <sub>E</sub>	B	23 40 13	6.5	-0.2			
i <sub>E</sub>	G	23 43 59	20							
i <sub>N</sub>	G	23 44 25	16		-12					
F		1 04								
5	April 4	Id	i <sub>P<sub>E</sub></sub>	A	5 58 43		+1.0			See discussion, p. 47
			i <sub>E</sub>	A	5 58 45		+0.8			
			i <sub>S<sub>E</sub></sub>	A	5 58 48		+3.5			
			e <sub>E</sub>	A	5 58 50		-1.7			
F		6 00±								
6	April 6	IIu	e <sub>N</sub>	A	7 13 07	7.0		0.3		Light eclipsed during beginning of quake
			e <sub>E</sub>	B	7 13 14	6.0	+0.2			
			i <sub>N</sub>	G	7 13 14	6		+3		
			i <sub>E</sub>	G	7 13 16	18	-6			
			e <sub>Z</sub>	G	7 13 17	8			+3	J. S. A. epicenter 10° N, 146° E

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
				h. m. s.	s.		A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
							mm.	mm.	mm.	
6	1931 April 6 (contd.)	IIu	e <sub>E</sub>	A	7 13 37	5.0	-0.4			
			e <sub>E</sub>	B	7 19 18	11.0	+0.1			
			e <sub>E</sub>	G	7 29.3	37				
			e <sub>Z</sub>	G	7 30.1	30				
			e <sub>E</sub>	B	7 31 12	24.5	+0.3			
			e <sub>N</sub>	G	7 31.5	24				
F		9 37								
7	April 7	Id	e <sub>P<sub>NE</sub></sub>	A	22 52 04	1.0	+0.5	-0.4		
			i <sub>S<sub>N</sub></sub>	A	22 52 08	0.5		+0.7		
			e <sub>NE</sub>	A	22 52 18	0.9	-0.6	+0.6		
F		22 53+								
8	April 9	I	e <sub>E</sub>	A	23 12 15	1.1	+0.2			May be P of distant quake
			e <sub>N</sub>	A	23 12 18	0.6		+0.3		
			F		23 15					
9	April 10	Id	e <sub>P<sub>NE</sub></sub>	A	13 16 41	0.3	-0.2	+0.2		
			i <sub>S<sub>NE</sub></sub>	A	13 16 45	0.5	+0.5	-0.4		
			e <sub>E</sub>	A	13 16 46	0.5	+0.3			
			F		13 17.4					
10	April 11	I	e <sub>E</sub>	G	15 46.0	30				Surface waves of distant quake
			F		16 21					
11	April 12	Id	e <sub>P<sub>NE</sub></sub>	A	11 36 40	0.4	-0.2	-0.3		
			e <sub>E</sub>	A	11 36 41	0.8	-0.3			
			i <sub>S<sub>N</sub></sub>	A	11 36 43	0.9		-0.3		
			F		11 38±					
12	April 16	I	i <sub>E</sub>	G	22 30.0	20				Surface waves of distant quake Waves quite regular
			e <sub>E</sub>	B	22 33 47	4.0	<-0.1			
			e <sub>E</sub>	B	22 38 01	8.2	-0.1			
			e <sub>N</sub>	G	22 38.3	15				
			e <sub>N</sub>	A	22 39.1	.9		-0.4		
			e <sub>E</sub>	A	22 39.2	1.0	+0.2			
e <sub>E</sub>	B	22 40 09	11.3	-0.3						
F		23 13								
13	April 17	I	e <sub>E</sub>	G	6 00.5	20				Probably surface waves of distant quake
			F		6 22					

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Amplitude			Remarks	
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>		
				h. m. s.	s.	mm.	mm.	mm.		
14	1931 April 19	IIr	eP <sub>N</sub>	A	2 05 11.5	1.9		-0.3		U. S. C. G. S. Epicenter 19° N, 109° W
			eP <sub>E</sub>	A	2 05 12.5	1.5	-0.3			
			iP <sub>Z</sub>	G	2 05 13	2			+1	
			iP <sub>E</sub>	G	2 05 14	2	-1			
			eP <sub>E</sub>	B	2 05 15	2.1	+0.1			
			iP <sub>N</sub>	G	2 05 17	3		-1.5		
			e <sub>E</sub>	B	2 06 35	5.0	-0.1			
			iS <sub>E</sub>	G	2 09 00	16	-5			
			eS <sub>E</sub>	A	2 09 00	10	-0.4			
			iS <sub>N</sub>	G	2 09 03	10		-4		
			eS <sub>N</sub>	A	2 09 07.5	10		+0.5		
			eS <sub>E</sub>	B	2 09 08	12.0	+0.5			
			iS <sub>Z</sub>	G	2 09 09	8			+4	
			eL <sub>N</sub>	G	2 10.8	23				
			eL <sub>E</sub>	B	2 11 00	20	+0.5			
			iL <sub>Z</sub>	G	2 11 52	26				
			iM <sub>E</sub>	G	2 12 00	15				
eM <sub>E</sub>	B	2 12 02	16.0	-0.8						
F		3 08								
15	April 22	Iu	eP <sub>N</sub>	G	0 05 16	12				Doubtful beginning New Zealand?
			eP <sub>E</sub>	G	0 05 18	10				
			e <sub>E</sub>	A	0 14 39.5	1.5	-0.2			
			e <sub>N</sub>	A	0 14 42.5	1.2		+0.3		
			eS <sub>N</sub>	G	0 16 13	18				
			iS <sub>E</sub>	G	0 16 35	12	-3			
			i <sub>E</sub>	G	0 18 47	10				
			e <sub>N</sub>	G	0 19 05	12				
			e <sub>E</sub>	G	0 19 28	40				
			e <sub>E</sub>	B	0 24 13	6.4	-0.1			
			i <sub>E</sub>	G	0 24 17	10				
			e <sub>E</sub>	A	0 25 09	8.0	-0.3			
			eL <sub>N</sub>	A	0 34 04	15.0		+0.3		
			e <sub>E</sub>	B	0 34.3	16.0	-0.2			
iL <sub>N</sub>	G	0 34 39	24							
F		2 00								
16	April 23	Iv	eP <sub>N</sub>	A	23 35 34.5	0.5		-0.1		
			eP <sub>E</sub>	A	23 35 35	0.5	+0.1			
			eS <sub>N</sub>	A	23 36 30.5	0.5		-0.2		
			eS <sub>E</sub>	A	23 36 31.5	0.5	+0.5			
			F		23 38					

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Amplitude			Remarks	
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>		
				h. m. s.	s.	mm.	mm.	mm.		
17	1931 April 24	I	e <sub>N</sub>	G	0 07.7	24				Probably surface waves of distant quake
			e <sub>E</sub>	G	0 08.9	24				
			F		0 28					
18	April 24	I	e <sub>E</sub>	G	02 34.8	24				Probably surface waves of distant quake
			e <sub>N</sub>	G	02 36.1	28				
			F		02 51					
19	April 24	IIu	eP <sub>E</sub>	A	17 35 07.5	1	-0.1			U. S. C. G. S. Epicenter 1° N 151° E
			iP <sub>E</sub>	G	17 35 08	10	+2			
			eP <sub>N</sub>	G	17 35 09	3				
			eP <sub>N</sub>	A	17 35 10	1.5		+0.1		
			eP <sub>E</sub>	B	17 35 15	5.0	-0.1			
			eP <sub>Z</sub>	W	17 35 18	2.7			-0.1	
			i <sub>N</sub>	G	17 35 18	5		+0.5		
			e <sub>E</sub>	A	17 35 22	3				
			e <sub>E</sub>	B	17 38 42	7.8	-0.1			
			eS <sub>N</sub>	A	17 45 31	4		-0.1		
			eS <sub>E</sub>	G	17 45 36					
			eS <sub>E</sub>	B	17 45 44					
			iS <sub>E</sub>	G	17 45 51	8	+6			
			eS <sub>N</sub>	G	17 45 52	7		+2.5		
e <sub>E</sub>	B	17 51 47	11.6	-0.3						
eL <sub>E</sub>	G	18 02 0	24							
eL <sub>E</sub>	B	18 02 07	38.5	-0.3						
eL <sub>E</sub>	A	18 02.8	35							
eL <sub>N</sub>	G	18 03	20							
eM <sub>E</sub>	B	18 03 24	28.0	-0.6						
e <sub>Z</sub>	W	18 03 57	24	<-0.1						
F		20 16								
20	April 24	Iv	e <sub>N</sub>	A	18 29.4				Rossi-Forel 7 in Santa Monica Bay district	
			e <sub>E</sub>	A	18 29.5					
			F		18 40					
21	April 25	Iv	eP <sub>N</sub>	G	1 40 14	4		-0.5	Beginning obscured by microseisms	
			iS <sub>N</sub>	G	1 40 58	10		+2		
			eS <sub>E</sub>	G	1 41 03	13	-1			
			M <sub>N</sub>	G	1 41 36	10		+5		
F		1 46								
22	April 25	I	e <sub>E</sub>	G	11 19.7	20			Probably surface waves of distant quake	
			F		11 28					

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
				h. m. s.	s.		A <sub>E</sub> mm.	A <sub>N</sub> mm.	A <sub>Z</sub> mm.	
23	1931 April 27	Iu	eP <sub>E</sub>	G	17 09 00	6	-0.5			Transcaucasia?
			e <sub>E</sub>	G	17 23 37	15				
			eL <sub>E</sub>	G	17 36.5	44				
			e <sub>N</sub>	G	17 39.7	35				
24	May 1	Iu	F		18 40		+0.5			Very irregular micro-seisms precede the quake
			eP <sub>E</sub>	G	22 46 34	7				
			eS <sub>E</sub>	G	22 55 33	11				
			eL <sub>E</sub>	G	23 04.4	20				
			eL <sub>N</sub>	G	23 05.1	17				
			e <sub>N</sub>	G	23 08.3	29				
25	May 6	I	i <sub>E</sub>	G	23 08 53	25	-1			Uncertain
			F		23 49					
			eP <sub>E</sub>	G	22 46 34	7				
			eS <sub>E</sub>	G	22 55 33	11				
			eL <sub>E</sub>	G	23 04.4	20				
			eL <sub>N</sub>	G	23 05.1	17				
26	May 9	IIr	e <sub>N</sub>	G	23 08.3	29	-0.3			J. S. A. Epicenter 8° N 70° W
			i <sub>E</sub>	G	23 08 53	25				
			F		23 49					
			eP <sub>E</sub>	B	10 38 50	2.8				
			eP <sub>E</sub>	A	10 38 50.5	2.0				
			eP <sub>Z</sub>	W	10 38 51	3.2				
			eP <sub>N</sub>	A	10 38 51.5	2.4				
			eP <sub>E</sub>	G	10 38 53	4				
			iP <sub>NZ</sub>	G	10 38 54	6				
			e <sub>N</sub>	A	10 38 59.5	1.5				
			eS <sub>E</sub>	B	10 42 23	11.2				
			iS <sub>E</sub>	G	10 42 25	9				
			iS <sub>N</sub>	G	10 42 27	11				
			iS <sub>Z</sub>	G	10 42 52	10				
eL <sub>N</sub>	G	10 43.5	28							
iM <sub>E</sub>	G	10 43 46	24							
eL <sub>E</sub>	A	10 43 51.5	20							
eL <sub>N</sub>	A	10 43 53.5	20							
eL <sub>E</sub>	B	10 44 01	19.6							
eL <sub>Z</sub>	G	10 44.4	23							
e <sub>Z</sub>	W	10 47 06	13.0							
F		11 50								

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks							
				h. m. s.	s.		A <sub>E</sub> mm.	A <sub>N</sub> mm.	A <sub>Z</sub> mm.								
27	1931 May 10	Iu	e <sub>E</sub>	G	19 44 09	16				Surface waves of distant quake. Very regular waves							
			i <sub>E</sub>	G	19 53 31	9											
			e <sub>N</sub>	G	19 56.0	9											
			F		20 57												
28	May 12	IIu	eP <sub>E</sub>	A	1 46 35	2.5	-0.5			J. S. A. Epicenter 54° N, 161° E							
			eP <sub>N</sub>	G	1 46 38	3											
			eP <sub>N</sub>	A	1 46 41	0.9											
			iP <sub>E</sub>	G	1 46 45	3											
			iS <sub>E</sub>	G	1 54 18	10											
			iS <sub>N</sub>	G	1 54 18	8											
			iL <sub>E</sub>	G	2 03 05	31											
			iM <sub>N</sub>	G	2 05 35	8											
			F		2 30												
			29	May 15	Id	eP <sub>E</sub>					A	20 00 45	0.4	-0.5			Surface waves small
eP <sub>N</sub>	A	20 00 45				0.6											
eS <sub>E</sub>	A	20 00 48				0.5											
eS <sub>E</sub>	A	20 00 48				0.7											
e <sub>E</sub>	A	20 00 49				0.8											
F		20 01.9															
30	May 16	Ir	iS <sub>E</sub>	G	20 58 56	9	-2			U. S. C. G. S. Epicenter 16° N, 96° W							
			iS <sub>N</sub>	G	20 59 00	8											
			iL <sub>E</sub>	G	21 02 05	16											
			eL <sub>N</sub>	G	21 02.5	32											
			eM <sub>E</sub>	A	21 04 00	17											
			M <sub>E</sub>	G	21 04.3	20											
			eM <sub>N</sub>	A	21 04 27	7											
			F		22 08												
			31	May 18	I	e <sub>N</sub>					A	20 25 51	0.8	+0.3			Microseisms
						e <sub>E</sub>					A	20 25 52	1.0				
e <sub>N</sub>	A	20 26 02				0.5											
F		20 30±															
32	May 20	IIu	iP <sub>E</sub>	G	2 35 01	10	-2			J. S. A. Epicenter 37.5° N, 16.5° W							
			iP <sub>N</sub>	G	2 35 04	8											
			eP <sub>N</sub>	A	2 35 07	0.8											
			e <sub>N</sub>	A	2 35 46	1.7											
			e <sub>E</sub>	B	2 43 01	4.0											
			e <sub>E</sub>	B	2 44 17	12											

BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks	
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>		
				h.	m.	s.	mm.	mm.	mm.		
32	1931 May 20 (contd.)	IIu	eS <sub>N</sub>	A	2 45	10.5	8		+0.2		S builds up very gradually
			iS <sub>N</sub>	G	2 45	12	13		+10		
			eS <sub>E</sub>	G	2 45	22	28				
			e <sub>E</sub>	B	2 46	55	7	-0.1			
			e <sub>E</sub>	B	2 50	04	20	-0.3			
			eL <sub>E</sub>	G	2 57	.1	50				
			eL <sub>E</sub>	B	2 58	54	35	-0.2			
			iL <sub>N</sub>	G	2 59	22	37				
			e <sub>N</sub>	A	3 00	14	25		-0.3		
			eM <sub>E</sub>	B	3 03	44	18	+0.4			
			M <sub>E</sub>	B	3 09	44	18	0.8			
			W <sub>2N</sub>	G	4 49	.9	18				
			F		5 55						
33	May 20 and 21	Iu	eP <sub>N</sub>	A	22 06	10.5	1			J. S. A. Epicenter 26°7 S, 72°5 W	
			eP <sub>E</sub>	A	22 06	11	1.5	-0.3			
			iP <sub>Z</sub>	G	22 06	11	4				
			iP <sub>E</sub>	G	22 06	13	8	-1			
			iS <sub>E</sub>	G	22 16	21	7	+1			
			iSR <sub>1E</sub>	G	22 21	57	10	-2			
			eL <sub>E</sub>	G	22 33	.3	34				
F		0 06									
34	May 22	I	eP <sub>N</sub>	A	19 49	50	0.7		-0.2	Strong microseisms	
			eN <sub>E</sub>	A	19 50	30	0.7	-0.2	-0.3		
			F		19 51	.7					
35	May 22	Id	eP <sub>N</sub>	A	20 07	30	0.7		-0.3		
			eP <sub>E</sub>	A	20 07	30.5	0.5	-0.2			
			eS <sub>E</sub>	A	20 07	35	0.6	+0.3			
			eS <sub>N</sub>	A	20 07	36	0.5		+0.2		
			F		20 08	.2					
36	May 23	I	i <sub>E</sub>	G	0 48	50	19			Probably surface waves of distant quake	
			F		1 33						
37	May 24	Id	eP <sub>NE</sub>	A	9 09	41					
			e <sub>E</sub>	A	9 09	45					
			eS <sub>NE</sub>	A	9 09	48					
			F		9 10	53					



BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks	
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>		
				h.	m.	s.	mm.	mm.	mm.		
38	1931 May 25	Id	eP <sub>E</sub>	A	8 57	50.5	0.4	+0.2			
			e <sub>E</sub>	A	8 57	54	0.6	-0.2			
			iS <sub>E</sub>	A	8 58	05	0.9	-0.4			
			eS <sub>N</sub>	A	8 58	07	1.0		-0.3		
			F		8 59						
39	May 27	I	e <sub>E</sub>	G	6 53	.5	7			Probably surface waves of distant quake	
			e <sub>N</sub>	G	7 04	.2					
			F		7 34						
40	May 27	Iu	i <sub>E</sub>	G	10 31	33	16			J. S. A. Epicenter 18° N, 120° W	
			i <sub>Z</sub>	G	10 35	18	20				
			F		11 00						
41	May 29	Id	eP <sub>NE</sub>	A	5 23	03	1.0	-0.2	+0.4	J. S. A. Epicenter 58° N, 158° W	
			e <sub>E</sub>	A	5 23	06.5	1.2	-0.3			
			eS <sub>E</sub>	A	5 23	12	1	+0.2			
			eS <sub>N</sub>	A	5 23	13	1		+0.2		
			e <sub>N</sub>	A	5 23	20	2.0		+0.3		
42	May 30	I	i <sub>E</sub>	G	11 49	30	22			Surface waves of distant quake	
			e <sub>N</sub>	G	11 56	.5	20				
			F		13 16						
43	June 1	I	i <sub>E</sub>	G	12 18	26	10				
			e <sub>Z</sub>	G	12 32	.8	30				
			i <sub>E</sub>	G	12 36	16	40				
			i <sub>N</sub>	G	12 36	.3	20				
			F		13 23						
44	June 2	I	e <sub>N</sub>	A	2 49	14	0.8		+0.2		
			e <sub>E</sub>	A	2 49	15	0.8	-0.4			
			F		2 52						
45	June 2	I	e <sub>N</sub>	A	22 17	06	0.3		-0.2	Microseisms strong	
			e <sub>E</sub>	A	22 17	07	0.3	-0.3			
			e <sub>E</sub>	A	22 17	11	0.9	+0.3			
			e <sub>N</sub>	A	22 17	14	0.9		-0.3		
			F		22 19±						
46	June 3	I	i <sub>E</sub>	G	2 58	32	16			May not all be the same quake	
			e <sub>E</sub>	G	3 49	.7	18				
			e <sub>E</sub>	G	6 15	.5	18				
			e <sub>Z</sub>	G	6 16	.7	17				
			F		6 55	.5					

BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
				h.	m.		s.	A <sub>E</sub>	A <sub>N</sub>	
47	1931 June 4	I	e <sub>E</sub>	A	5 34 27	0.5	+0.2			See discussion, p. 47
			e <sub>E</sub>	A	5 34 34	0.7	-0.3			
			F		5 35 11					
48	June 4	Iv	eP <sub>E</sub>	A	5 38 34	0.4	+0.2			See discussion, p. 47
			i <sub>E</sub>	A	5 39 02	0.7	+0.7			
			i <sub>E</sub>	A	5 39 06	0.6	+1.0			
			i <sub>E</sub>	A	5 39 09	1.0	-0.8			
			F		5 40 41					
49	June 4	I	i <sub>E</sub>	G	10 23 45	5				
			e <sub>E</sub>	G	10 43.1	22				
			F		11 23					
50	June 6	Id	iP <sub>N</sub>	A	0 46 22	0.7		+0.3		
			eP <sub>E</sub>	A	0 46 23	0.5	-0.3			
			i <sub>N</sub>	A	0 46 26	0.4	-0.3			
			e <sub>N</sub>	A	0 46 39	1.0	-0.4			
			iS <sub>N</sub>	A	0 46 43	0.7	-0.5			
			iS <sub>E</sub>	A	0 46 44	0.6	-0.7			
			i <sub>N</sub>	A	0 46 48	0.6	-0.7			
			e <sub>E</sub>	A	0 46 49	0.8	+0.6			
			e <sub>E</sub>	A	0 47 15	1.0	-0.4			
			F		0 48.5					
51	June 6	I	e <sub>E</sub>	A	2 15 52	0.9	-0.2			
			e <sub>N</sub>	A	2 15 56	0.7		-0.2		
			e <sub>N</sub>	A	2 15 59	0.6		+0.3		
			e <sub>E</sub>	A	2 16 01	0.6	+0.3			
			F		2 17.5					
52	June 7	Id	eP <sub>N</sub>	A	7 45 10	0.7		+0.2		May be earlier-traffic disturbance  See discussion, p. 47
			eP <sub>E</sub>	G	7 45 11	1				
			eP <sub>Z</sub>	G	7 45 11	2				
			eP <sub>N</sub>	G	7 45 12	2				
			iP <sub>E</sub>	A	7 45 12	0.6	-0.3			
			i <sub>N</sub>	A	7 45 13	0.6		-0.4		
			i <sub>E</sub>	A	7 45 17	0.3	+0.5			
			i <sub>N</sub>	A	7 45 18	0.5		+0.5		
			i <sub>E</sub>	G	7 45 27	4	-0.5			
			i <sub>E</sub>	A	7 45 28	0.5	+0.8			
			iS <sub>E</sub>	A	7 45 30	0.6	+0.8			
			eS <sub>N</sub>	A	7 45 30	0.8		+0.5		
			i <sub>N</sub>	A	7 45 33	0.4		-0.4		



BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
				h.	m.		s.	A <sub>E</sub>	A <sub>N</sub>	
52	1931 June 7 (contd.)	Id	i <sub>Z</sub>	G	7 45 36	4			+0.5	
			i <sub>Z</sub>	G	7 45 42	5			+0.5	
			i <sub>E</sub>	G	7 45 42	12	-1			
			i <sub>N</sub>	A	7 45 42	0.8		-1.0		
			i <sub>N</sub>	G	7 45 45	8		-1		
			i <sub>E</sub>	A	7 45 46	0.8	+1.0			
			i <sub>Z</sub>	G	7 45 47	2				
			e <sub>E</sub>	A	7 45 55	1.5	+0.6			
			i <sub>Z</sub>	G	7 46 13	7				
			F		7 48.0					
53	June 7	I	e <sub>NE</sub>	A	11 31 05	0.8	+0.3	+0.2		Very faint record on N-S
			e <sub>E</sub>	A	11 31 08	0.4	-0.2			
			F		11 31.8					
54	June 8	I	e <sub>E</sub>	A	0 35 52	1.0	-0.2			Microseisms make beginning indistinct
			e <sub>E</sub>	A	0 35 56	0.7	+0.3			
			F		0 37.4					
55	June 9	Id	iP <sub>E</sub>	A	3 46 02	0.6	-0.3			Identification of P and S doubtful
			iS <sub>E</sub>	A	3 46 05	0.5	+0.1			
			F		3 46 42					
56	June 9	IIu	eP <sub>N</sub>	G	14 03 40	6				Microseisms strong
			iP <sub>Z</sub>	G	14 03 41	4			-0.5	
			eP <sub>N</sub>	A	14 03 45	1.6		-0.2		
			eP <sub>E</sub>	A	14 03 47	1.0	-0.2			
			eP <sub>ZE</sub>	W	14 03 50	5	-0.1		<-0.1	
			e <sub>E</sub>	A	14 03 54.5	15	-0.3			
			e <sub>E</sub>	B	14 04 26	2.8	<-0.1			
			eS <sub>NE</sub>	A	14 13 07	8	-0.3	-0.3		
			eS <sub>E</sub>	B	14 13 10	8	<-0.1			
			iS <sub>N</sub>	G	14 13 14	12				
			iS <sub>Z</sub>	G	14 13 15	10				
			e <sub>E</sub>	B	14 15 07	7	<-0.1			
			e <sub>E</sub>	B	14 22 10	9	<-0.1			
			e <sub>E</sub>	B	14 25 46	10	-0.1			
e <sub>E</sub>	B	14 31 19	9	-0.2						
ez	W	14 34	15			-0.1				
F		17 22								
57	June 9	I	e <sub>E</sub>	B	16 15.5				Very slight trace	
			F		17 10.5					



BERKELEY STATION

No.	Date	Charac-ter	Phase	Time U. T.		Period	Amplitude			Remarks
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.		
58	1931 June 10	Id	eP <sub>NE</sub>	A	7 19 28					See discussion, p. 48
			eS <sub>N</sub>	A	7 19 37					
			eS <sub>E</sub>	A	7 19 38					
			F		7 20 38					
59	June 10	IIId	eP <sub>NEZ</sub>	G	12 16 28					See discussion, p. 48
			eP <sub>EZ</sub>	B&W12	16 28					
			iP <sub>E</sub>	A	12 16 29					
			i <sub>E</sub>	A	12 16 30					
			e <sub>Z</sub>	G	12 16 36					
			iS <sub>E</sub>	G	12 16 37					
			iS <sub>NZ</sub>	G	12 16 38	2.0		4.0		
			eS <sub>EZ</sub>	B&W12	16 38					
			iS <sub>E</sub>	A	12 16 38					
			i <sub>E</sub>	G	12 16 47					
			F		12 19.5					
			60	June 13	I		G			
61	June 14	Id	eP <sub>N</sub>	A	7 40 02.5	0.4		-0.3	Lengthening of period	
			eP <sub>E</sub>	A	7 40 03.5	0.4	-0.2			
			e <sub>N</sub>	A	7 40 09.5	0.8		-0.3		
			e <sub>E</sub>	A	7 40 11.0	0.5	-0.2			
			eS <sub>N</sub>	A	7 40 18	1				
			eS <sub>E</sub>	A	7 40 18.5	0.5				
			e <sub>E</sub>	A	7 40 21.5	0.7	-0.2			
			e <sub>N</sub>	A	7 40 25	0.9		-0.4		
			e <sub>N</sub>	A	7 40 32	0.7		+0.4		
			e <sub>E</sub>	A	7 40 33	0.9	-0.2			
			F		7 41 05					
			62	June 16	Id	eP <sub>N</sub>	A	14 53 08		0.4
eP <sub>E</sub>	A	14 53 09				0.6	-0.3			
i <sub>N</sub>	A	14 53 09				0.8		-0.9		
e <sub>E</sub>	A	14 53 15				0.9	-0.3			
e <sub>N</sub>	A	14 53 15				0.5		-0.5		
iS <sub>E</sub>	A	14 53 20				0.7	+1.3			
iS <sub>N</sub>	A	14 53 20				0.6		-1.8		



