

No. 1.



M A N I L A , P . I .

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.  $\lambda=120^{\circ} 58' 41''$  E.  $h=2.40$  m. Alluvium.

WIECHERT.  $M=1000$  Kg.

GALITZIN-WILIP.

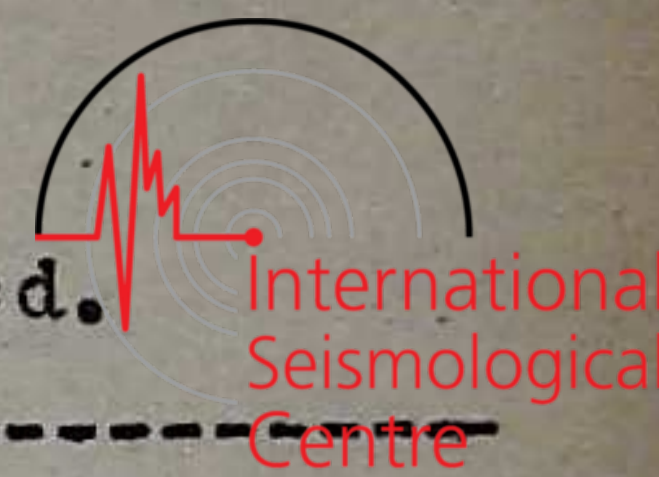
	$T_0$	V	$\epsilon$	$\frac{F}{T_0^2}$
N-S	4.3	267	2.5	0.025
E-W	4.8	268	2.7	0.026

	$T_0$	D	$T_L$	$l$	$\psi^2$	K
				cm.		
N-S	12.43	100.5	12.3	11.52	-.44	107
E-W	11.8	100.5	11.3	11.4	-.64	130
Z	11.6	100.5	12.0	14.82	-1.81	78

No.	Date	Phase	Greenwich Time h. m. s.	Per. s.	Distance Km.	Remarks.
1931						
1	Jan. 1st	iPN ePZ iSNE F	18 18 31 18 18 31 18 19 38 18 47		590	
2	Jan. 1st	iPNEZ iSNEZ LNE MNE M <sub>1</sub> E M <sub>2</sub> N F	22 18 29 22 20 26 22 21 30 22 22 22 22 22 48 22 22 57 22 47	10.2 11.1	1120	
3	Jan. 1st	iPN iSNEZ? iLEZ	23 54 45 23 56 49 23 58 40		1085	24° 20' N; 121° 50' E by Zikawei, Hong Kong, Manila, Koti.
	Jan. 2nd	F	1 12			P <sub>1</sub> and P <sub>2</sub> lost in change of records.
4	Jan. 2nd	iPNEZ S <sub>c</sub> P <sub>c</sub> SNE iPSNE iPPSNE F	10 04 16 10 14 50 10 19 17 10 20 33 12 15		13525	18° N; 108° W by U.S.C.G. S. 09:48:38. Disturbed by microseisms.
5	Jan. 2nd	iPNEZ PE SNZ iSEZ mN mZ F	18 55 12 18 55 28 18 56 12 18 56 29 18 56 35 18 56 42 19 24	10.1 5.1	500	
6	Jan. 4th	iNE F	4 53 38 5 21			
8	Jan. 5th	iPNEZ iSNE iLNE mN F	18 04 43 18 07 26 3 08 46 8 10 02 8 42	11.1	1570	

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## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date	Phase	Greenwich			Per. s.	Distance Km.	Remarks.
			h.	m.	s.			
1931								
9	Jan. 5th	iPNEZ	21	48	35		400	
		iSNE	21	49	25			
		iSNE	21	49	36			
		mN	21	50	37	9.8		
		mN	21	51	50	10.5		
		F	22	02				
10	Jan. 6th	iPNEZ	12	37	23		195	
		iSNEZ	12	37	53			
		F	12	40				
11	Jan. 6th	iPZ	22	45	04		275	
		iSNEZ	22	45	43			
		F	22	50				
12	Jan. 6th	iPNEZ	23	53	05		220	
		iSNE	23	53	34			
		F	23	56				
13	Jan. 7th	iPNEZ	2	02	16		2825	
		iSNE	2	06	36			
		iLNEZ	2	09	19			
		MNE	2	11	30			
		M <sub>1</sub> N	2	14	34	11.2		
		M <sub>2</sub> N	2	17	31	11.2		
		M <sub>3</sub> E	2	17	41	10.4		
		F	3	10				
14	Jan. 7th	iPNEZ	11	29	52		2045	
		iSNEZ	11	33	17			
		MN	11	37	ca			
		F	11	59				
15	Jan. 7th	iPNEZ	12	45	20		2410	
		iSNE	12	49	11			
		LNE	12	50	50			
		MN	12	55	08	11.4		
		F	13	34				
17	Jan. 9th	iPNZ	1	52	03		235	
		iSNEZ	1	52	35			
		F	1	54				
18	Jan. 9th	iNEZ	1	56	19			
		mN	1	59	09			
		F	2	17				
19	Jan. 9th	iPNEZ	11	18	26		2520?	
		iS?NE	11	22	12			
		iL?NEZ	11	24	15			
		MNE	11	26	ca			
		MN	11	26	25	11.2		
		MN	11	27	49	11.0		
		ME	11	29	15	12.4		
		F	11	57				

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## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY,--Continued.



No.	Date	Phase	Greenwich Time			Per. s.	Distance Km.	Remarks.
			h.	m.	s.			
1931								
20	Jan. 12th	iPNEZ iSNE F	7	27	43 08 33		195	January 10th, 11th and 12th heavy microseisms.
21	Jan. 12th	iPNEZ iNE iNE LNE F	20	43	19 09 44 38 55			Disturbed by microseisms.
22	Jan. 13th	iPNZ iE iSNE iSNEZ MN MZ F	11	19	29 33 41 05 18 34 51	8.7 6.2	640	Felt at Basco, Batanes Islands.
23	Jan. 13th	iPNE ePZ iSNEZ F	13	49	24 24 22 13		1130	
24	Jan. 14th	iPNEZ iSNE F	8	50	30 51 53		170	
25	Jan. 14th	iPNE iSNE F	14	19	31 57 22		200	
26	Jan. 15th	iNEZ iNE PR <sub>2</sub> E PR <sub>4</sub> NE PSNE PPSE LNE M <sub>1</sub> E M <sub>2</sub> E F	2	10	00 56 58 08 34 02 00 19 40 08	18.6 17.3	15295	Compression. U.S.C.G.S. 0=1:50:32, 16° N; 96° W. Horizontal data from the Wiechert.
27	Jan. 15th	iPNEZ iS?NE iL?NE ME	21	05	16 14 47 35	6.5	1720?	Compression. Horizontal data from the Wiechert.
28	Jan. 15th	ePN iPEZ iSNE iLNE MN ME	22	48	58 58 44 41 17 44	9.3 8.9	3240	2° 20' S; 145° E by Manila, Riverview, Koti, Zikawei, Adelaide. No. 27 still recording. Horizontal data from the Wiechert.
	Jan. 16th	F	1	05				



No.	Date	Phase	Greenwich Time			Par. s.	Distance Km.	Remarks.
			h.	m.	s.			
1931								
29	Jan.16th	ePZ eE iZ iP?E iSEZ iE F	1	26	37 43 50 55 37 10 14		510	
30	Jan.16th	ePNE S?NE F	19	39	08 39 32			U.S.C.G.S. 0=19:19:28, 16° N; 98° W
31	Jan.17th	iNEZ PPSE LNE F	3	12	20 43 44 05		12800	U.S.C.G.S. 0=2:50:10, 26° N; 111° W.
32	Jan.17th	PN iPEZ iSNE F	10	02	24 24 40 05		125	
33	Jan.17th	iPNEZ iSNE iLNEZ mN ME F	15	41	05 11 17 52 46 04	10.0 6.8	1210	
36	Jan.18th	iP?NEZ iNE mN iNE mN F	13	16	27 14 18 18 49 04	10.0 12.8		Sunda Straits, according to Batavia.
37	Jan.19th	iPNEZ iSNE iL?EZ mZ mE F	12	29	12 15 25 20 22 57	10.7 8.8	2590	In the region of 14° S, 112° E by Manila, Hong Kong, Adelaide, River- view.
38	Jan.20th	iPNEZ iSNEZ iLNZ eLE MN ME F	9	36	04 51 08 08 17 40 30	9.8 8.6	1600	
39	Jan.20th	iPNEZ iSNEZ iSN MN F	15	31	39 38 57 34 16	13.1	500	Compression.



## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time h. m. s.	Per. S.	Distance Km.	Remarks.
1931						
54	Jan. 24th	iPNE iS?NE iS?NE iNE F	16 52 52 16 54 04 16 54 34 16 57 26 17 25		640?	Aftershock of No. 53?
55	Jan. 24th	iNE F	17 34 58 18 07			
56	Jan. 24th	iP?NE mN F	19 13 56 19 16 34 19 28			
57	Jan. 25th	PNE iS?N iS?E mN iL?N iL?E mE mN mE F	17 52 11 17 56 17 17 56 22 17 57 45 17 58 41 17 58 46 17 59 44 18 00 09 18 00 54 19 30	11.2 9.6 14.4 10.4	2625?	Time not functioning on Z.
60	Jan. 26th	iP?NEZ iS?NE LNE MN MN F	22 29 03 22 33 10 22 36 07 22 38 46 22 41 05 23 12	11.0 11.7	2635?	
61	Jan. 27th	iNE eZ iNE mN F	6 25 05 6 25 05 6 25 50 6 27 37 7 07	9.9		
62	Jan. 27th	iPEZ PR <sub>1</sub> E PR <sub>2</sub> E PR <sub>3</sub> N iSNE SR <sub>1</sub> N SR <sub>2</sub> E SR <sub>3</sub> N iLNE MN F	20 14 46 20 15 26 20 15 38 20 15 40 20 19 21 20 20 46 20 21 08 20 21 20 20 22 27 20 25 41 23 48	14.5	5160	O=20:08:55 Approx. 26° N; 93° E by Manila, PhuLien, Zikawei, Koti, Batavia, Riverview. Horizontal data from the Wiechert.
64	Jan. 28th	iPNEZ iSNE SR <sub>1</sub> NE mE mN L?NE F	21 29 17 21 33 34 21 34 44 21 34 48 21 35 40 21 36 33 0 37	8.5 8.3	2780	O=21:23:42, 12°N; 146°30' E by Manila, Hong Kong, Zikawei, Phu-Lien, Adelai- de, Riverview. Dilatation. Horizontal data from the Wiechert.
	Jan. 29th	F	0 37			

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time h. m. s.	Per. s.	Distance Km.	Remarks.
1931						
66	Jan. 29	iPNEZ iSNEZ iLNEZ F	0 42 18 0 44 39 0 45 48 1 40		1355	Felt at Guam.
67	Jan. 29	iPNEZ iSNE F	2 44 32 2 44 53 2 47		165	
69	Jan. 29	iPNEZ iSNEZ iLNE F	11 16 03 11 18 13 11 19 25 11 30		1255	
70	Jan. 29	iPNEZ iSNE mE mZ mN F	13 50 57 13 52 26 13 54 10 13 54 12 13 54 52 14 52	10.6 9.0 10.2	820	
71	Jan. 29	iPNE iSNE MNE F	17 19 32 17 23 05 17 25 54 17 39		860	
72	Jan. 29	iPNEZ iSNEZ F	17 44 33 17 44 56 18 05		180	Compression.
73	Jan. 30	iPNZ ePE S?NE LN MN F	3 37 54 3 37 54 3 42 20 3 45 00 3 47 20 4 34	11.4	2610?	
74	Jan. 30	iNEZ mE mN F	14 49 40 14 55 09 14 55 50 15 25	6.8 14.1		
75	Jan. 31	iPNE ePZ iSNE mN F	19 55 50 19 55 50 19 56 32 19 57 16 20 09	11.4	320	

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No.	Date	Phase	Greenwich Time			Per. s.	Distance Km	Remarks
			h.	m.	s.			
	1931							
77	Jan. 31	iPNE	20	47	27		3555	
		iSNE	20	52	35			
		iLN	20	56	21			
		eLE	20	56	21			
		mN	20	57	26			
		MN	21	01	49	11.4		
		ME	21	02	07	10.6		
		F	21	28				

Fourteen insignificant or undecipherable disturbances on the following days of January: 5th, 7th, 18th(2), 23rd(4), 26th (2), 28th, 29th(2) and 31st.



No. 9.

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SEISMOLOGICAL BULLETIN OF THE OBSERVATORY



$\phi = 14^{\circ} 34' 42''$  N.  $\lambda = 120^{\circ} 58' 41''$  E.  $h = 2.40$  m. Alluvium.

WIECHERT.  $M = 1000$  Kg.

GALITZIN-WILIP.

	$T_0$	V	$\epsilon$	$\frac{V}{T_0}$
N-S	4.4	192	2.5	0.024
E-W	4.8	208	2.6	0.030

	$T_0$	D	$T_1$	L	$\mu^2$	K
				cm.		
N-S	12.43	100.5	12.5	11.52	-.44	107
E-W	11.8	100.6	11.3	11.4	-.64	130
Z	11.6	100.5	12.0	14.82	-1.81	78

No.	Date	Phase	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks
	1931					
78	Feb. 1	iPNEZ iSNE mN iLNE F	7 08 32 7 12 53 7 15 15 7 15 31 7 51	12.1	2845	
79	Feb. 2	iNEZ iL?NE mN F	3 46 30 3 51 07 3 52 13 4 16	13.0		
80	Feb. 2	iPNEZ P <sub>C</sub> PE? PR <sub>1</sub> N? SNE PSNE PPPSN? S <sub>C</sub> SE SR <sub>1</sub> NE LNE mN MNE M <sub>1</sub> E M <sub>2</sub> E M <sub>3</sub> N F	22 58 23 22 58 48 23 01 30 23 08 04 23 08 35 23 08 56 23 09 06 23 13 19 23 20 14ca 23 24 43 23 28 ca 23 33 38 23 38 30 23 38 50 3 05	15.6 17.5 17.4 14.8	8255	0=22:46:48 Compression. 39° 20' S; 177° E, according to Wellington. Horizontal data from the Wiechert.
81	Feb. 3	iPNEZ iSNE	2 32 26 2 32 44		140	No. 80 still recording.
82	Feb. 3	iPNEZ iSNE mE mN iLNE F	8 59 11 9 02 14 9 02 25 9 02 26 9 03 45 9 37	8.8 10.8	1790	
83	Feb. 4	PNEZ iSNE? iLNE MNE F	2 17 53 2 20 39 2 21 56 2 24 06 2 43		1590?	

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## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
85	Feb. 4	PNEZ	10	14	44		1510	
		iSNE	10	18	20			
		iLNE	10	19	44			
		MN	10	21	17	9.8		
		F	10	54				
87	Feb. 4	ePNE	16	40	17		1050	
		iN	16	41	32			
		iSN	16	42	08			
		mN	16	43	49			
		F	16	50				
88	Feb. 5	ePNEZ	5	22	36		2710?	
		iSNE?	5	26	48			
		mN	5	28	53	11.4		
		F	5	42				
89	Feb. 5	iPNEZ	10	15	59		160	Compression.
		iSNE	10	16	19			
		iZ	10	16	28			
		F	10	24				
90	Feb. 6	ePNEZ	9	37	12		790	
		iSNE	9	38	39			
		mN	9	42	49	9.8		
		F	9	52				
91	Feb. 7	ePNEZ	5	07	27		1745	
		iSNE	5	10	27			
		mN	5	11	54	10.4		
		F	5	27				
92	Feb. 7	ePNEZ	6	02	53		2200?	
		iS?NE	6	06	30			
		F	6	33				
93	Feb. 7	iPNEZ	15	30	26		520	
		iSNE	15	31	27			
		iSNE	15	31	48			
		mN	15	33	46	11.5		
		mE	15	34	36	9.8		
		mZ	15	35	48	7.4		
		F	16	13				
94	Feb. 8	iPNEZ	1	55	29		8160	0=1:43:58 Compression.
		iSNE	2	05	04			
		LNE	2	17	45			
		MNE	2	23	16	20ca		
		F	3	06				
95	Feb. 8	iPN	2	53	19		100	No. 94 still recording.
		ePE	2	53	19			
		iSNE	2	53	32			

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## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.	
			h.	m.	s.				
1931									
96	Feb. 10	iPNEZ	1	28	28		2855	Compression.	
		iSNE	1	32	50				
		iLE	1	35	27				
		ME	1	37	37	14.6			
		F	2	38					
97	Feb. 10	iPNZ	6	40	10		3500	On 6:33:30 Compression. S Sumatra and W Java according to Batavia. In minute gap. Horizontal data from Wiechert.	
		iPE	6	40	13				
		iSNE	6	45	14				
		iLNE	6	49	00				
		MN	6	53	12	12.7			
		ME	6	55	30	17.3			
		F	10	34					
98	Feb. 11	ePNEZ	17	13	26		9930		
		iSNE	17	24	21				
		LNE	17	36	14				
		MNE	17	43	ca				
		F	18	22					
99	Feb. 11	iPNE	19	53	31		2745		
		eSN	19	57	46				
		iSE	19	57	46				
		iLNE	20	00	40				
		MN	20	02	33	12.5			
		MN	20	03	05	12.8			
		ME	20	04	44	13.2			
		F	20	35					
100	Feb. 11	iNEZ	23	42	03				
		mN	23	49	07	12.6			
		mN	23	54	12	12.0			
	Feb. 12	F	0	13					
101	Feb. 12	iPNEZ	5	49	44		3370	0=5:43:14 Compression. South Sumatra and West Java according to Batavia.	
		PR <sub>1</sub> EZ	5	50	33				
		PR <sub>3</sub> Z	5	50	53				
		iSNE	5	54	40				
		SR <sub>2</sub> E	5	56	56				
		iLEZ	5	58	13				
		iLN	5	58	21				
		MN	6	00	48	19.6			
		ME	6	01	08	14.2			
		F	7	43					
105	Feb. 12	iPNEZ	21	07	54		330	Felt in Masbate and SE Luzon.	
		iSNE	21	08	37				
		iSNE	21	08	43				
		F	22	03					
106	Feb. 12	iPNEZ	23	40	50		710		
		iSNE	23	42	09				
	Feb. 13	F	0	29					

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time			Per. Sec.	Dist. Km.	Remarks.	
			h.	m.	s.				
1931									
107	Feb. 13	iPNZ iSZ PZ	0	44	20 04 13		985	N-S and E-W Galitzin records confused by overlapping lines. No minutes in the Wiechert.	
108	Feb. 13	iPNEZ iS?Z P	1	39	00 37 58		8165?	Dilatation. Provisional epicenter $69.8^{\circ}$ S; $177.8^{\circ}$ E according to Wellington. P in minute gap.	
109	Feb. 13	iNEZ F	11	38	41 03				
110	Feb. 13	iPNE iSNE iLNE mN F	14	13	08 18 29 32 34		1255	10.6	
112	Feb. 13	iPNEZ iSNE iLNE MN ME MN ME F	22	27	46 31 27 17 19 56 07 40		2310	12.4 13.2 12.0 13.0	
113	Feb. 14	PNEZ iSNE mZ mE mN F	6	02	30 48 40 40 51 34		700	6.0 9.2 9.2	Compression.
114	Feb. 14	PNEZ iSNEZ SRZ SRZE iLNEZ MN ME F	14	04	29 33 26 20 15 20 50 06		3490	17.6 14.4	O=13:57:49 South of Sumatra by Manila, Hong Kong, Zikawei, Koti.
115	Feb. 15	iPN iSN? F	0	41	43 37 55		360?	E and Z records light-struck.	
116	Feb. 15	PNE SNE? F	12	00	00 00 03		395?	P and S in minute gap.	
118	Feb. 15	iN mN F	22	41	36 41 08			E and Z records light-struck. Felt at Guam.	