BERKELEY STATION

No.	Date	Charac-ter	Phase	Time U. T.		Period	Amplitude			Remarks
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.		
62	1931 June 16 (contd.)	Id	e <sub>N</sub>	A	14 53 28	0.9		-0.8		
			i <sub>E</sub>	A	14 53 33	0.6	-0.7			
			i <sub>E</sub>	A	14 53 43	0.8	-0.5			
			F		14 56.4					
63	June 16	I	eP <sub>E</sub>	A	23 16 08.5				No further phases distinguishable	
			eP <sub>N</sub>	A	23 16 10.5					
			F		23 17 49					
64	June 17	I	eP <sub>E</sub>	A	12 21 16.5	2	+0.1			
			eP <sub>N</sub>	A	12 21 17	2		-0.1		
			F		12 25					
65	June 17	Id	iP <sub>N</sub>	A	12 56 56.5	0.3		-0.2		
			iS <sub>N</sub>	A	12 57 07.5	0.7		+0.2		
			iS <sub>E</sub>	A	12 57 07.5	1	-0.2			
			F		12 57 37					
66	June 17	Iu	e <sub>E</sub>	G	17 45 11	30			Surface waves of distant quake	
			i <sub>E</sub>	G	17 50 33	20				
			e <sub>Z</sub>	G	17 50 40	20				
			F		18 31					
67	June 19	Id	iP <sub>N</sub>	A	11 49 23.5	0.5			Increase in period	
			iP <sub>E</sub>	A	11 49 28.5	0.5	+0.2			
			i <sub>N</sub>	A	11 49 28.5	0.3				
			iS <sub>N</sub>	A	11 49 30	1		+0.2		
			eS <sub>E</sub>	A	11 49 30.5	1	+0.2			
			F		11 50 07					
68	June 20	IIId	iP <sub>NE</sub>	A	20 42 19.5	0.5	-0.1	-0.2		
			eS <sub>NE</sub>	A	20 42 36	1	+0.5	+0.3		
			i <sub>E</sub>	A	20 42 36.5	1				
			i <sub>N</sub>	A	20 42 37	1		+0.5		
			F		20 44 04					
69	June 21	Ir	iP <sub>Z</sub>	G	12 28 20	4			U. S. C. G. S. Epicen-ter 18° N, 108° W	
			iP <sub>N</sub>	G	12 28 22	10 & 3		+2		
			iP <sub>E</sub>	G	12 28 25	6	+3			
			e <sub>E</sub>	B	12 28 25	2.7	-0.2			
			e <sub>E</sub>	B	12 30 36	6.7	-0.1			
			iS <sub>N</sub>	G	12 32 33	10		-3		
			eL <sub>Z</sub>	G	12 34.7	20				

BERKELEY STATION

No.	Date	Charac-ter	Phase	Time U. T.	Period	Amplitude			Remarks
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.	
69	1931 June 21 (contd.)	Ir	iL <sub>E</sub>	G 12 34 46	24				
			eL <sub>N</sub>	G 12 35.0	18				
			e <sub>E</sub>	B 12 35 41	20	-0.1			
			e <sub>E</sub>	B 12 37 33	8.0	-0.2			
			F	13 31					
70	June 22	Id	eP <sub>N</sub>	A 12 39 36	0.3				E-W component not operating at time of quake
			iS <sub>N</sub>	A 12 39 51	0.5		+0.5		
			F	12 41 20					
71	June 23	Iu	eP <sub>Z</sub>	G 6 26 34	5			-0.5	Microseisms
			eP <sub>N</sub>	G 6 27 04	6				
			iS <sub>E</sub>	G 6 35 57	8	+1.5			
			iS <sub>N</sub>	G 6 35 58	6		+1.5		
			e <sub>N</sub>	G 6 45.6	26				
			eL <sub>E</sub>	G 6 48.8	28				
			eL <sub>Z</sub>	G 6 49.1	24				
72	June 27	Iu	eP <sub>E</sub>	G 18 25 13	4	+0.3			Obscured by microseisms
			iS <sub>E</sub>	G 18 31 55	16	+1.5			
			eL <sub>E</sub>	G 18 43.4	25				
			iz	G 18 45.4	22				
			F	19 34					
73	June 28	II d	iP <sub>NE</sub>	A 10 08 25	0.3		+9		See discussion, p. 48 Felt in Berkeley Beg. of long period Fast motion, period doubtful Doubtful Beginning of a very long period with small periods superposed
			iP <sub>E</sub>	G 10 08 25	3	-7			
			iP <sub>N</sub>	G 10 08 25	2		+1		
			iP <sub>Z</sub>	G 10 08 25	1			-1.5	
			iz	G 10 08 26	14 & 1			+16	
			iP <sub>E</sub>	B 10 08 26	3.1	-0.6			
			iS <sub>N</sub>	G 10 08 27			+17		
			iS <sub>N</sub>	A 10 08 27			-13		
			i <sub>E</sub>	G 10 08 28	1 & 32				
			i <sub>N</sub>	G 10 08 28	16		+13		
			iS <sub>E</sub>	B 10 08 28	1.2	-5.9			
			e <sub>E</sub>	B 10 08'37	0.8	-0.2			
			F	10 10 27					
74	July 5	Id	eP <sub>N</sub>	A 0 17 10.5	0.3		<0.1		Increase in period
			eP <sub>E</sub>	A 0 17 11.0	0.5	< 0.1			
			iS <sub>N</sub>	A 0 17 25.0	0.5		-0.2		
			eS <sub>E</sub>	A 0 17 25.5	1	+0.3			
			F	0 18 23					



BERKELEY STATION

No.	Date	Charac-ter	Phase	Time U. T.	Period	Amplitude			Remarks
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.	
75	1931 July 7	II	e <sub>E</sub>	B 4 00 34	6.4	-0.1			Uncertain due to microseisms
			iP <sub>Z</sub>	G 4 00 55	6			-1.5	
			eL <sub>E</sub>	G 4 10.6	28				
			eL <sub>N</sub>	A 4 11.6	9				
			eL <sub>E</sub>	A 4 11.9	8				
			e <sub>E</sub>	B 4 12 19	6.0	-0.2			
			M <sub>E</sub>	G 4 13.5	10	12			
			e <sub>E</sub>	B 4 14 24	13.2	+0.4			
			e <sub>E</sub>	B 4 15 39	8.4	+0.3			
			M <sub>E</sub>	B 4 16 06		0.9			
			e <sub>Z</sub>	G 4 16.5	16				
76	July 12	I	e <sub>Z</sub>	G 17 03 34	5				Trace of distant quake
			e <sub>Z</sub>	G 17 33.2	27				
			F	18 30					
77	July 15	IIv	eP <sub>N</sub>	A 18 40 43	0.3		+0.1		Beginning very uncertain Microseisms Felt "slightly" at Guadalupe, Santa Margarita, Nipomo, San Luis Obispo Increase in period
			eP <sub>E</sub>	A 18 40 44	0.5	-0.1			
			eP <sub>N</sub>	G 18 40 55	4				
			e <sub>E</sub>	B 18 40 57	0.8	<-0.1			
			e <sub>Z</sub>	W 18 40 57	1.0		<+0.1		
			eP <sub>Z</sub>	G 18 41 03	1				
			eP <sub>E</sub>	G 18 41 10	2				
			i <sub>E</sub>	A 18 41 14	1	-0.3			
			e <sub>E</sub>	B 18 41 15	2.0	-0.1			
			iz	G 18 41 26	6		-1.5		
			i <sub>E</sub>	G 18 41 28	4	+1.5			
			i <sub>N</sub>	A 18 41 36	1		+0.5		
			i <sub>E</sub>	A 18 41 37	1	-1			
			e <sub>E</sub>	B 18 41 38	1.6	-0.1			
i <sub>N</sub>	G 18 41 38								
i <sub>E</sub>	G 18 41 38	4	+1.5						
M <sub>Z</sub>	G 18 41.7	6		5					
i <sub>E</sub>	G 18 41 45	5	-2						
i <sub>E</sub>	A 18 41 47	2	-1						
e <sub>E</sub>	B 18 41 49	2.4	-0.3						
i <sub>N</sub>	G 18 41 50	6							
iM <sub>E</sub>	G 18 42 07	7	+10						
e <sub>E</sub>	B 18 42 08	7.5	+0.3						
iM <sub>N</sub>	G 18 42 10	8		-12					
F	19 12								

BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
				h. m. s.	s.		A <sub>E</sub> mm.	A <sub>N</sub> mm.	A <sub>Z</sub> mm.	
78	July 17	IIr	iP <sub>Z</sub>	G	9 20 17	6			+1.5	Poor beginning  U. S. C. G. S. Epicenter 14° N, 96° W Destructive in Ecuador
			eP <sub>E</sub>	G	9 20 35	7	+0.3			
			eS <sub>E</sub>	B	9 25 15	6.5	-0.1			
			eS <sub>N</sub>	G	9 25 15	8		-0.5		
			iS <sub>E</sub>	G	9 25 15	10	-3			
			i <sub>N</sub>	G	9 25 19	8		+3		
			eL <sub>E</sub>	G	9 28.7	30				
			eL <sub>E</sub>	B	9 29 04	32	-0.1			
			eL <sub>N</sub>	G	9 29.6	22				
			e <sub>E</sub>	B	9 30 42	6	-0.2			
			M <sub>Z</sub>	G	9 30.6	7			5	
			e <sub>E</sub>	A	9 30.8	5				
			F		10 48					
79	July 18	Iu	eP <sub>E</sub>	G	5 38 55	7	+0.3			Questionable
			eP <sub>Z</sub>	G	5 38 55	4			-1	
			eS <sub>Z</sub>	G	5 48 44					
			eS <sub>E</sub>	G	5 48 46	14	-1.5			
			i <sub>N</sub>	G	5 49 29	6				
			F		6 07					
80	July 18	IIu	eP <sub>E</sub>	B	11 33 00	3.6	<+0.1			U. S. C. G. S. Epicenter 53° N, 162° E  Curtsey
			iP <sub>E</sub>	G	11 33 05	5	+0.5			
			eP <sub>N</sub>	G	11 33 05	6		-0.3		
			iP <sub>Z</sub>	G	11 33 05	4			+1	
			eS <sub>E</sub>	G	11 40 28	10	-1			
			iS <sub>E</sub>	G	11 40 33	8	+4			
			eS <sub>E</sub>	B	11 40 34	8	+0.2			
			eS <sub>N</sub>	G	11 40 34	10		-2		
			iS <sub>Z</sub>	G	11 40 35	8			+3	
			eL <sub>Z</sub>	G	11 49.1	30				
			eL <sub>E</sub>	G	11 49.1	26				
			eL <sub>E</sub>	B	11 49 41	22	-0.2			
			F		13 48					
81	July 19	I	e <sub>E</sub>	G	11 11 34	16	+0.5			Probably surface waves of distant quake  Very irregular periods
			e <sub>Z</sub>	G	11 12 14	12			+0.5	
			e <sub>N</sub>	G	11 12 21	9				
			i <sub>E</sub>	G	11 33 26	20				
			e <sub>N</sub>	G	11 33.7	12				
			e <sub>Z</sub>	G	11 33.9					
			F		12 06					



BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
				h. m. s.	s.		A <sub>E</sub> mm.	A <sub>N</sub> mm.	A <sub>Z</sub> mm.	
82	July 19	I	e <sub>E</sub>	G	20 24 50	15				Probably surface waves of distant quake
			e <sub>Z</sub>	G	20 31.6					
			F		21 55					
83	July 20	IIu	eP <sub>Z</sub>	G	8 41 40	6				-0.5  +2  +0.3  +1.5  +0.5  -0.1  -0.1  -0.1  -0.2
			eP <sub>E</sub>	G	8 41 41	4			-0.5	
			i <sub>Z</sub>	G	8 41 43					
			eS <sub>E</sub>	G	8 50 52	8	+0.3			
			eS <sub>N</sub>	G	8 51 02	8			+1.5	
			eS <sub>Z</sub>	G	8 51 04	12				
			i <sub>N</sub>	G	9 02 34	9			+0.5	
			eL <sub>E</sub>	B	9 02 41	32	-0.1			
			eL <sub>Z</sub>	G	9 02.8	28				
			eL <sub>N</sub>	G	9 03.2	24				
			iL <sub>E</sub>	G	9 03 33	30				
			e <sub>E</sub>	B	9 03 51					
			F		10 07					
84	July 21	I	eP <sub>N</sub>	A	3 45 51	0.5				-0.2  -0.1
			eP <sub>E</sub>	A	3 45 53	0.5				
			e <sub>N</sub>	A	3 46 34	1				
			i <sub>E</sub>	A	3 46 35	1.5	-0.1			
			F		3 49					
85	July 21	Iu	e <sub>E</sub>	B	3 48 41	4.7	-0.1			J. S. A. Epicenter 22° S, 174° E  Very sharp beginning  Sharp  +1  +0.5  -2  -2
			iP <sub>N<sub>E</sub></sub>	A	3 48 52	1	-0.2		-0.1	
			e <sub>Z</sub>	W	3 48 53	0.5			<-0.1	
			iP <sub>Z</sub>	G	3 48 53	4			-4	
			iP <sub>E</sub>	G	3 48 56	6	+2.5			
			e <sub>E</sub>	B	3 49 23	2.7	+0.1			
			i <sub>Z</sub>	G	3 49 31	4			-8	
			ePR <sub>1Z</sub>	G	3 52 14	5			+1	
			eS <sub>c</sub> P <sub>c</sub> S <sub>E</sub>	A	3 58 59	3	-0.1			
			eS <sub>c</sub> P <sub>c</sub> S <sub>N</sub>	A	3 59 00	3				
			eS <sub>c</sub> P <sub>c</sub> S <sub>E</sub>	G	3 59 03	10	+1.5			
			eS <sub>Z</sub>	G	3 59.3	6			+0.5	
			iS <sub>E</sub>	G	3 59 25	12	+6			
ePS <sub>E</sub>	G	4 00 16	10	-2						
eL <sub>E</sub>	G	4 17.8	19							
eL <sub>Z</sub>	G	4 17.8	22							
F		5 25								

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.	Period	Amplitude			Remarks
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.	
86	1931 July 21	Iv	eP <sub>N</sub>	A 12 08 32.5	0.5				See discussion, p. 48
			eP <sub>E</sub>	A 12 08 33	0.5	<+0.1			Very short period superposed on microseisms Uncertain. Microseisms Weak Sudden increase in period
			eP <sub>Z</sub>	G 12 08 59	1				
			e <sub>E</sub>	B 12 09 02	1.2	<-0.1			
			e <sub>Z</sub>	W 12 09 03	1.3			<-0.1	
			eP <sub>E</sub>	G 12 09 04	1				
			i <sub>E</sub>	A 12 09 04	1	-0.3			
			eS <sub>E</sub>	G 12 09 19	4	+0.5			
			iS <sub>Z</sub>	G 12 09 20	6			+1.5	
			iS <sub>E</sub>	A 12 09 27.5	1	-0.5			
			iS <sub>N</sub>	A 12 09 31.5	1			-0.5	
			eL <sub>E</sub>	G 12 09 33	4	-1.5			
			iL <sub>E</sub>	A 12 09 35	2	+0.5			
			e <sub>E</sub>	B 12 09 37	2.0	-0.3			
			e <sub>E</sub>	B 12 09 55	6.9	+0.3			
	F	12 22							
87	July 22	IIId	iP <sub>N</sub>	A 6 53 58	1		+0.1		May begin earlier. Obscured by microseisms
			eP <sub>E</sub>	A 6 53 59	0.3	-0.1			
			eP <sub>Z</sub>	W 6 54 01	0.6			<+0.1	
			iP <sub>E</sub>	A 6 54 03.5	0.7	+0.2			
			iP <sub>N</sub>	A 6 54 04.5	1			-0.2	
			e <sub>E</sub>	B 6 54 13	0.8	<-0.1			
			eP <sub>E</sub>	G 6 54 19	1	+0.2			
			eP <sub>Z</sub>	G 6 54 19	3			+0.1	
			eS <sub>E</sub>	A 6 54 20	1.5	+0.3			
			iS <sub>N</sub>	A 6 54 20	0.6			+0.5	
			iS <sub>E</sub>	A 6 54 21	0.5	-0.5			
			i <sub>E</sub>	A 6 54 23.5	0.5	-1			
			iS <sub>E</sub>	G 6 54 30	12	-2			
			eS <sub>Z</sub>	G 6 54 31	4			+0.2	
			i <sub>Z</sub>	G 6 54 38	4			-0.6	
i <sub>Z</sub>	G 6 54 59	4			-0.2				
i <sub>Z</sub>	G 6 55 08	5			+0.8				
	F	6 57							
88	July 23	Iu	eP <sub>E</sub>	G 14 33 18	12	-1			J. S. A. Epicenter 1° N, 155° E
			iP <sub>Z</sub>	G 14 33 18	6			-3	
			i <sub>Z</sub>	G 14 35 22	6			+2.5	
			eS <sub>E</sub>	G 14 42 58	6	-0.5			
			iS <sub>E</sub>	G 14 43 01	8	+1.5			
			iS <sub>N</sub>	G 14 43 04	4			+1.5	
			iS <sub>Z</sub>	G 14 43 05	8			+1	

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.	Period	Amplitude			Remarks		
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>			
				h. m. s.	s.	mm.	mm.	mm.			
88	1931 July 23 (contd.)	Iu	i <sub>N</sub>	G 14 46 04	6				U. S. C. G. S. Epicenter 15° N, 85° W		
			eL <sub>E</sub>	G 14 46.7	30			+2			
			F	15 45							
89	July 27	Ir	eS <sub>E</sub>	G 7 29 31	8	-0.5			S-P=1.2 sec.		
			eL <sub>E</sub>	G 7 37 57	27	+1					
			eL <sub>N</sub>	G 7 38.0							
		F	8 01								
90	July 29	Id	iP <sub>NE</sub>	A 5 58 57					Probably surface waves of distant quake		
			F	5 59 19							
91	July 31	Id	iP <sub>NE</sub>	A 1 55 32.0	0.5	-0.5	+0.5		New Guinea No time marks on Galitzin records		
			iS <sub>NE</sub>	A 1 55 33.5	0.5	+4	-2				
			F	1 56 56							
92	Aug. 1	I	e <sub>E</sub>	G 0 47 09	20	0.5					
			F	1 07							
93	Aug. 1	I	e <sub>Z</sub>	G 20 17 06	21						
			e <sub>E</sub>	G 20 23 26	16	+0.5					
			e <sub>E</sub>	G 20 26 53	16	-0.5					
			e <sub>Z</sub>	G 20 28.0	15						
			F	20 53±							
94	Aug. 6	I	e <sub>E</sub>	G 16 03.6	20						
			e <sub>E</sub>	G 16 23.0	14						
			e <sub>Z</sub>	G 16 28.6	16						
			F	16 55							
95	Aug. 7	Iu	eP <sub>NE</sub>	A 2 25 11.5	1						
			e <sub>E</sub>	B 2 25 16	4	-0.1					
			e <sub>NE</sub>	A 2 35 53	4	+0.1	+0.2				
			e <sub>E</sub>	B 2 35 56	6	-0.2					
			eL <sub>E</sub>	B 2 43 45	12	-0.2					
			e <sub>E</sub>	B 2 55 46	30	-0.4					
			e <sub>E</sub>	B 3 02 36							
			F	4 15							
96	Aug. 8	Id	iP <sub>NE</sub>	A 14 11 25	0.5	+0.1	-0.1				
			iS <sub>N</sub>	A 14 11 52	0.5		+0.2				
			eS <sub>E</sub>	A 14 11 54	1						
			i <sub>N</sub>	A 14 12 04	1		+0.5				
			i <sub>E</sub>	A 14 12 05	1	-0.5					
			F	14 13 01							

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.	Period	Amplitude			Remarks
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.	
97	1931 Aug. 8	I	e <sub>E</sub>	G 18 45 32	16	-1.2			
			e <sub>Z</sub>	G 21 46.5	18ca				
			e <sub>E</sub> F	G 22 51 12 22 57	20	-0.3			
98	Aug. 10	Id	iP <sub>NE</sub>	A 13 06 12					S-P=1.0 sec.
			F	13 06 36					
99	Aug. 10	I	e <sub>N</sub>	G 10 14					
			e <sub>E</sub>	G 10 42.3	27				
			e <sub>Z</sub>	G 10 46.9	20				
			F	12 06±					
100	Aug 10 and 11	IIIu	eP <sub>N</sub>	G 21 31 39	9		-0.2		U. S. C. G. S. Epicenter 46° N, 89°5 E
			eP <sub>E</sub>	A 21 31 40	0.5				
			eP <sub>Z</sub>	G 21 31 45	10		+0.8		
			iP <sub>N</sub>	A 21 31 50.5	1		+0.1		
			iP <sub>Z</sub>	G 21 31 52	10		-2		
			i <sub>N</sub>	G 21 31 57	10		-1		
			e <sub>E</sub>	G 21 31 58	10	+1.5			
			eP <sub>E</sub>	B 21 31 59	2.8	-0.1			
			ePR <sub>1E</sub>	B 21 35 15	3.3	+0.1			
			e <sub>E</sub>	B 21 35 46	5	+0.2			
			i <sub>E</sub>	G 21 40 43	12	+7			
			eS <sub>E</sub>	B 21 42 19	8	-0.3			
			iS <sub>E</sub>	G 21 42 19	8	+4			
			eS <sub>N</sub>	G 21 42 24	8		+9		
			iS <sub>E</sub>	A 21 42 30.5	8	+0.5			
			eS <sub>N</sub>	A 21 42 41.5	11		+0.5		
			iPS <sub>E</sub>	B 21 43 18	12	+1.5			
i <sub>E</sub>	B 22 10 04	15	-2						
i <sub>E</sub>	B 22 11 39	18	-5.0						
M	B 22 16 55	18	12.7						
i <sub>E</sub>	B 22 19 14	17	+2.8						
F	3 03								
101	Aug. 13 and 14	IIu	iP <sub>Z</sub>	G 22 21 46	4			+2.0	Uncertain. Also a
			iP <sub>N</sub>	G 22 21 48	6		+0.8		
			eP <sub>NE</sub>	A 22 21 49	0.7	-0.1	+0.1		
			eP <sub>Z</sub>	W 22 21 49	2.7			-0.1	
			eP <sub>E</sub>	G 22 21 54	3	-0.5			

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.	Period	Amplitude			Remarks
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.	
101	1931 Aug. 13 and 14 (contd.)	IIu	e <sub>Z</sub>	W 22 22 06	3.7				period of 14 sec.
			e <sub>E</sub>	B 22 22 17	3.5	-0.1			
			ePR <sub>1Z</sub>	G 22 25 17	7			+0.8	
			eS <sub>N</sub>	G 22 32 11	8			-1.2	
			iS <sub>E</sub>	G 22 32 14	17	+1.5			
			iS <sub>Z</sub>	G 22 32 24					
			iPS <sub>N</sub>	G 22 32 29	10			-6.0	
			eS <sub>E</sub>	B 22 32.6	8	-0.1			
			e <sub>E</sub>	G 22 37 45	12	+1.2			
			e <sub>E</sub>	G 22 44 10	14				
			L <sub>E</sub>	G 22 48.0	30				
L <sub>Z</sub>	G 22 48.2	30							
L <sub>N</sub>	G 22 48.3	30							
e <sub>Z</sub>	W 22 53 59	17.5				<-0.1			
F	0 29								
102	Aug. 14	I	e <sub>Z</sub>	G 16 19 05	4				-0.4
			e <sub>Z</sub>	G 16 24 29	10	+0.5			
			e <sub>Z</sub>	G 16 26.7	22				
			e <sub>N</sub>	G 16 27.2	18				
			M <sub>N</sub> F	G 16 29 25 19 30	10			+2.5	
103	Aug. 16	Id	eP <sub>NE</sub>	A 0 54 11					
			iS <sub>NE</sub>	A 0 54 15					
			i <sub>E</sub>	A 0 54 19					
			F	0 55 05					
104	Aug. 16	IIIv	eP <sub>E</sub>	A 11 44 16	6	-0.2			Destructive in southwest Texas Byerly's Epicenter 30°53'N, 104°11'W
			eP <sub>N</sub>	A 11 44 17	2			+0.1	
			eP <sub>E</sub>	B 11 44 17	10	-0.3			
			iP <sub>N</sub>	G 11 44 17	9			+2.5	
			iP <sub>E</sub>	G 11 44 17	10	-5			
			i <sub>NE</sub>	A 11 44 22	1.5	+0.5			
			eS <sub>E</sub>	B 11 47 23	6.6	-0.2			
			i <sub>E</sub>	G 11 47 24	11	+4			
			i <sub>N</sub>	G 11 47 32	8			-5	
			e <sub>E</sub>	A 11 47.6	7	+0.5			
			iS <sub>E</sub>	G 11 47 36	8	+16			
			L <sub>N</sub>	G 11 48.1	40				
			L <sub>E</sub>	G 11 48.3	40	+4			
i <sub>E</sub>	G 11 48 53	22	-2.0						

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Amplitude			Remarks	
						AE	AN	Az		
104	1931 Aug. 16 (contd.)	IIIv	i <sub>N</sub>	G	11 48 53	20		+20		
			eL <sub>E</sub>	B	11 49 00	26	-0.5			
			i <sub>N</sub>	A	11 49 07					
			L <sub>E</sub>	A	11 49.3	17	+1			
			iM <sub>E</sub>	B	11 49 35	18				
			iM <sub>NE</sub>	G	11 49.6	18	-80	-60		
			F		14 25					
105	Aug. 17	I	e <sub>E</sub>	G	13 26 48	30				Very small
			e <sub>N</sub>	G	13 27 20	22				
			i <sub>E</sub>	G	13 27 36	21				Texas
			F		13 41±					
106	Aug. 18	IIu	eP <sub>E</sub>	G	14 34 08	4	+0.4			U. S. C. G. S. Epicenter 49° N, 90° E
			iP <sub>N</sub>	G	14 34 08	6		-0.5		
			ePR <sub>IE</sub>	G	14 37 54	6	-0.5			
			ePR <sub>IN</sub>	G	14 37 56	7		-0.7		
			iS <sub>NE</sub>	G	14 44 48	8	-2.5	+3.5		
			eS <sub>E</sub>	B	14 44 48	7.5	-0.1			
			eL <sub>E</sub>	G	15 02 6	48ca				
			eL <sub>N</sub>	G	15 03 22	26ca		+1.5		
			M <sub>E</sub>	G	15 08.2	14				
			eM <sub>N</sub>	G	15 09.2	18				
			F		19 25					
107	Aug. 21	Id	iP <sub>NE</sub>	A	16 50 21	0.5	-0.3	-0.5		See report, p. 49
			i <sub>E</sub>	A	16 50 24	0.4	-0.3			
			i <sub>N</sub>	A	16 50 24	0.5		+0.5		
			iS <sub>E</sub>	A	16 50 26	05.	-2.5			
			iS <sub>N</sub>	A	16 50 26	0.3		+1.5		
			i <sub>N</sub>	A	16 50 28.5	0.3		-2		
			i <sub>E</sub>	A	16 50 28.5	0.5	+2			
			F		16 52					
108	Aug. 22 and 23	I	i <sub>E</sub>	G	22 55 19	8	+0.3			May be more than one quake
			i <sub>E</sub>	G	23 02 09	11	+0.2			
			e <sub>E</sub>	G	23 13.1	30				
			i <sub>E</sub>	G	23 43 21	17	+0.2			
			iz	G	23 45 39	5				
			ez	G	0 15.9				+0.2	
			F		0 51±					