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No.	Date	Phase	Greenwich Time			Per. s.	Dist. No.	Remarks.
			h.	m.	s.			
1931								
119	Feb. 16	iPZ	18	55	18		3555	In region of 41° 30' N; 150° E by Koti, Zikawei, Hong Kong, Manila.
		iPNE	18	55	20			
		iSNE	19	00	23			
		mN	19	01	05	11.4		
		mN	19	02	21	10.8		
		mE	19	02	49	9.2		
		iLE	19	04	18			
		MNE	19	07	06			
		ME	19	08	46	12.4		
		F	20	14				
120	Feb. 17	iPNEZ	11	15	10		165	
		iSNEZ	11	15	31			
		F	11	18				
121	Feb. 17	iPNEZ	15	21	41		150	Dilatation. Felt at Batangas, Luzon.
		iSNEZ	15	22	00			
		mN	15	23	44	6.6		
		F	15	36				
122	Feb. 18	PNEZ	1	18	54		895	
		iSNE	1	20	30			
		mN	1	21	47	10.6		
		F	1	30				
123	Feb. 18	iPNEZ	19	17	55		1260	
		iSNE	19	20	06			
		iLNE	19	21	14			
		MN	19	22	05			
		ME	19	22	11			
		MN	19	23	24	10.6		
124	Feb. 18	iPNEZ	19	37	20		135	No. 123 still recording.
		iSNE	19	37	37			
		F	19	48				
125	Feb. 19	iPNEZ	2	29	27		430?	Dilatation.
		iSNEZ?	2	30	19			
		F	2	33				
126	Feb. 19	iPNEZ	17	46	12		2890	Enggano Island, south of Sumatra, according to Batavia.
		iSNE	17	50	37			
		iLNE	17	53	27			
		mE	17	55	24	12.4		
		MN	17	55	58			
127	Feb. 19	iPNEZ	18	06	41		115	Dilatation. Felt slightly in Manila and Ambulong, Batangas.
		iSEZ	18	06	56			
128	Feb. 19	iPZ	18	29	54		2945	No. 126 still recording. No. 126 still recording.
		iNE	18	30	07			
		iSNE	18	34	23			

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SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
129	Feb. 19	PNEZ	21	39	35		4000	
		iSNE	21	45	11			
		iLNE	21	49	52			
		MN	21	55	04	11.6		
		MN	21	56	22	11.2		
		F	22	31				
130	Feb. 20	iPNEZ	5	39	27		3310	0=5:33:02 Japan.
		PR <sub>1</sub> N	5	40	15			Compression from NE.
		PR <sub>2</sub> N	5	40	30			Horizontal data from the
		iSNE	5	44	19			Wiechert.
		mE	5	44	24	4.0		
		mN	5	44	54	3.8		
		iLNE	5	47	45			
		MN	5	50	49	5.4		
		ME	5	52	25	8.3		
		F	7	48				
132	Feb. 20	iPNEZ	22	53	07		3580	Compression.
		iSNE	22	53	16			
		iLNE?	23	00	30			
		MNE?	23	02	40			
		F	23	22				
133	Feb. 22	iPEZ	12	51	08		245	
		ePN	12	51	08			
		iSNE	12	51	42			
		F	12	55				
134	Feb. 22	iPNEZ	21	32	19		2665	
		PR <sub>1</sub> E	21	32	49			
		iNE	21	33	14			
		iSNE	21	36	29			
		mE	21	37	11	9.2		
		SR <sub>1</sub> E	21	37	33			
		mE	21	37	43	8.0		
		mN	21	38	17	11.4		
		iLNE	21	38	53			
		M <sub>1</sub> N	21	44	20	11.4		
		M <sub>2</sub> E	21	45	14	10.0		
		M <sub>3</sub> N	21	48	04	12.4		
		M <sub>4</sub> E	21	50	15	11.6		
		F	22	37				
135	Feb. 23	PNEZ	2	22	02		3530?	
		SNE?	2	27	09			
		LNE?	2	30	50			
		F	2	41				
136	Feb. 23	iPNEZ	5	30	02		2655	
		iSNE	5	34	11			
		iLNE	5	36	33			
		MN	5	38	44			
		F	6	18				

MANILA OBSERVATORY



SPECIAL BULLETIN OF PRINCIPAL EARTHQUAKES

FEBRUARY, 1931

1st	1PNEZ	7 08 32		13th	1PNE	14 18 08	
	1SNE	7 12 53			1SNE	14 20 18	
2nd	1PNEZ	22 58 23	Compression.	13th	1PNEZ	22 23 46	
	SNE	23 08 04			1SNE	22 27 31	
4th	PNEZ	2 17 53		14th	PNEZ	14 04 29	
	1S?NE	2 20 39			1SNEZ	14 07 55	
4th	ePNE	16 40 17		16th	1PZ	18 55 18	
	1SN	16 42 08			1PNE	18 55 20	
					1SNE	19 00 26	
8th	1PNEZ	1 55 29	Compression.	18th	1PNEZ	19 17 55	
	1SNE	2 05 04			1SNE	19 20 06	
10th	1PNEZ	1 28 28		19th	1PNEZ	17 46 12	
	1SNE	1 32 50			1SNE	17 50 37	
10th	1PNZ	6 40 10	Compression.	19th	PNEZ	21 39 35	
	1PE	6 40 13			1SNE	21 45 11	
	1SNE	6 45 14					
11th	ePNEZ	17 13 26		20th	1PNEZ	5 39 27	Compression
	1SNE	17 24 21			1SNE	5 44 19	From NE.
11th	1PNE	19 53 31		22nd	1PNEZ	21 32 19	
	eSN	19 57 46			1SNE	21 36 29	
	1SE	19 57 46					
12th	1PNEZ	5 49 44	Compression.	23rd	1PNEZ	5 30 02	
	1SNE	5 54 40			1SNE	5 34 11	
13th	1PNZ	0 44 20		24th	1PNEZ	17 33 41	Compression.
	1SZ	0 46 04			1SNEZ	17 36 42	
13th	1PNEZ	1 39 00	In minute gap.	27th	1PNEZ	9 40 55	Dilatation.
	1S?Z	1 48 37	Dilatation.		1SNE	9 44 52	

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

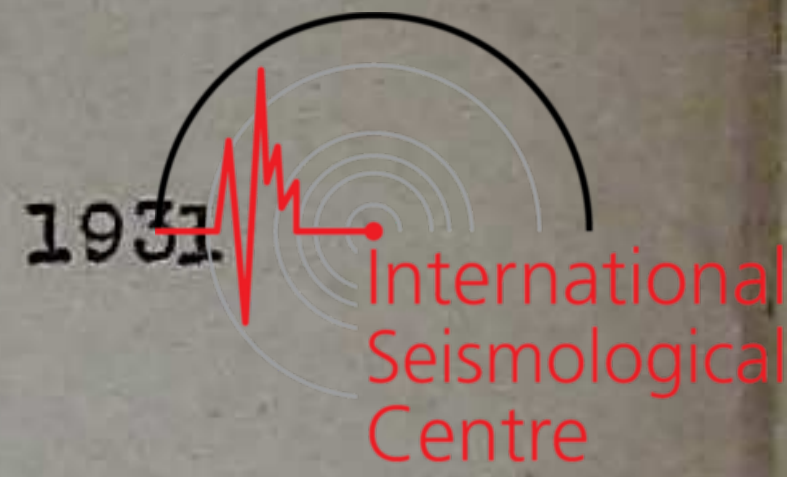


No.	Date	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
137	Feb. 24	iNZ	14	16	17			
		eE	14	16	17			
		iN	14	19	43			
		mN	14	24	25	8.6		
		F	14	57				
138	Feb. 24	iPNEZ	17	33	41		1755	Compression.
		iSNEZ	17	36	42			
		iLNE	17	38	24			
		M <sub>1</sub> E	17	39	54	10.6		
		M <sub>2</sub> N	17	40	31	10.0		
		M <sub>3</sub> N	17	43	22	14.0		
		F	18	26				
139	Feb. 25	iPNEZ	11	03	05		175	
		iSNE	11	03	27			
		F	11	12				
144	Feb. 27	ePNEZ	1	43	50		2555?	
		iSNEZ?	1	47	52			
		iLNE?	1	50	31			
		MN	1	52	31	11.5		
		ME	1	52	34	10.8		
		F	2	47				
145	Feb. 27	iPNEZ	9	40	55		1465	Dilatation. In the region of
		iSNEZ	9	43	27			2° N; 126° E by Manila, Bat-
		iLNE	9	44	45			avia, Wellington.
		MZ	9	51	01	5.4		Felt at Menado, N.E.I. accord-
		MN	9	51	18	16.0		ing to Batavia.
		ME	9	51	53	13.4		
146	Feb. 27	iPNEZ	11	11	36		2200	No.145 still recording.
		iSNEZ	11	15	13			
148	Feb. 27	iPNEZ	19	26	24		190	
		iSNE	19	26	48			
		F	19	32				
150	Feb. 28	iPNEZ	9	17	18		140	
		iSNEZ	9	17	36			
		F	9	22				
151	Feb. 28	iPNEZ	22	30	44		4075	
		iSNE	22	36	25			
		iLNE	22	41	17			
		F	23	03				

Fourteen insignificant or undecipherable disturbances on the following days of February: 4th(2), 12th(3), 13th, 15th, 20th, 26th(4), 27th and 28th.