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Amplitude			Remarks			
						AE	AN	Az				
109	1931 Aug. 23	IIv	eP <sub>E</sub>	B	18 02 35	6	-0.2			See discussion, p. 49 Earthquake well recorded on G and A but time marks missing		
			eP <sub>Z</sub>	W	18 02 37	1			+0.1			
			e <sub>E</sub>	B	18 02 56	3	+0.1					
			ez	W	18 03 01	3					-0.2	
			eS <sub>E</sub>	B	18 03 52	12						
			eS <sub>Z</sub>	W	18 03 57							
			F		18 30							
110	Aug. 24 and 25	IIu	iP <sub>Z</sub>	G	21 54 35	6				-1.0	U. S. C. G. S. Epicenter 33° N, 69° E Destructive in Baluchistan Beginning of maximum amplitude	
			ez	G	22 04 20	8				+2.5		
			iz	G	22 04 29	8				-5.0		
			ez	G	22 40.5	20						3.0
			e <sub>E</sub>	B	22 45.4							
			iz	G	23 48 13	16						
			F		0 23							
111	Aug. 25	Id	iP <sub>N</sub>	A	19 43 19.5	0.3				-0.2		
			iP <sub>E</sub>	A	19 43 19.5	0.4	+0.2					
			iS <sub>E</sub>	A	19 43 23.5	0.5	-0.5					
			iS <sub>N</sub>	A	19 43 23.5	0.3				-0.5		
			i <sub>E</sub>	A	19 43 26.5	0.5	-0.5					
			F		19 44 05							
112	Aug. 25	I	e <sub>E</sub>	G	22 39 15	30	+0.5			+0.5		
			ez	G	22 43 45	19						
			e <sub>N</sub>	G	22 44.0	20						
			M <sub>E</sub>	G	22 44.3	20		3.0				
			F		23 17±							
113	Aug. 27	IIIu	eP <sub>E</sub>	G	15 46 14	9	+0.5			Doubtful beginning U. S. C. G. S. Epicenter 29°5 N, 67°5 E		
			ePR <sub>IE</sub>	B	15 47 12	4						
			iS <sub>c</sub> P <sub>c</sub> P <sub>c</sub> S <sub>E</sub>	G	15 54 28	16	-5.5					
			e <sub>E</sub>	G	15 11 56	54ca	+10					
			L <sub>E</sub>	B	16 28.7	31						
			M <sub>E</sub>	G	16 31			20				
			M <sub>E</sub>	B	16 40.0	17		1.5				
F		19 27										
114	Aug. 28 and 29	Iu	eP <sub>E</sub>	G	23 33 52	2				A short period superposed on microseisms Surface waves very weak		
			eS <sub>E</sub>	G	23 43 16	7	-2.0					
			F		0 02							

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.		
115	1931 Aug. 29	Id	eP <sub>E</sub>	A 18 40 14.5	0.5	-0.2				
			eP <sub>N</sub>	A 18 40 15						
			i <sub>E</sub>	A 18 40 16.5	0.5	+0.3				
			iS <sub>E</sub>	A 18 40 20.5	0.2	-1.0				
			iS <sub>N</sub>	A 18 40 20.5	0.5		+2			
			i <sub>E</sub>	A 18 40 21.5	0.5	-2				
			F	18 41 26						
116	Aug. 29	Id	iP <sub>NE</sub>	A 22 46 14.5	0.5	-0.2				
			i <sub>E</sub>	A 22 46 17	0.5	+0.5				
			i <sub>N</sub>	A 22 46 19.5	0.6		+0.5			
			i <sub>E</sub>	A 22 46 21	0.5	+0.5				
			iS <sub>E</sub>	A 22 46 25.5	0.6	+0.5				
			iS <sub>N</sub>	A 22 46 25.5	0.7		+0.5			
			F	22 47 26						
117	Aug. 30	I	e <sub>E</sub>	G 7 50 57	13	-1.0				
			e <sub>N</sub>	G 7 55.8	11					
			F	8 05						
118	Sept. 1	Id	eP <sub>E</sub>	A 0 21 37	0.2					
			iS <sub>NE</sub>	A 0 21 39.5	0.5	+0.2				
			F	0 22 06						
119	Sept. 2	Iv	eP <sub>E</sub>	A 15 35 24.5	1					
			eP <sub>N</sub>	A 15 35 25.5	1					
			iS <sub>NE</sub>	A 15 36 08.5	1.5	-0.2	+0.3			
			e <sub>E</sub>	B 15 36 10		<-0.1				
			i <sub>E</sub>	A 15 36 11.5	0.3					
			i <sub>N</sub>	A 15 36 11.5	0.5					
			e <sub>Z</sub>	W 15 36.2						
			L <sub>E</sub>	G 15 36 17	13	-4.0				
			e <sub>E</sub>	B 15 36 48	11	-0.2				
			e <sub>E</sub>	B 15 37 21	10	-0.3				
			i <sub>E</sub>	G 15 37 21	8	-5.5				
			e <sub>E</sub>	B 15 37 40	9.5	-0.3				
			eL <sub>E</sub>	A 15 37.7	7					
			eL <sub>N</sub>	A 15 37.7	9					
			e <sub>Z</sub>	W 15 37 50	8					
F	15 55±					-0.1				

## BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.		
120	1931 Sept. 5	IIId	iP <sub>N</sub>	A 11 25 17.5	0.7		+1.5			See discussion, p. 50
			iP <sub>E</sub>	A 11 25 18	0.5	-1.5				
			iP <sub>EZ</sub>	B&W 11 25 15						
			iP <sub>E</sub>	G 11 25 18	2.5	-8.0				
			iP <sub>N</sub>	G 11 25 18	0.5		+1			
			iS <sub>NE</sub>	A 11 25 19	0.5		+10			
			iS <sub>E</sub>	B 11 25 19						
			iS <sub>Z</sub>	W 11 25 20						
			i <sub>N</sub>	G 11 25 20	2		+23.5			
			i <sub>E</sub>	G 11 25 21	2	+21				
			e <sub>N</sub>	G 11 25 24	7		+1.5			
			i <sub>E</sub>	G 11 25 27	20 & 1	+5.0				
			F	11 28						
121	Sept. 6	I	e <sub>E</sub>	G 8 33.8	18				Trace of distant quake	
			e <sub>N</sub>	G 8 35.8	22					
			e <sub>Z</sub>	G 8 36.2	18					
			e <sub>E</sub>	G 8 36.6	14					
			e <sub>E</sub>	B 8 36.6	14	+0.1				
			F	8 54.6						
122	Sept. 6	Iv	eP <sub>N</sub>	A 11 07 28	1					
			eP <sub>E</sub>	A 11 07 31	1	+0.1				
			i <sub>E</sub>	A 11 07 41	1	+0.1				
			e <sub>N</sub>	A 11 07 41.5	1					
			i <sub>N</sub>	A 11 07 50	1					
			eP <sub>E</sub>	G 11 07 50	2					
			eP <sub>Z</sub>	G 11 07 51	2.5					
			eP <sub>N</sub>	G 11 07 54	2					
			iS <sub>E</sub>	A 11 08 00	1	-0.3				
			iS <sub>N</sub>	A 11 08 00.5	1.5		+0.5			
			F	11 10						
123	Sept. 9	II	iP <sub>Z</sub>	G 13 41 21					See discussion, p. 51	
			iP <sub>NE</sub>	G 13 41 22						
			eP <sub>NE</sub>	A 13 41 23						
			e <sub>N</sub>	A 13 41 24						
			i <sub>N</sub>	G 13 41 24						
			i <sub>E</sub>	A 13 41 25						
			eP <sub>E</sub>	B 13 41 26						
			i <sub>E</sub>	A 13 41 29						
			i <sub>NE</sub>	A 13 41 37						

BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks	
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>		
				h. m. s.	s.	mm.	mm.	mm.			
123	Sept. 9 (contd.)	II	e <sub>N</sub>	A	13 41 38						
			i <sub>N</sub>	G	13 41 38						
			i <sub>N</sub>	A	13 41 51						
			i <sub>Z</sub>	G	13 41 52						
			e <sub>SE</sub>	A	13 41 53						
			i <sub>E</sub>	A	13 41 56						
			i <sub>SE</sub>	A	13 41 58						
			i <sub>SN</sub>	A	13 41 59						
			i <sub>SZ</sub>	G	13 42 00						
			i <sub>N</sub>	G	13 42 01						
			e <sub>E</sub>	B	13 42 15						
			i <sub>N</sub>	A	13 42 17						
			e <sub>E</sub>	G	13 42 21						
			i <sub>M<sub>N</sub></sub>	G	13 42 24						
			i <sub>E</sub>	B	13 42 24						
			e <sub>N</sub>	A	13 42 28						
			i <sub>E</sub>	A	13 42 32						
			i <sub>M<sub>Z</sub></sub>	G	13 42 48						
			e <sub>E</sub>	G	13 43 09						
			i <sub>E</sub>	A	13 43 16						
			i <sub>E</sub>	B	13 43 18						
			i <sub>Z</sub>	G	13 43 42						
			e <sub>E</sub>	G	13 44 53						
e <sub>Z</sub>	G	13 45 26									
i <sub>E</sub>	G	13 47 32									
F		14 35									
124	Sept. 9	IIu	i <sub>P<sub>Z</sub></sub>	G	20 50 20	6			-19.5	J. S. A. Epicenter 18°5 N, 146° E	
			i <sub>P<sub>E</sub></sub>	G	20 50 21	6	-8.5				
			i <sub>P<sub>N</sub></sub>	G	20 50 21	5		+4.0			
			i <sub>P<sub>EZ</sub></sub>	B&W	20 50 21	4	-0.3		-0.5		
			i <sub>P<sub>NE</sub></sub>	A	20 50 21	1 & 3	-0.2	+0.2			
			i <sub>PR<sub>IZ</sub></sub>	G	20 53 20	6			-6.0		
			i <sub>PR<sub>IE</sub></sub>	G	20 53 25	6	-8.5				
			i <sub>SE</sub>	B	21 00 06	6	+0.7				
			e <sub>SN</sub>	A	21 00 11	4		-0.5			
			e <sub>SE</sub>	A	21 00 11	6	+0.3				
			i <sub>SE</sub>	G	21 00 12	8	+17.0				
			i <sub>SN</sub>	G	21 00 12	7		-16.5			
			i <sub>SZ</sub>	G	21 00 15	8			-11.0		
			e <sub>SZ</sub>	W	21 00 15	4			+0.2		
			M <sub>N</sub>	G	21 13.3	12			11		



BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.		
124	Sept. 9 (contd.)	IIu	L <sub>E</sub>	G	21 14 6	30				
			e <sub>Z</sub>	G	21 17 03	20			-6.0	
			M <sub>E</sub>	B	21 17 19	20	-0.3			
			M <sub>E</sub>	G	21 17 6	10	9.0			
			F		23 19					
125	Sept. 11 and 12	I	e <sub>E</sub>	G	23 21 0	17				
			e <sub>N</sub>	G	23 22 1	18				
			e <sub>E</sub>	G	2 07 6	20				
			e <sub>N</sub>	G	2 18 0	20				
F		2 31								
126	Sept. 12	I	e <sub>P<sub>NE</sub></sub>	A	1 54 13	1				
			F		1 57					
127	Sept. 15	Id	i <sub>P<sub>NE</sub></sub>	A	12 55 42	0.5	+0.1	+0.1		
			i <sub>SE</sub>	A	12 55 50	1	+0.2			
			e <sub>SN</sub>	A	12 55 51	1				
F		12 57								
128	Sept. 15	Id	e <sub>P<sub>E</sub></sub>	A	20 08 16	0.5				
			i <sub>S<sub>NE</sub></sub>	A	20 08 22	0.5	-0.2			
			i <sub>E</sub>	A	20 08 25	0.5				
			F		20 09					
129	Sept. 15	Id	e <sub>P<sub>E</sub></sub>	A	20 37 18				Uncertain beginning	
			i <sub>S<sub>NE</sub></sub>	A	20 37 24	0.5	+0.1			
			i <sub>NE</sub>	A	20 37 28	1	+0.2			
			F		20 37 58					
130	Sept. 16	I	e <sub>N</sub>	G	12 31 02	4		-0.5		
			e <sub>E</sub>	G	12 31 04	8	-0.2			
			e <sub>Z</sub>	G	12 32 0	9				
			e <sub>E</sub>	G	12 32 2	5				
			e <sub>N</sub>	G	13 04 5	10				
			e <sub>N</sub>	G	13 17 4	9				
			F		14 19±					
131	Sept. 19	Id	e <sub>P<sub>NE</sub></sub>	A	19 45 05				S-P=1.5 sec.	
			F		19 45 6					
132	Sept. 19	I	e <sub>E</sub>	G	8 28 6				Feeble trace of distant quake	
			F		8 51±					



BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.		
133	Sept. 20	Id	iP <sub>N</sub>	A	0 29 55	0.3		+0.1		
			iP <sub>E</sub>	A	0 29 55	0.5	+0.1			
			iS <sub>E</sub>	A	0 29 59	0.5	+0.2			
			iS <sub>N</sub>	A	0 30 00	0.5		+0.3		
			F		0 30 35					
134	Sept. 21	IIu	eP <sub>E</sub>	A	2 31 40	1	-0.1			Doubtful owing to microseisms U. S. C. G. S. Epicen- ter 36° N, 140° E Destructive in Tokyo
			eP <sub>N</sub>	A	2 31 40	0.5		+0.1		
			iP <sub>Z</sub>	G	2 31 40	6			-2.0	
			eP <sub>E</sub>	G	2 31 40	2				
			iS <sub>E</sub>	G	2 41 17	11	+5.0			
			eS <sub>N</sub>	G	2 41 21	12		+2.0		
			eS <sub>E</sub>	B	2 41 31	5	+0.2			
			e <sub>E</sub>	G	2 51 35	21	-4.0			
			e <sub>N</sub>	G	2 52 00	12		-2.7		
			e <sub>Z</sub>	G	3 06.1	19			+3	
			M <sub>E</sub>	G	3 13.3	17	6.0			
F		4 25								
135	Sept. 21	I	e <sub>E</sub>	G	11 00 35	22	-2.0			Very weak
			L <sub>E</sub>	G	11 16 03	30	-3.0			
			i <sub>E</sub>	G	11 22 38	20	+1.5			
			e <sub>N</sub>	G	11 36.1	18				
			F		12 10					
136	Sept. 22	I	e <sub>E</sub>	G	10 14 5	20	+2.5			
			F		10 44					
137	Sept. 23	I	eP <sub>N</sub>	A	8 26 18				Questionable	
			eP <sub>E</sub>	A	8 26 23					
			i <sub>E</sub>	A	8 26 57	0.5	+0.1			
			F		8 28 05					
138	Sept. 25	IIu	iP <sub>Z</sub>	G	6 18 59	6			-1.5	Very weak beginning  Questionable begin- ning  Increase in period and amplitude
			eP <sub>E</sub>	A	6 19 00	1				
			eP <sub>N</sub>	A	6 19 06	0.5				
			i <sub>E</sub>	A	6 19 15.5	1.5	+0.1			
			eP <sub>E</sub>	G	6 19 17	8	+0.5			
			iP <sub>N</sub>	G	6 19 29	6			+1	
			eP <sub>E</sub>	B	6 20 34	4	+0.1			
			i <sub>E</sub>	G	6 20 57	12	+2			
			i <sub>Z</sub>	G	6 20 57	8			+4	

BERKELEY STATION

No.	Date	Character	Phase	Time U. T.		Period	Amplitude			Remarks
							A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.		
138	Sept. 25 (cont.)	IIu	e <sub>E</sub>	A	6 22 06	4				U. S. C. G. S. Epicen- ter 4° S, 100° E
			i <sub>E</sub>	B	6 22 19	9	+0.2			
			i <sub>N</sub>	G	6 22 39	8				
			eP <sub>S<sub>E</sub></sub>	G	6 31 03	9				
			iP <sub>S<sub>E</sub></sub>	B	6 31 03	8	+0.2			
			iP <sub>S<sub>N</sub></sub>	G	6 31 17	10		+5		
			eL <sub>N</sub>	G	7 00.0	28				
			eL <sub>E</sub>	B	7 00	30	-0.4			
			eL <sub>Z</sub>	G	7 00.4	30				
			F		7 55					
139 & 140	Sept. 26	II u	iP <sub>Z</sub>	G	19 57 27	5			+1	Two quakes super- posed Beginning obscured by microseisms U. S. C. G. S. Epicen- ter 12° N, 91° W 1st quake 0=19 <sup>h</sup> 49.9 <sup>m</sup> 2d quake 0=20 <sup>h</sup> 02.7 <sup>m</sup> 2d quake stronger
			iP <sub>E</sub>	G	19 57 28	8	-0.5			
			eP <sub>N</sub>	G	19 57 29					
			iS <sub>E</sub>	G	20 02 55	10	-1			
			iS <sub>N</sub>	G	20 03 09	8		+0.5		
			eL <sub>E</sub>	G	20 07 56	30	+1			
			eL <sub>N</sub>	G	20 08 16	30				
			e <sub>E</sub>	B	20 09 28	24	+0.1			
			eP <sub>N</sub>	A	20 10 11	1				
			eP <sub>E</sub>	A	20 10 12	1.5				
			iP <sub>Z</sub>	G	20 10 12	7			+1.5	
			e <sub>E</sub>	B	20 19 44	32	+0.2			
			eL <sub>N</sub>	G	20 20.6	32				
			iL <sub>E</sub>	G	20 20 39	30	+5			
eN <sub>E</sub>	A	20 22.0	10							
iM <sub>E</sub>	G	20 22 14	24	+15						
eM <sub>N</sub>	G	20 22.4	24		-10					
iM <sub>Z</sub>	G	20 24 20	16			-6				
F		22 25								
141	Sept. 29	I	e <sub>E</sub>	G	9 35.1	22				Probably surface waves of distant quake
			e <sub>N</sub>	G	9 35.1					
			e <sub>Z</sub>	G	9 35.4	20				
			e <sub>E</sub>	G	9 43.9	18				
			F		10 21					

## 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 time (Universal Time).

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

## CONSTANTS OF THE SEISMOGRAPHS

Apparatus	Component	V	T <sub>0</sub>	e
Wood-Anderson	E	3000	1	15
	N	3000	1	15

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
1	1931 April 1	II	i <sub>NE</sub>	12	49	51.5	0.3		-0.6		
			i <sub>N</sub>	12	49	53	0.5		-3.0		
			i <sub>N</sub>	12	49	54.5	0.5		-2.6		
			e <sub>N</sub>	12	49	58	0.8		+0.5		
			e <sub>E</sub>	12	50	11					
			i <sub>N</sub>	12	50	11.5	0.4		-1.0		
			i <sub>N</sub>	12	50	13	0.4		+0.8		
		F	12	50	24						
2	April 3	Id	eP <sub>E</sub>	23	30	25	0.8	-0.1			
			iP <sub>N</sub>	23	30	26	0.8		-0.2		
			i <sub>E</sub>	23	30	27	1	-0.2			
			iS <sub>NE</sub>	23	30	32	0.8	-0.3			
		F	23	33±							
3	April 3	I	i <sub>N</sub>	23	39	39	6		-0.4		P obscured by end of preceding local quake
			e <sub>E</sub>	23	39	41	4	+0.1			
			F	23	45						
4	April 4	Id	iP <sub>NE</sub>	5	58	53					
			iS <sub>N</sub>	5	59	04					
			i <sub>N</sub>	5	59	15					
			F	5	59	50					
5	April 5	Iu	eP <sub>NE</sub>	7	02	34	1		+0.1		J. S. A. Epicenter 10° N, 146° E
			i <sub>N</sub>	7	02	37	3+		-0.1		
			eS <sub>N</sub>	7	13	21	5				
			eS <sub>E</sub>	7	13	22	5	+0.1			
			eL <sub>E</sub>	7	33.1		23				
			F	7	42						
6	April 12	I	e <sub>N</sub>	2	13	50	0.5			Beginning uncertain. Only slightly recorded on E-W	
			F	2	16						
7	April 12	Id	iP <sub>N</sub>	2	31	18.5	0.5		-0.2		
			e <sub>N</sub>	2	31	20	0.3		+0.2		
			i <sub>N</sub>	2	31	21	0.5		+0.4		
			iS <sub>N</sub>	2	31	23	0.5		-0.3		
			i <sub>N</sub>	2	31	25	0.5				
			F	2	31	46					
8	April 12	Id	iP <sub>NE</sub>	11	36	22.5	0.5	+0.2	-0.2		
			iS <sub>NE</sub>	11	36	25.5	0.5	+1.5	+0.5		
			F	11	38	05					

LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							mm.	mm.	min.		
9	1931 April 16	Id	iP <sub>NE</sub>	15	23	07	0.2	-0.1		Very gradual beginning	
			iS <sub>N</sub>	15	23	08.5	0.4	+2			
			F	15	23	33					
10	April 16	I	eP <sub>N</sub>	22	36	51	0.5				
			eE	22	40	1	9				
			eN	22	40	4	6				
			F	22	52						
11	April 16	Id	eP <sub>N</sub>	23	23	28	0.5	+0.1			
			eS <sub>N</sub>	23	23	41	1				
			F	23	24	08					
12	April 19	Ir	eP <sub>E</sub>	2	05	03	1			Obscured by microseisms U. S. C. G. S. Epicenter 19° N, 109° W	
			eP <sub>N</sub>	2	05	04	1				
			eS <sub>E</sub>	2	08	52	9	+0.3			
			eS <sub>N</sub>	2	08	53	8	+0.2			
			eL <sub>NE</sub>	2	10	7	20				
13	April 23	Iv	eP <sub>NE</sub>	23	35	12.5	0.5	<+0.1	-0.1		
			eE	23	35	18.5	0.5	+0.2			
			iN	23	35	18.5	0.7		-0.2		
			eE	23	35	23	0.5	+0.2			
			iN	23	35	23	0.5		-0.1		
			eE	23	35	35	0.5	-0.1			
			iN	23	35	36.5	0.8		-0.2		
			iN	23	35	58.5	1		-0.4		
			eE	23	36	02.5	1	-0.2			
			iS <sub>E</sub>	23	36	06	2	-0.3			
			eS <sub>N</sub>	23	36	06	1		+0.2		
			iN	23	36	08	0.7		+0.5		
			eN	23	36	10.5	1.5		-0.5		
			iE	23	36	11	0.5		-0.2		
			F	23	38	06					
14	April 24	Iu	eP <sub>E</sub>	17	35	11	3	-0.1		Beg. of long periods Uncertain beginning Uncertain beginning U. S. C. G. S. Epicenter 1° N, 151° E	
			eP <sub>N</sub>	17	35	11	0.5		+0.2		
			iN	17	35	22	4		-0.2		
			eS <sub>N</sub>	17	46	02	5		+0.2		
			eS <sub>E</sub>	17	46	04	6	+0.2			
			eL <sub>E</sub>	18	02	7	25				
			F	18	29						



LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							mm.	mm.	mm.		
15	1931 April 24	Iv	eP <sub>N</sub>	18	29	15	0.5			Rossi-Forel 7 in Santa Monica Bay district	
			eP <sub>E</sub>	18	29	21	0.5	<0.1			
			eS <sub>N</sub> ?	18	30	23	0.7		+0.2		
			eS <sub>E</sub>	18	30	24	1.5	-0.1			
			F	18	32	16					
16	April 25	Iv	eP <sub>NE</sub>	1	40	00	0.5	<+0.1	<-0.1	Beginning doubtful	
			eS <sub>E</sub>	1	40	48	0.8	+0.3			
			eS <sub>N</sub>	1	40	49	0.5		-0.5		
			F	1	44						
17	April 25	Id							A quake began recording about 12 <sup>h</sup> 14.9 <sup>m</sup> . S-P=2 sec. ca. Time marker failed		
18	April 29	IIId	iP <sub>NE</sub>	4	29	09			Line very dim		
			iS <sub>N</sub>	4	29	10					
			F	4	29	48					
19	May 1	Id	eP <sub>NE</sub>	1	55	04	0.9	-0.1	-0.1	U. S. C. G. S. Epicenter 8° N, 70° W	
			eNE	1	55	08	0.5	-0.1	-0.2		
			eS <sub>E</sub>	1	55	17	0.5	-0.2			
			eS <sub>N</sub>	1	55	17	1		-0.3		
			iM <sub>EN</sub>	1	55	19	0.7	-0.1	-0.5		
			F	1	56	19					
20	May 1	Iu	eP <sub>N</sub>	22	46	27	1		+0.1		
			F	22	50						
21	May 2	Id	eP <sub>NE</sub>	11	46	45.5	1	-0.1	-0.2		
			eNE	11	46	49	0.5	+0.1	-0.5		
			iS <sub>NE</sub>	11	46	58.5	0.5	+0.5	+0.5		
			F	11	48	19					
22	May 9	Ir	eP <sub>N</sub>	10	38	43	2		+0.1	Uncertain beginning	
			eP <sub>E</sub>	10	38	46	1				
			eS <sub>N</sub>	10	42	31	6		-0.2		
			eL <sub>E</sub>	10	43	7	20				
			eL <sub>N</sub>	10	45	46	15				
F	10	59									

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		mm.	mm.	mm.	
23	1931 May 10	Id	eP <sub>NE</sub>	12	06	38	0.3		-0.5		
			iS <sub>NE</sub>	12	06	39			-2		
			F	12	07						
24	May 11	Id	iP <sub>NE</sub>	20	35	28	0.5		-0.5		
			iS <sub>E</sub>	20	35	29		-6			
			iS <sub>N</sub>	20	35	29.5	0.5		+1		
			F	20	36						
25	May 12	Iu	eP <sub>E</sub>	1	46	42	2	-0.1			J. S. A. Epicenter 54° N, 161° E
			eP <sub>N</sub>	1	46	42	1		-0.1		
			eS <sub>E</sub>	1	54	27	4	-0.2			
			eS <sub>N</sub>	1	54	29	5		+0.1		
			F	1	57						
26	May 14	Id	iP <sub>E</sub>	8	22	50					
			iP <sub>N</sub>	8	22	50.5					
			iS <sub>N</sub>	8	22	51					
			iS <sub>E</sub>	8	22	51.5					
			F	8	23	16					
27	May 18	Id	eP <sub>NE</sub>	20	25	10	0.5	+0.1	+0.1		
			eN	20	25	17	1		-0.2		
			eS <sub>E</sub>	20	25	31.5	0.5	-0.5			
			eS <sub>N</sub>	20	25	32	1		+0.2		
			F	20	27	21					
28	May 20	Iu	eP <sub>N</sub>	2	34	53	0.5		<+0.1		U. S. C. G. .S Epicen- ter 37°8 N, 17°2 W
			eP <sub>E</sub>	2	34	56	1	<-0.1			
			eS <sub>N</sub>	2	45	10	6		+0.2		
			eS <sub>E</sub>	2	45	26	7	-0.2			
			eL <sub>E</sub>	3	00.4		27				
			F	3	33						
29	May 20	Iu	eP <sub>N</sub>	22	06	07	0.5		+0.1		J. S. A. Epicenter 26°7 S, 72°5 W
			eP <sub>E</sub>	22	06	08	3	+0.2			
			eS <sub>N</sub>	22	16	17	4		+0.2		
			F	22	18						
30	May 24	Id	eP <sub>N</sub>	9	09	48					
			iS <sub>N</sub>	9	09	55					
			F	9	11						