No. 16.



M A N I L A , P . I .

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.  $\lambda=120^{\circ} 58' 41''$  E.  $h=2.40$  m. Alluvium.

WIECHERT.  $M=1000$  Kg.

GALITZIN-WILIP.

	$T_0$	V	$\epsilon$	$\frac{r}{T_0^2}$
N-S	4.3	195	2.5	0.026
E-W	4.8	208	2.7	0.026

	$T_0$	D	$T_1$	$l$	$\mu^2$	K
				cm.		
N-S	12.43	100.5	12.3	11.52	-.44	107
E-W	11.8	100.5	11.3	11.4	-.64	130
Z	11.6	100.5	12.0	14.82	-1.81	78

No.	Date	Phase	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks.
1931						
155	March 1	iPNEZ iSNE F	21 13 40 21 14 14 21 19		245	
156	March 1	iPNEZ iSNE F	23 39 20 23 39 28 23 41		60	
157	March 1	iPNZ ePE iSNE iLNE MNE MN	23 44 11 23 44 11 23 48 16 23 50 40 23 52 49 23 54 33	13.0	2610	
	March 2	F	0 27			
158	March 2	iPNEZ SNE? iLNE? F	2 28 36 2 32 37 2 34 51 4 29		2545?	Compression. Horizontal data from the Wiechert.
159	March 2	iPNEZ iSNE mN mN mE F	7 28 31 7 29 54 7 31 41 7 32 54 7 32 57 7 53	11.6 10.8 10.9	435	Compression.
160	March 2	iPNEZ iSE F	10 55 46 10 56 51 11 09		425	Felt at Legaspi, SE Luzon.
162	March 3	iNE F	19 15 11 19 41			
163	March 4	iPNZ ePE iSEZ F	23 35 50 23 35 51 23 36 58 23 46		595	

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date	Phase	Greenwich			Dist. Km.	Remarks.	
			h.	m.	s.			
1931								
164	March 5	iPNE	18	01	02	2900	From the Wiechert. Time not functioning on Galibain.	
		iSNE	18	05	27			
		iLNE	18	08	10			
		MNE	18	14	30			
		F	19	11				
165	March 6	iPEZ	12	29	27	1635		
		eFN	12	29	27			
		iSNE	12	32	17			
		iLN	12	33	46			
		F	12	45				
166	March 7	iPNEZ	1	01	12	7450?	U.S.C.G.S. 0=0:41:35, 10°N; 87° W. J.S.A., 7.5°N; 84°W.	
		SNE?	1	10	34			
		LNE?	1	22	30			
		F	1	31				
168	March 7	iPNEZ	10	09	06	5255	0=10:00:21	
		iSE	10	15	57			
		iSNZ	10	16	00			
		mN	10	16	50			10.4
		iN	10	19	30			
		mE	10	22	16			9.6
		iLN	10	23	19			
		iLE	10	23	27			
		MN	10	30	11			12.2
		MN	10	36	29			12.0
		F	11	34				
169	March 7	iPNEZ	18	26	51	5010?		
		iS?N	18	33	28			
		iE	18	33	40			
		F	19	07				
171	March 8	iPNEZ	2	03	04	9330	0=1:50:34 Dilatation. Bulgaria. U.S.C.G.S. 0=1:50:13, 42° N; 23° E.	
		iSNE	2	13	35			
		iLNE	2	31	29			
		mN	2	32	22			12.8
		M <sub>1</sub> E	2	41	39			15.0
		M <sub>2</sub> E	2	43	21			17.5
		M <sub>3</sub> N	2	45	04			16.8
		M <sub>4</sub> E	2	45	55			15.8
		M <sub>5</sub> N	2	46	58			15.6
		F	3	38				
172	March 8	iPNEZ	2	52	30	110	No. 171 still recording.	
		iSNE	2	52	44			
173	March 8	iPNEZ	6	05	21	9200		
		iSNE	6	15	46			
		mE	6	16	23			11.0
		F	6	45				
174	March 8	PNEZ?	12	02	19	8210?		
		iN	12	11	47			
		iSE	12	11	58			
		iLNE	12	28	10			
		MNE	12	33	ca			
		F	13	06				

MANILA OBSERVATORY

SPECIAL BULLETIN OF PRINCIPAL EARTHQUAKES

MARCH, 1931

17 <sup>5</sup> st	iPNZ	23 44 11		14th	iPEZ	14 11 12	Compression.
	ePE	23 44 11			SE?	14 16 18	
	iSNE	23 48 16		15th	ePEZ	15 20 12	
2nd	iPNEZ	2 28 36	Compression.		iSE	15 24 24	
	iSNE	2 32 37		15th	iPEZ	16 40 05	
5th	iPNE	18 01 02			iSE	16 44 28	
	iSNE	18 05 27		15th	ePEZ	19 03 38	
7th	iPNEZ	1 01 12			SE	19 08 11	
	SNE?	1 10 34		18th	eP'E	8 22 18	Compression?
7th	iPNEZ	10 09 06			iP'Z	8 22 18	Dist. 157.3°
	iSE	10 15 57			LZ	9 15 00	
	iSNZ	10 16 00		18th	iPEZ	20 16 17	Compression.
8th	iPNEZ	2 03 04	Dilatation.		SNE?	20 18 30	Probably in
	iSNE	2 13 35	Bulgaria.				southern Celebes
8th	iPNEZ	6 05 21					Sea. Felt in
	iSNE	6 15 46					Mindanao.
8th	PNEZ?	12 02 19		19th	iPEZ	6 26 03	18°15'N; 120°5'
	iSE	12 11 58			iSE	6 27 08	E as on June 18
11th	iPEZ	6 03 50	Dilatation.				1927.
	iSEZ	6 06 08					Felt throughout
11th	iPEZ	12 31 50	Compression.	23rd	ePEZ	15 27 30	northern Luzon.
	iSNE	12 36 10	Approx. 20°30'N; 147°E.		eSE	15 32 33	
12th	iPEZ	10 45 45	Compression.	28th	iPEZ	12 43 42	Compression.
	iSE	10 50 09			iSNE	12 47 44	
12th	ePEZ	19 09 32		29th	iPEZ	1 04 21	
	iSEZ	19 14 42			iS?E	1 07 08	
12th	ePEZ	21 03 48		29th	iPEZ	17 58 32	Dilatation.
	iSEZ	21 07 16			iSEZ	18 02 06	
14th	iPEZ	12 11 45		30th	ePEZ	7 28 34	
	iSE	12 15 17			iSEZ	7 31 39	
				30th	ePE	13 39 08	Felt throughout
					iSNE	13 40 23	northern Luzon.

M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date.	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			.h.	m.	s.			
1931								
175	Mar. 8	ePN	16	46	50		560	
		iPEZ	16	46	50			
		iSNEZ	16	47	55			
		iE	16	48	30			
		iN	16	48	38			
		F	16	54				
176	Mar. 9	iPNE	3	55	23		3900	0=3:48:12 In region of 38° N; 145° E by Zikawei, Manila, Kobi, HongKong and Phu-Lien. U.S.C.G.S. 0=3:48:40, 41° N; 142° E.
		iSNE	4	00	53			
		iLNE	4	05	27			
		MNE	4	08	26			
		M <sub>1</sub> N	4	13	38	15.5		
		M <sub>2</sub> E	4	14	30	14.0		
		M <sub>3</sub> E	4	17	23	13.4		
		M <sub>4</sub> N	4	17	39	14.0		
		F	6	22				Z not operating. Horizontal data from the Wiechert.
179	Mar. 11	iPEZ	6	03	50		2670	Dilatation.
		iSEZ	6	08	00			N-S component not operating.
		F	7	14				
180	Mar. 11	iPEZ	12	31	50		2820	0=12:26:10 Compression. Approx. 20° 30' N; 147° E by Manila, Phu-lien, Zikawei. U.S.C.G.S. 0=12:26:15, 19° N; 144° E.
		mN	12	34	08	5.5		
		iSNE	12	36	10			
		iN	12	36	51			
		iE	12	37	49			
		iLNE	12	38	49			
		ME	12	45	15	14.5		
		F	14	51				N-S component not operating owing to shortage of paper. Horizontal data from the Wiech- ert.
183	Mar. 12	iPEZ	10	45	45		2880	0=10:40:00 Compression. 23° N; 146° 36' E by Manila and Zikawei.
		mE	10	47	08	8.8		
		mZ	10	47	47	8.4		
		iSE	10	50	09			
		mE	10	50	15	13.6		
		iZ	10	50	36			
		mZ	10	51	15	8.5		
		iLE	10	52	51			
		mE	10	53	52	13.6		
		M <sub>1</sub> E	10	55	22	16.0		
		M <sub>2</sub> Z	10	56	47	14.8		
		M <sub>3</sub> E	10	57	26	16.3		
		F	12	47				
186	Mar. 12	ePEZ	19	09	32		3590	0=19:02:45
		iE	19	10	08			
		iZ	19	11	26			
		iSEZ	19	14	42			
		mE	19	16	49	8.5		
		iLE	19	18	45			
		MEZ	19	21	ca			
		ME	19	26	29	15.4		
		F	20	42				