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		mm.	mm.	mm.	
31	1931 May 27	Iu	eP <sub>N</sub>	10	26	35	1			+0.1	J. S. A. Epicenter 18° N, 120° W
			eP <sub>E</sub>	10	26	38	1	-0.1			
			eS <sub>E</sub>	10	35	06	4	+0.1			
			eS <sub>N</sub>	10	35	16	2		+0.1		
			F	10	42						
32	May 29	Id	eP <sub>N</sub>	5	22	50	1		-0.1		Uncertain beginning. J. S. A. Epicenter 58° N, 158° W
			iS <sub>N</sub>	5	23	10	1		-0.2		
			iS <sub>E</sub>	5	23	11	1	-0.3			
			F	5	25						
33	May 31	Id	iP <sub>E</sub>	1	45	39					
			iS <sub>E</sub>	1	45	40					
			F	1	46						
34	June 4	Iv	eE	5	34	27	0.5	<-0.1			Very gradual begin- ning
			eE	5	34	41	0.8	-0.3			
			eE	5	34	45	0.6	+0.2			
			F	5	35	25					
35	June 4	Iv	eP <sub>E</sub>	5	38	40	0.8	+0.2			See discussion, p. 47
			eE	5	38	54	0.7	+0.2			
			eE	5	39	11	0.6	-0.2			
			iS <sub>E</sub>	5	39	16	0.9	-0.8			
			eE	5	39	18	1.2	+0.4			
			eE	5	39	26	0.5	+0.5			
			F	5	40	50					
36	June 6	Id	iP <sub>E</sub>	0	46	10	0.5	+0.2			
			iE	0	46	14	0.6	+0.8			
			iS <sub>E</sub>	0	46	21	0.7	+6.5			
			iE	0	46	26	0.7	+1.4			
			iE	0	46	29	0.6	-2.6			
			iE	0	46	49	0.8	+0.4			
			F	0	48.0						
37	June 6	I	eE	2	15	47	0.6	-0.2			
			eE	2	15	54	0.7	+0.3			
			F	2	16	19					
38	June 7	IIId	iP <sub>E</sub>	7	44	58	0.5	-2.0		See discussion, p. 47	
			iS <sub>E</sub>	7	45	09	0.7	-5.0			
			eE	7	45	32	0.5	+1.5			
			F	7	45	38					

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							s.	mm.	mm.	mm.	
39	1931 June 7	Id	eP <sub>E</sub>	11	30	37	0.6	-0.2			
			iS <sub>E</sub>	11	30	41	0.5	+1.0			
			i <sub>E</sub>	11	30	44	0.5	+0.8			
			F	11	31	18					
40	June 10	Id	iP <sub>E</sub>	7	19	26				See discussion, p. 48	
			iS <sub>E</sub>	7	19	34					
			F	7	20	29					
41	June 10	Id	iP <sub>E</sub>	12	16	20				See discussion, p. 48	
			F	12	19	29					
42	June 10	Id	iP <sub>E</sub>	12	20	07					
			iS <sub>E</sub>	12	20	10					
			F	12	20	34					
43	June 10	Id	iP <sub>E</sub>	12	34	00					
			iS <sub>E</sub>	12	34	02					
44	June 14	Id	iP <sub>N<sub>E</sub></sub>	7	39	49	0.5	-0.1	+0.2	Very short periods	
			i <sub>E</sub>	7	39	52		-0.3			
			i <sub>N</sub>	7	39	54	0.5		+0.5		
			i <sub>E</sub>	7	39	56		-0.3			
			iS <sub>N<sub>E</sub></sub>	7	40	01	0.5	+0.5	-1		
			M <sub>N<sub>E</sub></sub>	7	40	03	0.5	-1	-1.5		
45	June 14	Id	iP <sub>E</sub>	21	02	18				Begins to record during hour mark	
			F	21	02	48					
46	June 15	Id	iP <sub>E</sub>	6	58	13	0.5	-0.2			
			iP <sub>N</sub>	6	58	14	0.5		+0.2		
			iS <sub>N<sub>E</sub></sub>	6	58	16	0.5	-1	+0.3		
			F	6	58	38					
47	June 16	IIId	iP <sub>N</sub>	14	52	55				Motion very fast— line dim	
			iP <sub>E</sub>	14	52	56					
			F	14	54	58					
48	June 16	Id	eP <sub>N<sub>E</sub></sub>	20	48	32	0.4		-1.0		
			iS <sub>N<sub>E</sub></sub>	20	48	36					
			F	20	49	03					

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							s.	mm.	mm.	mm.	
49	1931 June 17	Id	iP <sub>N<sub>E</sub></sub>	12	56	43					Very sharp beginning
			iS <sub>N<sub>E</sub></sub>	12	56	45					
			e <sub>E</sub>	12	56	50					
			e <sub>E</sub>	12	56	52					
			e <sub>N</sub>	12	56	53					
			F	12	57	33					
50	June 17	I	e <sub>N<sub>E</sub></sub>	12	59	16					
51	June 17	I	e <sub>N<sub>E</sub></sub>	12	59	26					
52	June 17	Id	eP <sub>N<sub>E</sub></sub>	13	00	27					S-P=2 sec.
53	June 19	IIId	eP <sub>E</sub>	11	49	10					-0.7 -2.5 -3.1
			iP <sub>N</sub>	11	49	11					
			eS <sub>N<sub>E</sub></sub>	11	49	13					
			i <sub>N<sub>E</sub></sub>	11	49	15					
			F	11	50						
54	June 19	Id	eP <sub>N<sub>E</sub></sub>	12	21	02					S-P=2.5 sec.
55	June 20	IIId	eP <sub>N<sub>E</sub></sub>	20	42	07					-0.5 +3.5
			eS <sub>E</sub>	20	42	15					
			iS <sub>N</sub>	20	42	16					
			F	20	45±						
56	June 21	Ir	e <sub>N<sub>E</sub></sub>	12	28	13					Very weak U. S. C. G. S. Epicenter 18° N, 108° W
			F	12	48±						
57	June 23	Id	eP <sub>N<sub>E</sub></sub>	17	00	13					S-P=1.3 sec.
58	June 24	Id	eP <sub>E</sub>	5	06	27					
			eP <sub>N</sub>	5	06	28					
			iS <sub>N<sub>E</sub></sub>	5	06	29					
			e <sub>N</sub>	5	06	32					
			F	5	06	42					
59	June 24	I	e <sub>N</sub>	19	53	4					
			e <sub>E</sub>	19	53	28					
			e <sub>E</sub>	19	54	42					
			e <sub>N</sub>	19	54	43					
			e <sub>N</sub>	19	54	43					
			F	19	57±						

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.	Period	Amplitude			Remarks
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.	
60	1931 June 28	Id	eP <sub>E</sub>	10 08 39	0.5	+0.1			See discussion, p. 48
			eP <sub>N</sub>	10 08 40					
			e <sub>N</sub>	10 08 42					
			i <sub>E</sub>	10 08 51	0.5	-0.5			
			i <sub>N</sub>	10 08 52					
			i <sub>N</sub>	10 08 54					
			F	10 10±					
61	June 29	I	e <sub>N</sub>	20 36 29					
			e <sub>E</sub>	20 36 31					
			e <sub>N</sub>	20 36 40					
			e <sub>E</sub>	20 36 41					
			F	20 39±					
62	July 7	I	eNE	4 11.0					Trace of distant quake
			F	4 32.0					
63	July 7	Id	eP <sub>NE</sub>	8 01 09					S-P=2.5 sec.
64	July 7	I	e <sub>E</sub>	13 41 49					
			e <sub>N</sub>	13 41 50					
			eNE	13 42 01					
			eNE	13 42 02					
			F	13 43 23					
65	July 11	Id	eP <sub>NE</sub>	23 04 22					S-P=1.5 sec.
66	July 13	Id	iP <sub>NE</sub>	6 30 28					S-P=1.2 sec.
67	July 15	Iv	eNE	18 40 35					Felt "slightly" at Guadalupe, Santa Margarita, Nipomo, and San Luis Obispo
			i <sub>E</sub>	18 40 43					
			e <sub>E</sub>	18 40 48					
			e <sub>E</sub>	18 41 21					
			e <sub>E</sub>	18 41 30					
			e <sub>E</sub>	18 41 47					
			F	18 49±					
68	July 17	IIId	iP <sub>NE</sub>	3 58 41					
			iS <sub>NE</sub>	3 58 42.5					
			e <sub>N</sub>	3 58 47					
			e <sub>E</sub>	3 58 50					
			F	3 59 20					

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.	Period	Amplitude			Remarks
						A <sub>E</sub>	A <sub>N</sub>	A <sub>Z</sub>	
				h. m. s.	s.	mm.	mm.	mm.	
69	1931 July 17	Ir	eNE	9 20					Trace of distant quake U. S. C. G. S. Epicen- ter 14° N, 96° W
			F	9 42					
70	July 18	I	e <sub>N</sub>	5 38 52					Very small
			e <sub>E</sub>	5 39.0					
			F	5 43					
71	July 18	Iu	e <sub>N</sub>	11 33 08					Loops like previous quake U. S. C. G. S. Epicen- ter 53° N, 162° E
			e <sub>E</sub>	11 33 09					
			F	11 38.0					
72	July 21	I	e <sub>N</sub>	3 45 34					
			e <sub>E</sub>	3 45.6					
			e <sub>N</sub>	3 45 47					
			F	3 48.6					
73	July 21	Iu	eNE	3 48 54					Might begin earlier. Previous quake makes it difficult to determine J. S. A. Epicenter 22° S, 174° E
			e <sub>N</sub>	3 49 06					
			e <sub>E</sub>	3 49 34					
			e <sub>N</sub>	3 49 41					
			F	3 53.6					
74	July 21	I	e <sub>N</sub>	12 08 24					See discussion, p. 48
			i <sub>N</sub>	12 08 27					
			e <sub>N</sub>	12 08 40					
			i <sub>N</sub>	12 08 50					
			i <sub>N</sub>	12 09 18					
			F	12 15.7					
75	July 22	IIId	iP <sub>NE</sub>	6 53 49					
			i <sub>N</sub>	6 53 55					
			iS <sub>NE</sub>	6 54 00					
			i <sub>N</sub>	6 54 01					
			F	6 56.7					
76	July 26	I	eNE	7 50 47					
77	July 26	Id	eP <sub>NE</sub>	22 52 53					
			eNE	22 52 55					

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							s.	mm.	mm.	mm.	
77	1931 July 26 (contd.)	Id	eN	22	53	02					
			iN	22	53	10					
			iS <sub>NE</sub>	22	53	12					
			iE	22	53	13					
			F	22	54	5					
78	July 27	Ir	eNE	7	23	31					J. S. A. Epicenter 15°9 N, 86°2 W
			F	7	25	5					
79	July 31	I	eNE	2	37.5	ca					Time not marking
80	Aug 6	I	eNE	23	33	41					
81	Aug 7	I	eNE	2	25	3					Trace of distant quake
82	Aug 7	I	eNE	5	48	36					
83	Aug 7	I	eNE	21	52	33					
84	Aug 8	Id	iP <sub>NE</sub>	14	11	16	0.5				
			iN	14	11	26	0.7				
			iS <sub>NE</sub>	14	11	32	0.6				
			F	14	13	2					
85	Aug 9	I	eNE	14	32	6					
86	Aug 10	Id	iP <sub>NE</sub>	19	23	43					S-P=1.6 sec.
87	Aug 10 and 11	Iu	eE	21	31	54					U. S. C. G. S. Epicen- ter 46° N, 89°5 E
			eN	21	31	57					
			F	0	01	2					
88	Aug. 12	I	eN	6	47	25					
			eE	6	47	30					
			iN	6	47	33					
			eE	6	47	41					
			F	6	48	30					
89	Aug. 13	I	eNE	22	21	47					Probably a distant quake

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							s.	mm.	mm.	mm.	
90	1931 Aug. 16	Iv	eN	11	44	09					Destructive in south- west Texas. Epi- center 30° 53' N, 104° 11' W
			eE	11	44	10					
			eN	11	47	16					
			eE	11	47	22	6.0				
			eN	11	48	49					
			eE	11	48	56	2.5				
			eN	11	49	21	10.0				
			eE	11	49	28	11.0				
			eE	11	51	30	9.0				
			F	12	16	0					
91	Aug. 18	Iu	eNE	14	36	0					U. S. C. G. S. Epicen- ter 49° N, 90° E
			F	15	38						
92	Aug. 21	Id	eP <sub>E</sub>	16	50	27					See discussion, p. 49
			eP <sub>N</sub>	16	50	28					
			iS <sub>NE</sub>	16	50	36	<0.1				
			iNE	16	50	38					
			F	16	51	28					
93	Aug. 23	Iv	eP <sub>E</sub>	18	02	46.7					See discussion, p. 49
			eP <sub>N</sub>	18	02	47.2					
			eE	18	02	47.7					
			iE	18	02	48.9					
			iN	18	02	49.8					
			iE	18	03	11.9					
			iNE	18	03	34					
			iM <sub>N</sub>	18	03	37.7					
			iM <sub>E</sub>	18	03	37.9					
			F	18	19	±					
94	Aug. 24	Iu	eNE	22	45	9				U. S. C. G. S. Epicen- ter 33° N, 69° E	
95	Aug. 25	Id	iP <sub>NE</sub>	11	03	18				S-P=1.2 sec.	
96	Aug. 25	I	eNE	22	28	05					
97	Aug. 27	Iu	eNE	15	46	3				U. S. C. G. S. Epicen- ter 29°5 N, 67°5 E	
98	Aug. 28	Id	eP <sub>NE</sub>	18	40	8				S-P=2 sec.	

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							mm.	mm.	mm.		
99	1931 Aug. 29	I	eNE	9	13.8						
100	Aug. 29	Id	eP <sub>NE</sub> eE iS <sub>NE</sub> F	18	40	18				Time approximate	
101	Aug. 29	I	eNE	19	46	14					
102	Sept. 2	Iv	eP <sub>NE</sub> eS <sub>NE</sub> F	15	35	34					
103	Sept. 3	I	eNE	13	35.7						
104	Sept. 4	Id	iP <sub>NE</sub>	19	18	35				S-P=2.0 sec.	
105	Sept. 5	Id	iP <sub>NE</sub>	2	09	46				S-P=2.5 sec.	
106	Sept. 5	Id	iP <sub>NE</sub>	3	23	42				S-P=2.5 sec.	
107	Sept. 5	Id	iP <sub>NE</sub>	9	59	13				S-P=2.5 sec.	
108	Sept. 5	Id	eP <sub>NE</sub> iS <sub>NE</sub> F	11	25	31	0.5	+0.6		See discussion, p. 50	
				11	25	43	0.7	-1.6			
				11	27.5						
109	Sept. 6	Iv	eP <sub>NE</sub> eE iN eE F	11	07	18	1.0	-0.6			
				11	07	29					
				11	07	32	0.5	+2.0			
				11	07	33					
				11	10.6						
110	Sept. 6	I	eNE	12	40.6						
111	Sept. 6	I	eNE	21	14	31					
112	Sept. 7	I	eNE	22	22.6						
113	Sept. 8	I	eNE	11	07.5						

## LICK OBSERVATORY STATION

No.	Date	Character	Phase	Time U. T.			Period	Amplitude			Remarks
				h.	m.	s.		AE	AN	Az	
							mm.	mm.	mm.		
114	1931 Sept. 9	Iv	iP <sub>NE</sub> eE iE iNE iE iE iS <sub>NE</sub> iN eN iE iE F	13	41	32				See discussion, p. 51	
				13	41	36					
				13	41	39					
				13	41	44					
				13	41	47					
				13	42	09					
				13	42	15					
				13	42	19					
				13	42	41					
				13	42	42					
				13	42	56					
				14	01±						
115	Sept. 9	Iu	eE eN F	20	50	23				U. S. C. G. S. Epicenter 20° N, 144° E	
				20	50	24					
				21	30.5						
116	Sept. 10	I	eNE	4	37.5						
117	Sept. 11	I	eNE	9	35	22					
118	Sept. 12	I	eNE	1	54	19					
119	Sept. 15	Id	iP <sub>NE</sub>	7	16	34				S-P=1.7 sec.	
120	Sept. 15	Id	iP <sub>NE</sub>	7	25	34				S-P=1.7 sec.	
121	Sept. 15	IIId	iP <sub>NE</sub> iS <sub>NE</sub> F	12	55	32	0.7	-1.0			
				12	55	35		-10.0			
				12	57.0						
122	Sept. 18	Id	iP <sub>NE</sub>	18	43	05				S-P=10 ca.	
123	Sept. 21	I	eNE	2	31.8					U. S. C. G. S. Epicenter 36° N, 140° E	
124	Sept. 21	I	eNE	13	47.7						
125	Sept. 23	I	eP <sub>NE</sub> eN eNE F	8	26	10					
				8	26	48					
				8	26	50					
				8	28.5						
126	Sept. 24	Id	iP <sub>NE</sub>	18	12	49				S-P=1.1 sec.	



## LICK OBSERVATORY STATION

No.	Date	Charac- ter	Phase	Time U. T.			Period s.	Amplitude			Remarks
				h.	m.	s.		A <sub>E</sub> mm.	A <sub>N</sub> mm.	A <sub>Z</sub> mm.	
127	1931 Sept. 24	Id	iP <sub>NE</sub>	18	49	47				S-P=1.0 sec.	
128	Sept. 24	Id	iP <sub>NE</sub>	19	28	57				S-P=1.3 sec.	
129	Sept. 24	Id	iP <sub>NE</sub>	19	40	04				S-P=1.0 sec.	
130	Sept. 25	I	eNE	23	14	08					
131	Sept. 26	I	eNE	20	10	07				U. S. C. G. S. Epicen- ter 12° N, 91° W	
132	Sept. 27	Id	iP <sub>NE</sub>	16	15	39				S-P=7.5 sec.	
133	Sept. 27	Id	eP <sub>NE</sub>	19	16	02				S-P=9 sec.	
134	Sept. 28	I	eNE	15	51	30					
135	Sept. 28	I	eNE	18	48.4						
136	Sept. 30	Id	eP <sub>NE</sub>	12	04	34				S-P=2 sec.	
137	Sept. 30	Id	eP <sub>NE</sub>	14	43.1					S-P=1.5 sec.	
138	Sept. 30	I	eNE	15	48.4					Time approximate	

## EARTHQUAKES IN NORTHERN CALIFORNIA

## THE EARTHQUAKE OF APRIL 3, 1931

At about 9<sup>h</sup>59<sup>m</sup> P.M., P.S.T., on April 3, 1931 an earthquake was felt in San Francisco. It was reported as of intensity IV Rossi-Forel in San Bruno. Fort Point, Forest Hills, Ingleside Terrace and the Richmond District also reported it.

This earthquake was recorded at Berkeley on the Wood-Anderson seismographs only, but not elsewhere. From the seismograms it would appear that the focus was about 15 miles from the Berkeley station. This distance may be in error by a few miles.

## THE EARTHQUAKE OF MAY 19-20, 1931

At about midnight, P.S.T., between May 19 and 20 an earthquake was felt in Mendocino County. It was reported as about IV, Rossi-Forel, from Alton, Eureka, and Humboldt Bay Fog Signal. This earthquake was not recorded at Berkeley or Lick Observatory.

## THE EARTHQUAKE OF JUNE 3, 1931

At about 9<sup>h</sup>34<sup>m</sup> P.M., P.S.T., June 3, 1931, an earthquake was felt in Plumas County. It was reported as "severe" at Quincy, and reports from Caribou and Greenville indicate an intensity of about IV, Rossi-Forel.

This earthquake was recorded at Berkeley and Lick Observatory.

## THE EARTHQUAKE OF JUNE 6, 1931

At 11<sup>h</sup>45<sup>m</sup> P.M., P.S.T., an earthquake was felt in the region just east of Monterey Bay. It was reported as of Rossi-Forel intensity IV at Capitola, Carmel, Chualar, Gonzales, Salinas, Spreckels. The intensity was III at Hollister, Morgan Hill, Santa Cruz.

This earthquake was recorded well at Lick Observatory and Stanford, but weakly at Berkeley. All stations being in the same general direction, the determination of an accurate epicenter from instrumental data was not possible.

## THE EARTHQUAKE OF JUNE 9, 1931

At 11<sup>h</sup>19<sup>m</sup> P.M., P.S.T., an earthquake was felt in the vicinity of Point Ano Nuevo. According to reports the Rossi-Forel intensity was IV at Ano Nuevo Island Light, Boulder Creek, Pigeon Point Light, Santa Cruz. At Olympia and Laurel it was reported as about III.

This earthquake was recorded at Berkeley, Lick Observatory, and Stanford. According to the seismograms the epicenter was very near Point Ano Nuevo. A fault is known there.

## THE EARTHQUAKE OF JUNE 10, 1931

At 4<sup>h</sup>16<sup>m</sup> A.M., P.S.T., on June 10, 1931 an earthquake was felt in the region about San Jose. The following points reported an intensity IV, Rossi-Forel: Agnew, Alvarado, Alviso, Capitola, Half Moon Bay, Irvington, Los Gatos, Mount Hamilton, San Mateo, San Jose, Santa Cruz, Saratoga; intensity III, Arroyo Sanitorium, Boulder Creek, Brookdale, Campbell, Centerville; I-II, Davenport. The earthquake was reported not felt at Watsonville.

According to the seismograms the epicenter was near San Jose.

## THE EARTHQUAKE OF JUNE 28, 1931

At 2<sup>h</sup>08<sup>m</sup> A.M., P.S.T., an earthquake was felt in Contra Costa and Solano counties. Intensity III, Rossi-Forel, was reported from Antioch, Berkeley, Martinez, Pittsburg, Richmond, Southampton Shoal Light and Vallejo.

The epicenter was about six to nine miles northwest of the Berkeley station.

## THE EARTHQUAKE OF JULY 21, 1931

At about 4<sup>h</sup>08<sup>m</sup> A.M., P.S.T., on July 21, 1931, an earthquake was felt in San Luis Obispo and Santa Barbara counties.

At Port San Luis the intensity was V to VI, Rossi-Forel scale. It was IV at Halcyon, Los Alamos, Oceano, San Luis Obispo, San Luis Obispo Light and Templeton. The intensity was III at Cambria, Nipomo, and Santa Margarita.

This earthquake was recorded faintly at Lick Observatory, and at Berkeley.

## THE EARTHQUAKE OF AUGUST 4, 1931

At about 5<sup>h</sup>10<sup>m</sup> P.M., P.S.T., an earthquake was felt in Mendocino County. It was reported from only two points, Cape Mendocino Light and Fortuna, where the intensity was about III, Rossi-Forel.

This earthquake was not recorded at Berkeley or Lick Observatory.

## THE EARTHQUAKE OF AUGUST 21, 1931

On August 21, 1931, at about 8<sup>h</sup>50<sup>m</sup> A.M., P.S.T., an earthquake was felt in San Mateo County from San Bruno to Redwood City. The intensity was about IV, Rossi-Forel, at San Mateo and at Redwood City.

This earthquake was recorded at the Berkeley Station, the Lick Observatory Station, and the Stanford Station. The epicenter probably lay on the San Andreas Fault southwest of San Mateo.

## THE EARTHQUAKE OF AUGUST 23, 1931

At about 10<sup>h</sup>02<sup>m</sup> A.M., P.S.T., on August 23, 1931 an earthquake shook Humboldt and northern Mendocino Counties. It attained an intensity of VII, Rossi-Forel, at Hydesville.

According to the seismograms, the epicenter was at sea off Cape Mendocino. The intensities are as follows:

VII. Hydesville.

V-VI. Metropolitan.

IV. Alderpoint, Alton, Beatrice, Beagle, Ore., Blocksburg, Briceland, Bridgeville, Burnt Ranch, Carlotta, Curtin, Ore., Dos Rios, Eel Rock, Ettersburg, Falk, Fernbridge, Fortuna, Garberville, Holmes, Korbel, Loleta, Nashmead, Pepperwood, Rohnerville, Samoa, Scotia, Skelly, Solyer, Trinidad, Waddington, Willow Creek, Zenia.

III. Arcata, Bayside, Bayview, Branscombe, Dyerville, Farley, Ferndale, Freshwater, Fruitland, Harris, Hartsook, Honeydew, Petrolia, Weott.

I-II. Fort Bragg, Miranda.

## THE EARTHQUAKE OF SEPTEMBER 5, 1931

At 3<sup>h</sup>25<sup>m</sup> A.M., P.S.T., on September 5, 1931, an earthquake was felt in the area around the northern end of San Francisco Bay. Reports gave the Rossi-Forel intensities as follows: IV in Berkeley, El Cerrito, Richmond, San Rafael, Southampton Shoal Light; III in San Anselmo.

This earthquake was recorded at Berkeley, Lick Observatory, San Francisco, and Stanford, which enabled a very accurate determination of epicenter.

The arrival times and S-P intervals are given for each station below:

STATION	P	S-P	$\Delta$	O
Berkeley	3-25-17.5	1.3	6 km.	3-25-16.5
San Francisco	3-25-20.5	3	23	3-25-16.5
Stanford	3-25-26.5	7.5	58	3-25-16.0
Lick	3-25-31	11	85	3-25-16.0

If the speed of P is taken as 5.6 km/sec an epicenter may be located from the arrival times of P at the three more distant stations. This epicenter is found to lie 6 km (3.7 mi.) ca. northwest of Berkeley on the Haywards Fault. The column  $\Delta$  in the table gives the distances to the various stations. The o given in the above table is the time of occurrence to the nearest half-second as computed from the arrival time of P at the various stations, the above epicenter being adopted. It will be noted that the epicentral distance of the three more distant stations may be obtained from the S-P interval by multiplying by 7.7. The corresponding value of the speed of S is 3.2 km/sec. These values of the speeds check with those found frequently elsewhere and were found successful by the writer in explaining quarry blast records in this immediate district (see Byerly and Dyk, Bull. Seismological Soc. of America, 22, pp. 50-55, March, 1932). According to the paper to which reference is given the speeds of P and S in the sedimentary layer underlying Berkeley are about 4.44 km/sec and 2.37 km/sec. If the earthquake had its origin in this layer and if P and S both originated at the focus, the focal distance of Berkeley would be about  $5.1 \times 1.3 = 6.5$  km. This would point to a focal depth of 2 or 3 kilometers.

It is to be noted that the direction of the epicenter as computed from the Berkeley Galitzins is inconsistent with this epicenter, although that computed from the Wood-Andersons is consistent.

It is therefore concluded that the earthquake of September 5, 1931, originated at 3<sup>h</sup>25<sup>m</sup>16<sup>s</sup> A.M., P.S.T., on the Haywards Fault about 6 km northwest of Berkeley at a depth of a few kilometers.

## THE EARTHQUAKE OF SEPTEMBER 9, 1931

At about 5<sup>h</sup>40<sup>m</sup> A.M., P.S.T., an earthquake shook Humboldt, Trinity, and Tehama counties, and portions of Mendocino, Shasta, and Butte counties. It attained an intensity of VII, Rossi-Forel, in Humboldt County. The following list of intensities at various points shows a surprising distribution. This earthquake, according to the seismograms, centered off the coast from Cape Mendocino. But it was felt as far east as Isaiah in Butte County. The furthest north that it was reported was Orick and the furthest south was Willits. However, the boundary of the felt region is not clearly defined as reports of "not felt" were not received.

The following gives the Rossi-Forel intensities:

VII. Blocksburg, Briceland, Chico, Dyerville, Fernbridge, Garberville, Holmes, Pepperwood, Scotia, Skelly, Upper Mattole, Weott, Whitlow.

V-VI. Alderpoint, Bell Springs, Covello, Dos Rios, Eel Rock, Eureka, Ferndale, Fortuna, Island Mountain, Metropolitan, Miranda, Punta Gorda Light, Waddington.

IV. Alton, Beatrice, Benbow, Bridgeville, Cape Mendocino Light, Ettersburg, Farley, Forest Glen, Fort Bragg, Fort Seward, Fortuna, Fruitland, Gerber, Harris, Hartsook, Humboldt Bay Light, Hydesville, Isaiah, Kneeland, Littleriver, Las Plumas, Mina, Orick, Petrolia, Red Bluff, Redding, Rohnerville, Ruth, Samoa, Vina, Westport, Willits, Zenia.

III. Arcata, Bayside, Branscombe, Hayfork, Nashmead, Table Bluff Light.

I-II. Greenwood, Pt. Cabrillo.



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Issued September 24, 1932