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time			Per. S.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
187	Mar. 12	ePEZ	21	03	48		2090	
		iE	21	04	13			
		mE	21	06	35	8.1		
		iSEZ	21	07	16			
		mE	21	07	22	8.2		
		iLEZ	21	08	52			
		MEZ	21	10	55			
		MZ	21	13	26	9.2		
		ME	21	15	50	15.6		
		F	22	32				
190	Mar. 14	iPEZ	5	38	26		250	
		iSEZ	5	38	54			
		mE	5	39	59	8.2		
		mZ	5	40	09	7.4		
		F	5	57				
191	Mar. 14	iPEZ	12	11	45		2135	
		iSE	12	15	17			
		LE	12	17	00			
		mE	12	18	55	12.8		
		ME	12	19	32	12.0		
		MZ	12	19	55	9.2		
		ME	12	21	59	12.6		
		F	13	24				
192	Mar. 14	iPEZ	14	11	12		3520?	Compression.
		iZ	14	11	17			
		iE	14	17	50			
		SE?	14	16	18			
		IE?	14	20	00			
		F	14	56				
193	Mar. 14	ePEZ	20	57	23		2630?	
		SE?	21	01	30			
		IE?	21	03	54			
		F	21	26				
195	Mar. 15	iPEZ	6	07	16		160	Compression.
		iSEZ	6	07	36			
		F	6	13				
196	Mar. 15	iPZ	6	31	41		165	Dilatation.
		ePE	6	31	41			
		iSEZ	6	32	02			
		F	6	36				
197	Mar. 15	ePE	11	53	57		195	
		iPZ	11	53	57			
		iSE	11	54	22			
		F	11	58				

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date.	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
198	Mar. 15	ePEE	15	20	12		2710	
		iSE	15	24	24			
		iIE	15	27	00			
		ME	15	29	34			
		F	15	58				
199	Mar. 15	iPEZ	16	40	05		3420	
		iSE	16	45	05			
		LE	16	48	35			
		ME	16	51	09			
		F	17	31				
200	Mar. 15	ePEZ	19	03	38		3020	
		SE	19	08	11			
		LE	19	11	05			
		ME	19	13	29			
		F	19	44				
201	Mar. 18	iPE	1	49	19		610?	
		ePZ	1	49	19			
		iSEZ?	1	50	29			
		iSEZ?	1	50	56			
		mE	1	52	27	8.0		
		F	2	03				
202	Mar. 18	eP'E	8	22	18		17480	0=8:02:11 Compression?
		iP'Z	8	22	18			U.S.C.G.S. 0=8:02:17, 34°S; 72°W.
		iZ	8	39	18			Saint Louis, J.S.A. 32°S; 73°W.
		LZ	9	15	00			
		F	11	32				
203	Mar. 18	iPEZ	20	16	17		1290	Compression. In the region of
		iNE	20	16	30			40°N; 128°E. Felt in Mindanao.
		iE	20	17	08			Horizontal data from the
		iN	20	17	10			Wiechert.
		SNE?	20	18	30			
		F	22	55				
204	Mar. 19	iPEZ	6	26	03		425	18° 20' N; 120° 10' E by Manila,
		iE	6	26	05			HongKong, Zikawei, Phu-Lien,
		iSE	6	27	08			Kobe, Osaka.
		F	8	55				Felt throughout northern Luzon
								and HongKong. Same epicenter
								as June 18, 1927.
205	Mar. 19	ePEZ	11	02	26		160	
		iE	11	02	37			
		iSEZ	11	02	46			
		F	11	09				
209	Mar. 22	iPZ	14	04	57		415	Dilatation.
		iE	14	05	01			Felt in NW Luzon. Related to
		iSEZ	14	05	49			No. 204.
		SEZ	14	06	00			
		mZ	14	09	20	5.4		
		mE	14	09	47	5.6		
		F	14	26				

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date.	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
210	Mar. 22	iPEZ	15	07	46		160	Compression. 16° 5' N; 121° 10' E. Felt in Central Luzon. S from the wiechert.
		iSE	15	08	06			
		F	16	26				
211	Mar. 22	ePEZ	17	33	22		400	Felt in Ilocos Norte Province, NW Luzon. Related to No. 204.
		iSE	17	34	22			
		mE	17	38	41	7.4		
		mZ	17	39	07	5.5		
		F	17	46				
212	Mar. 22	iPEZ	22	17	34		140	Compression. A second shock superimposed between 22:18 and 22:19.
		iSE	22	17	52			
		F	22	27				
214	Mar. 23	ePEZ	15	27	30		3480	
		eSE	15	32	33			
		LE	15	36	12			
		ME	15	39	20			
		ME	15	44	15	11.6		
		F	16	02				
216	Mar. 23	iPEZ	20	11	47		410	Compression. Felt in northern Luzon. Related to No. 204.
		iSEZ	20	12	37			
		SEZ	20	12	47			
		mE	20	16	32	8.6		
		F	20	42				
218	Mar. 24	iE	7	21	22			
		iE	7	25	06			
		F	8	45				
223	Mar. 26	ePE	3	04	51?		430?	Felt in NW Luzon. Related to No. 204.
		iSEZ	3	05	57			
		F	3	12				
224	Mar. 26	iPEZ	19	09	20		410	
		iSEZ	19	10	21			
		F	19	16				
227	Mar. 28	iPEZ	12	43	42		2560	Compression. South Moluccas according to Batavia. U.S.C.G.S. O=12:32.2, 18°N; 137°E.
		iSNE	12	47	44			
		iLNE	12	50	26			
		MN	12	53	09	8.2		
		F	15	17				
228	Mar. 29	iPEZ	1	04	21		1600?	
		iS?E	1	07	08			
		iL?E	1	09	11			
		ME	1	10	48			
		ME	1	12	13	9.8		
		F	2	01				

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date.	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
230	Mar. 29	iPEZ	17	58	32		2165	Dilatation.
		iSEZ	18	02	06			
		iLEZ	18	03	51			
		ME	18	06	21			
		MZ	18	06	25	7.4		
		F	19	04				
231	Mar. 30	iPEZ	5	23	58		440	Compression.
		iSZ	5	24	52			
		iSZ	5	25	06			
		mZ	5	28	27	7.6		
		mE	5	29	26	9.1		
		F	5	51				
232	Mar. 30	ePEZ	7	28	34		1095	24°N; 124°E by Zikawei, Hong-Kong, Manila.
		iSEZ	7	30	30			
		mE	7	34	27	14.8		
		ME	7	34	54	12.6		
		ME	7	35	51	15.0		
		F	8	29				
233	Mar. 30	eE	10	51	51			
		iZ	10	51	51			
		eEZ	10	52	23			
		MEZ	11	01	34			
		F	11	22				
234	Mar. 30	ePE	13	39	08		485	Related to No. 204. Horizontal data from the Wiechert.
		iPZ	13	39	08			
		iSNE	13	40	23			
		mN	13	41	13	4.4		
		mE	13	41	26	4.7		
		mN	13	44	29	5.0		
		mE	13	44	33	5.0		
		F	14	57				
235	Mar. 30	ePEZ	14	45	34		430	Felt in NW Luzon. Related to No. 204. No. 234 still re- cording.
		iSEZ	14	46	40			
236	Mar. 31	eZ	6	47	14			
		iZ	6	49	38			
		F	7	10				
237	Mar. 31	P?Z	16	19	05			U.S.C.G.S. 0=16:01:54, 12° N; 86° W.
		eZ	16	37	00			
		SPS?Z	16	43	32			
		PPSS?Z	16	44	10			
		F	18	12				

Twenty-eight insignificant or undecipherable disturbances on the following days of March: 1st(3), 2nd, 7th(2), 9th, 10th, 11th(2), 12th(3), 13th, 14th, 19th(2), 22nd, 23rd(2), 24th(4), 26th, 27th(2), and 29th.



No. 23.



M A N I L A , P . I .

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.  $\lambda=120^{\circ} 58' 41''$  E.  $h=2.40$  m. Alluvium.

WIECHERT. M=1000 Kg.

GALITZIN-WILIP.

	$T_0$	V	$\epsilon$	$\frac{F}{T_0^2}$
N-S	4.4	199	2.4	0.031
E-W	4.9	203	2.4	0.034

	$T_0$	D	$T_1$	$l$	$\mu^2$	K
N-S	12.43	100.5	12.5	11.52	.030	107
E-W	11.8	100.5	11.87	11.4	.017	133
Z	9.0	100.5	12.0	14.82	.017	131

No.	Date	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
240	Apr. 1	iPEZ	20	29	00	7.6	740	Dilatation. P in Minute gap. N-S and E-W Galitzin not operating through lack of paper. Horizontal data from the Wiechert.
		iSEZ	20	30	22			
		iL?EZ	20	31	00			
		mZ	20	32	06			
		F	21	34				
243	Apr. 2	iPNEZ	12	27	47	7.6	2310	Dilatation.
		iZ	12	28	12			
		S?NEZ	12	31	32			
		F	12	53				
246	Apr. 3	PNEZ	19	19	01	7.6	2535	
		SNEZ	19	23	01			
		F	19	31				
247	Apr. 3	iPZ	23	29	14	7.6	3410?	Dilatation.
		iS?Z	23	34	13			
		iZ	23	36	49			
		iZ	23	37	33			
		iZ	23	41	26			
	Apr. 4	F	0	37				
250	Apr. 5	PZ	10	17	31	7.6	485	
		iSNEZ	10	18	28			
		mZ	10	22	21			
		F	10	32				
251	Apr. 5	ePZ	21	36	28	7.2	2500?	
		eS?Z	21	40	26			
		iL?Z	21	43	23			
		MZ	21	45	03			
		F	22	09				
253	Apr. 6	iPZ	6	57	17	7.0	3780	O=6:50:16 Compression.
		mZ	6	58	16			
		mZ	6	58	41			
		iZ	6	59	37			
		iSZ	7	02	39			
		mZ	7	04	46			
		iL?Z	7	06	27			
		MZ	7	10	00			
		F	8	14				

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date.	Phase.	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
254	Apr. 6	ePNE	12	10	17		500	Compression. Felt in northern Luzon. Epicenter probably in the Babuyan Islands.
		iPZ	12	10	17			
		iSNEZ	12	11	16			
		mZ	12	12	56	6.2		
		F	12	56				
255	Apr. 8	iPZ	8	06	25		1490	
		iZ	8	07	48			
		iSNEZ	8	08	59			
		mZ	8	09	04	8.7		
		iZ	8	09	11			
		iL?NEZ	8	10	13			
		F	8	58				
256	Apr. 8	ePZ	8	40	29		470	No. 255 still recording.
		iSZ	8	41	25			
257	Apr. 8	iPNEZ	19	08	25		2720	O=19:02:55 Compression.
		iZ	19	08	27			
		iZ	19	11	50			
		iSNEZ	19	12	38			
		mZ	19	14	47	8.4		
		iLZ	19	15	11			
		MZ	19	29	24	11.0		
		F	20	10				
258	Apr. 9	ePZ	14	56	06		175	
		iSNE	14	56	28			
		F	14	58				
259	Apr. 9	ePZ	23	08	12		7.6	
		L?Z	23	14	10			
		MZ	23	17	28			
		F	23	35				
261	Apr. 10	ePZ	12	06	16		650	Felt in Central Visayan Islands and northern Mindanao. Epicenter in the Mindanao Sea.
		iSZ	12	08	00			
		mZ	12	10	43	6.8		
		mZ	12	12	24	6.4		
		F	12	36				
263	Apr. 11	ePNEZ	15	10	16		7.2	
		mZ	15	12	10			
		mZ	15	16	51	8.7		
		MZ	15	19	21			
		F	15	56				
264	Apr. 12	ePNEZ	2	10	50		7295	O=2:00:05
		iZ	2	11	28			
		mZ	2	14	36	7.7		
		iSNEZ	2	19	40			
		mZ	2	20	37	9.0		
		MZ	2	37	12			
		F	3	25				

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date.	Phase	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks
1931						
266	Apr. 12	ePNEZ	22 37 25		650	Felt in Surigao, Mindanao.
		iZ	22 37 40			
		eSZ	22 38 38			
		eZ	22 39 47			
		F	22 48			
267	Apr. 13	iPNEZ	10 15 16		1310	Compression.
		iSNEZ	10 17 34			
		iLZ	10 18 46			
		mZ	10 19 49			
		F	10 33			
271	Apr. 14	ePNEZ	19 55 39		435	Felt at Vigan, on northwest coast of Luzon.
		iSNEZ	19 56 32			
		mZ	19 58 37			
		F	20 04			
272	Apr. 16	ePNEZ	12 01 00		3000	
		iSNEZ	12 05 32			
		iLEZ	12 06 32			
		mZ	12 09 13	8.7		
		F	12 48			
274	Apr. 16	ePNE	21 42 52		5240	
		iPZ	21 42 52			
		iZ	21 46 06			
		iSEZ	21 49 42			
		eSN	21 49 42			
		iLZ	21 57 05			
		LNE	21 57 11			
		F	22 34			
275	Apr. 17	iPNEZ	5 31 13		165	Dilatation. Epicenter Approx. 119° 40' E; 15° 20' N. Felt at Iba on the west coast of Luzon.
		iSNZ	5 31 34			
		iZ	5 31 42			
		F	6 13			
276	Apr. 17	ePN	5 44 15		165	No. 275 still recording. Probably from same epicenter as preceding.
		iPZ	5 44 15			
		iSNZ	5 44 36			
277	Apr. 17	iPNEZ	9 11 57		840	
		iSNEZ	9 13 28			
		F	9 27			
278	Apr. 19	ePN	2 35 49		1790	0=2:32:01 Dilatation.
		iPEZ	2 35 49			
		iSNE	2 38 52			
		iLNEZ	2 40 25			
		MNE	2 42 30			
		M <sub>1</sub> N	2 44 22	11.0		
		M <sub>2</sub> E	2 44 44	11.6		
		M <sub>3</sub> N	2 45 51	10.2		
		F	3 57			

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date.	Phase	Greenwich			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
279	Apr. 20	ePNE	16	37	43		2865	
		iPZ	16	37	43			
		SNE	16	42	06			
		LN	16	44	52			
		F	17	24				
281	Apr. 21	iPEZ	23	52	02		1545	N-S component not recording.
		iSEZ	23	54	42			
		MEZ	23	57	18			
282	Apr. 22	ePE	0	14	19		7750	Compression.
		iPZ	0	14	19			N-S component not recording.
		iE	0	14	26			
		iSE	0	23	35			
		iE	0	24	17			
		mE	0	24	41	11.0		
		LEZ	0	36	50			
		F	1	57				
283	Apr. 23	ePNEZ	20	15	56		535	
		iPNE	20	16	16			
		iSNE	20	16	58			
		F	20	23				
284	Apr. 24	ePN	5	52	43		3270	
		iPEZ	5	52	43			
		iSNEZ	5	57	33			
		LNE	6	00	26			
		F	6	26				
285	Apr. 24	PNEZ	13	23	27		620	
		PE	13	25	48			
		SNE	13	24	37			
		F	13	36				
286	Apr. 24	ePNEZ	16	55	33		565	Felt in the city of Cebu.
		SNEZ	16	56	38			
		iNEZ	16	57	14			
		F	17	20				
287	Apr. 24	ePNEZ	17	29	43		4500	O=17:21:51 Epicenter approx.
		iNEZ	17	29	51			4°5 S; 158°5 E. Measured dis-
		SNEZ	17	35	50ca			tances satisfy Manila, Batavia,
		LNEZ	17	40	30			Honolulu, Wellington, Zikawei.
		mE	17	44	52	16.4		
		mE	17	46	37	15.6		
		mN	17	46	46	12.4		
		MN	17	50	45	16.0		
		MN	17	51	24	14.8		
		F	19	42				
288	Apr. 24	ePNE	18	44	22		1480?	No. 287 still recording.
		iPZ	18	44	22			
		iS?NE	18	46	55			

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY,--Continued.

No.	Date.	Phase	Greenwich			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
-----								
1931								
291	Apr. 25	ePNEZ	19	18	50		2890	O=19:13:04 Epicenter about 2° from Guam.
		iZ	19	19	01			
		iE	19	19	06			
		iN	19	19	16			
		iSNEZ	19	23	15			
		iLNEZ	19	25	57			
		MN	19	28	29	10.8		
		ME	19	28	30	10.8		
		F	20	41				
292	Apr. 25	ePNEZ	22	12	20		4490	
		iSNE	22	18	26			
		mN	22	22	44	8.6		
		mE	22	23	02	9.2		
		F	22	59				
294	Apr. 26	ePNEZ	19	32	05		2845	
		eSNEZ	19	36	26			
		F	20	12				
295	Apr. 27	ePNE	17	01	49		7510	O=16:50:54
		iPZ	17	01	49			
		iZ	17	01	55			
		iE	17	02	00			
		iSNEZ	17	10	52			
		PSNE	17	11	08			
		PPPSE	17	11	34			
		S <sub>c</sub> SNE	17	12	20			
		SR <sub>1</sub> N?	17	15	46			
		SR <sub>2</sub> N	17	18	41			
		iLNE	17	23	40			
		MN	17	33	37	18.2		
		MN	17	34	40	18.8		
		ME	17	38	13	14.8		
		F	19	03				
297	Apr. 27	ePNZ	21	22	16		1220	
		iPE	21	22	16			
		SNEZ	21	24	23			
		iLE	21	25	29			
		F	21	40				
300	Apr. 30	iPNEZ	21	18	37		135	Dilatation. Probably near 15° 50' N; 121° 10' E. Felt in Central Luzon.
		SNEZ	21	18	54			
		F	21	45				

Twenty-one insignificant or undecipherable disturbances on the following days of April: 1st(2), 2nd(3), 4th, 5th, 6th, 10th(2), 12th, 14th(3), 16th, 25th(2), 26th, 27th and 29th(2).

Correction to earthquake data of February 13, 1931: P at 0:43:20 instead of 0:44:20 as given in the report for February.

EARTHQUAKE OF MARCH 18, 1931. O=20h 13m 21s

$\varphi = 5^{\circ} \text{ N}; \lambda = 127^{\circ} 30' \text{ E.}$

	$\Delta$	P	O-C
Amboina	8° 44'	2m 39s	+31s
Manila	11 32	2 46	0
Hong Kong	21 35	4 52	- 5s
Batavia	23 28	5 22	+ 4s
Phu Lien	25 40	5 35	- 8s
Zikawei	26 48	5 47	- 8s
Koti	29 06	6 13	- 5s
Osaka	30 33	6 30	- 2s
Adelaide	41 16	8 08	+ 7s
Riverview	44 48	8 37	+11s
Melbourne	45 48	8 47	+13s
Wellington	63 14	9 41	-48s
Honolulu	73 46	11 57	+25s
Tananarive	78 54	12 33	+32s
Ksara	88 36	13 07	+12s
Belgrade	98 22	13 45	- 2s
Zagreb	101 05	14 01	0
Treviso	103 36	14 18	+ 4s
Catania	104 24	14 27	+ 9s
Rome	104 48	14 23	+ 3s
Coire	104 50	14 20	0
De Bilt	104 58	14 22	+ 2s
Strasbourg	105 09	14 23	+ 2s
Zurich	105 15	14 27	+ 5s
Neuchatel	106 21	14 28	+ 1s
Pasadena	106 54	14 37	+ 7s

		P'	
Tucson	113 18	18 49	+ 6s
St. Louis	124 24	19 19	+ 7s
Buffalo	126 28	19 21	+ 6s
Fordham	130 08	19 30	+ 8s
Georgetown	130 34	19 30	+ 7s

EARTHQUAKE OF MARCH 19, 1931. O=6h 25m 4s

$\phi=18^{\circ} 20' N$ ;  $\lambda=120^{\circ} 10' E$ .

	$\Delta$	Observed travel time of P	Observed-Cal- culated
Manila	3° 49' 59"	59s	0
Hong Kong	6 54	1m 44s	+ 2s
Zikawei	12 54	3 04	- 1s
Phu Lien	13 00	3 09	+ 2s
Koti	19 21	4 24	- 5s
Osaka	21 13	4 46	- 6s
Anboina	23 24	5 02	-16s
Batavia	27 49	5 50	-15s
Bombay	44 45	8 19	- 7s
Adelaide	56 04	9 33	-12s
Riverview	59 57	10 02	- 7s
Melbourne	60 49	10 08	- 6s
Ksara	75 20	11 46	+ 5s
Tananarive	80 24	11 56	+13s
Belgrade	83 48	12 32	+ 4s
Zagreb	86 22	12 44	+ 1s
Tarente	87 33	12 50	+ 1s
Triest	87 52	13 12	+21s
Treviso	88 50	12 56	0
Padua	89 10	12 56	- 2s
Messina	89 38	12 56	- 4s
Coire	90 02	12 59	- 4s
De Bilt	90 06	12 59	- 4s
Strasbourg	90 12	12 56	- 8s
Catania	90 15	13 10	+ 6s
Rome	90 16	13 05	+ 1s
Zurich	90 18	12 56	- 8s
Neuchatel	91 27	13 06	- 4s
Stonyhurst	92 45	16 58	+ 3m 41s
Paris	93 06	13 13	- 6s
Kew	93 06	13 27	+ 8s
Barcelona	97 16	16 17	+ 2m 35s
Algiers	99 06	13 48	- 3s
Tucson	109 42	18 12	-17s
		Time of P'	
Granada	103 18	18 16	+13s
Pasadena	103 40	14 01	-13s
Toronto	115 27	19 26	+36s
Buffalo	116 18	19 52	+59s
St. Louis	116 18	19 53	+60s
Georgetown	120 32	19 10	+ 6s
Dakar	126 45	19 54	+38s

Note: Buffalo and St. Louis may be one minute in error in their report.

M A N I L A      O B S E R V A T O R Y  
SPECIAL BULLETIN OF PRINCIPAL EARTHQUAKES



O C T O B E R ,   1 9 3 1

		h. m. s.	
1 <sup>st</sup>	PEZ	12 10 39	
	L?E	12 36 ca	
2 <sup>nd</sup>	PNEZ	14 23 42	
	SNE	14 28 12	
3 <sup>rd</sup>	PNEZ	10 48 37	
	S?NE	10 53 25	
3 <sup>rd</sup>	PNEZ	19 21 49	In region of 11°S; 161°E by Manila,
	SNE	19 28 35	Zikawei, Phu-Lien and Koti. Des-
			tructive sea wave at San Cristobal
			Island, Solomon Group.
3 <sup>rd</sup>	PNE	22 56 19	Phases not certain.
	S?NE	23 01 16	
4 <sup>th</sup>	PNEZ	6 51 31	
	SNEZ	6 54 19	
5 <sup>th</sup>	PNEZ	4 54 38	
	SNE	4 57 48	
5 <sup>th</sup>	PNE	22 40 00	Compression.
	SNE	22 44 49	
6 <sup>th</sup>	PEZ	18 22 38	
	SE	18 26 48	
10 <sup>th</sup>	PNEZ	0 28 26	Compression.
	SNE	0 35 32	
16 <sup>th</sup>	PNEZ	13 33 09	
	SNE	13 36 09	
17 <sup>th</sup>	PNEZ	15 38 31	
	SNE	15 42 22	

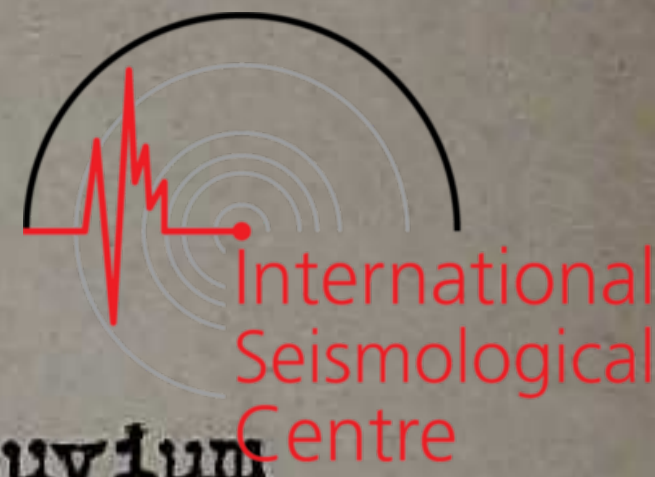
C O R R E C T I O N S   A N D   A D D I T I O N A L  
D E T E R M I N A T I O N S

- April 3<sup>rd</sup> 23h Approximately 16° S; 168° E by Manila, Riverview, Batavia, Koti Melbourne.
- April 6<sup>th</sup> 0=6:49:25 7° S; 156° 30' E by Riverview, Wellington, Batavia, Medan, Manila, Hong Kong, Zikawei.
- April 8<sup>th</sup> 19h 1° S; 140° E Adelaide, Perth, Batavia, Amboina, Phu-Lien, Chiufeng.
- April 16<sup>th</sup> 12h, In region of 12° S; 121° E by Batavia, Medan, Manila.
- April 24<sup>th</sup> 5h. N.E.I. Probably south of Java.
- June 8<sup>th</sup> 14h. Moluccas, N.E.I.
- August 10<sup>th</sup> 21h. 51° N; 88° E. 0=21:18:03, by Manila, Zikawei, Kong, Bombay, Medan. — Some stations appear to have error of one minute in the time of P.
- August 18<sup>th</sup> 14h. Bombay: 31° 30' 0-C= + 2s.



MANILA, P. I.

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY



International  
Seismological  
Centre

$\phi = 14^{\circ} 34' 42''$  N.  $\lambda = 120^{\circ} 58' 41''$  E.  $h = 2.40$  m. Alluvium

WIECHERT.  $M = 1000$  Kg.

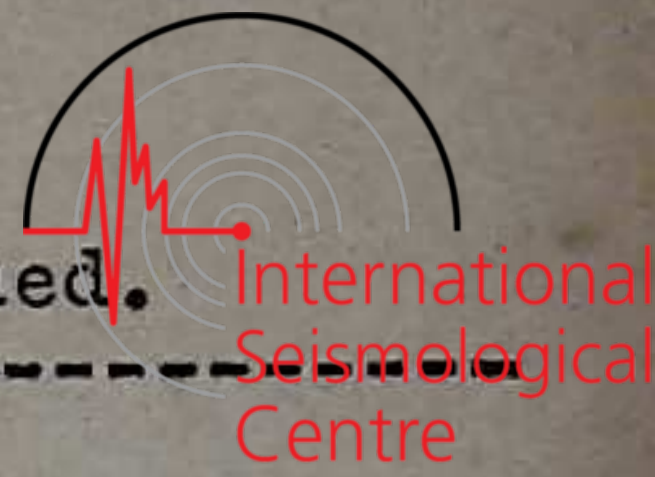
GALITZIN-WILIP.

	$T_0$	V	$\frac{V}{Q}$	$\frac{V^2}{Q^2}$		$T_0$	D	$T_1$	$\lambda$	$\mu^2$	K
N-S	4.4	188	2.5	0.022		12.43	100.5	12.5	11.52	.030	1.07
E-W	4.9	206	2.6	0.031		11.8	100.5	11.37	11.4	.017	1.33
						9.0	100.5	12.0	14.82	.017	1.51

No.	Date	Phase	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks.
1931						
302	May 2	PNEZ iSNEZ F	2 52 43 2 53 19 3 02		255	
303	May 2	$\bar{P}$ NEZ SNEZ mNE F	21 12 17 21 12 36 21 15 ca 21 20		150	
304	May 3	PNEZ iSNE iLN F	19 33 23 19 35 23 19 36 29 20 44		1155	
305	May 4	iPNZ ePE SNE LNE MN F	2 57 14 2 57 14 2 59 27 3 00 43 3 02 39 3 20	12.4	1280	
306	May 4	PNEZ S?NE F	17 32 52 17 37 20 18 05		2935?	
308	May 6	i $\bar{P}$ PNZ iSNE mNE F	9 13 36 9 13 56 9 14 38 9 42		160	Dilatation. Felt in Central Luzon. $16^{\circ}$ N; $121^{\circ} 13'$ E by Baguio and Manila. S from the Wiechert. E-W component not operating.
309	May 6	PNZ SN LN mN F	15 08 34 15 17 05 15 29 ca 15 33 ca 16 05		6980	E-W component not operating.
310	May 7	PNEZ SNE F	5 31 49 5 32 25 5 36		255	
311	May 8	e $\bar{P}$ NEZ iSNEZ F	19 51 54 19 52 09 19 55		120	

MANILA, P. I.

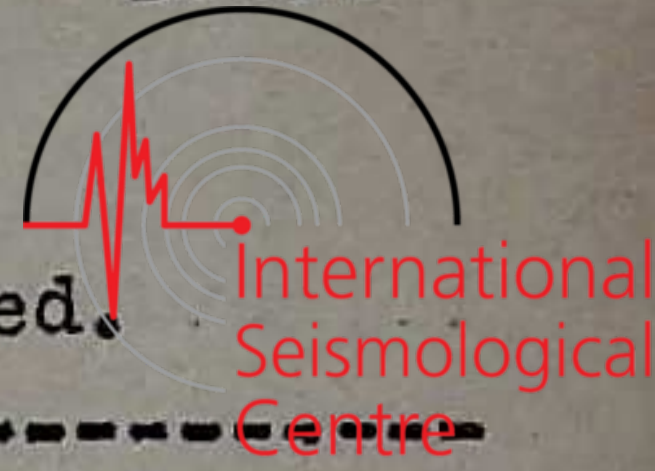
SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date	Phase	Greenwich Time			Per. S.	Dist. Km.	Remarks.
			h.	m.	s.			
1931								
312	May 8	PEZ	23	23	06		425	Felt at Aparri, north Luzon. N-S trace lost by overlapping lines.
		SEZ	23	24	11			
		F	23	30				
315	May 10	PNE	12	25	32		160	
		iSNE	12	25	52			
		F	12	29				
318	May 12	ePNE	1	45	37		5255	O=1:36:52 Compression. U.S.C.G.S. O=1:37.4 Epicenter: Region of Kamchatka.
		iPZ	1	45	37			
		iE	1	45	40			
		iN	1	45	42			
		PR <sub>1</sub> NZ	1	41	37			
		SNEZ	1	52	28			
		PPPS?NE	1	52	45			
		INE	2	00	19			
F	2	56						
319	May 12	PNEZ	5	08	44		1380	
		SNEZ	5	11	07			
		F	5	24				
320	May 12	PNEZ	20	47	02		660	Felt in Dumaguete, Negros. Epicenter 9° N; 123° 15' E by Manila and Butuan.
		SNE	20	48	16			
		F	21	07				
321	May 13	PNEZ	0	24	05		2720	
		iSE	0	28	18			
		F	0	41				
322	May 13	PNE	1	31	41		1390	
		iPZ	1	31	41			
		SNE	1	34	05			
		F	1	44				
323	May 13	PNEZ	2	04	35		2505	Compression.
		iSN	2	08	33			
		SE	2	08	35			
		mE	2	10	17	10.2		
		F	2	37				
324	May 13	PNEZ	4	14	56		2535	
		SNE	4	18	56			
		mN	4	19	03	10.2		
		mE	4	22	38	9.6		
		F	4	39				
325	May 13	PNEZ	7	35	22		2645	Dilatation.
		iSNE	7	39	30			
		mN	7	39	37	9.4		
		mN	7	40	07	11.2		
		mE	7	41	05	9.6		
326	May 13	PNEZ	7	57	19		1260	No. 325 still recording.
		SNE	7	59	30			
		F	8	34				

## MANILA, P. I.

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date	Phase	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
-----								
1931								
327	May 13	ePEZ	23	07	21		1690	O=23:03:45 Manila and Butuan give 25° N; 131° E approx. P in N-S component lost by overlapping lines.
		SNEZ	23	10	15			
		iN	23	10	18			
		iE	23	10	21			
		iZ	23	10	23			
		LNEZ	23	11	35			
		iE	23	12	50			
		ME	23	17	13	11.4		
		MN	23	17	16	9.6		
		MN	23	19	44	11.6		
	May 14	F	0	26				
329	May 15	ePNE	7	52	27		1030	Dilatation.
		iPZ	7	52	27			
		SNEZ	7	54	16			
		F	8	17				
331	May 16	PNEZ	11	00	43		160	
		SNEZ	11	01	03			
		F	11	03				
332	May 16	PEZ	21	18	44		2300?	Compression. N-S component lost by over- lapping lines.
		SEZ?	21	22	28			
		LEZ?	21	24	26			
		F	21	53				
335	May 17	ePEZ	9	32	21		895?	
		S?NE	9	33	57			
		mE	9	35	21	13.6		
		mN	9	35	42	13.2		
		mE	9	36	32	14.0		
		F	10	09				
336	May 17	PNEZ	11	35	13		150	
		iSNEZ	11	35	32			
		F	11	38				
338	May 19	PNEZ	7	58	39		135	
		iSNEZ	7	58	56			
		F	8	03				
339	May 19	ePNEZ	9	12	37		400	
		iSNE	9	13	37			
		F	9	16				
340	May 19	PNEZ	13	23	49		1520	Compression.
		iSNE	13	26	28			
		iLNE	13	27	39			
		MN	13	29	14	11.0		
		ME	13	29	18	11.4		
		MN	13	31	20	10.8		
		F	13	55				
341	May 19	PNEZ	14	17	05		170	Dilatation.
		iSNE	14	17	26			
		F	14	22				

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich			Per. s.	Dist. Km.	Remarks.	
			h.	m.	s.				
-----									
1931									
343	May 20	eP'EZ	2	41	24		620	Near the Azores Islands, Atlantic Ocean. U.S.C.G.S. O=2:22:55, 37.8° N; 17.2° W.	
		iNEZ	2	42	21				
		LNEZ	3	18	00				
		ME	3	24	14				
		F	6	03					
344	May 20	iNEZ	22	13	49		620	Oscillations continue for about one hour with no definite phases. U.S.C.G.S. O=21:54:03, 28° S; 74° W.	
346	May 21	PZ	11	56	52		10.8	620	Felt in Leyte and Cebu.
		PNE	11	56	56				
		SNEZ	11	58	30				
		mN	12	00	30				
		F	12	38					
347	May 22	PNEZ	5	53	02		620		
		PN	5	53	21				
		iSE	5	54	11				
		iSN	5	54	40				
		F	6	01					
348	May 22	ePNEZ	17	42	04		820	Approx. 9° 20' N; 126° 30' E by Manila and Butuan.	
		SNE	17	43	34				
		F	18	26					
350	May 23	PNEZ	6	36	04		1280		
		SNEZ	6	38	17				
		LNE	6	39	29				
		F	6	53					
353	May 24	ePNE	0	14	39		580	Dilatation. Felt in the eastern Visayan Islands and northern Mindanao.	
		iPZ	0	14	39				
		SNE	0	15	45				
		iSNEZ	0	15	10				
		F	2	18					
355	May 24	PNEZ	4	54	25		630	Felt at Maasin, Leyte.	
		SNE	4	56	06				
358	May 24	iPNEZ	20	39	34		150	Dilatation. Felt slightly in Manila. Epicenter to ENE of Manila.	
		iSNEZ	20	39	53				
		F	20	54					
359	May 24	PNEZ	21	27	02		3145	Compression.	
		iSNE	21	31	44				
		F	22	07					
360	May 26	PNEZ	2	22	54		880	Felt at Surigao, Mindanao. 9° N; 126° 40' E by Manila and Butuan.	
		SNE	2	24	28				
		F	2	35					

## M A N I L A , P : I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks.
	1931					
361	May 26	eNEZ iN iN mE mN F	14 20 48 14 21 42 14 22 54 14 32 50 14 33 27 14 53			
362	May 27	PNEZ SNEZ LNE F	0 48 43 0 53 00 0 55 26 1 18		2780	
364	May 27	iPNEZ iSNEZ F	17 11 53 17 12 11 17 46		135	Compression. Felt in Manila and Ambulong.
365	May 28	PNEZ iSNE F	3 54 01 3 55 12 4 06		630	
366	May 28	PNEZ SNZ? mNE F	9 23 50 9 25 31 9 27 27 9 40		630?	Probably at 9° N; 123° 10' E. Record distorted by a local disturbance. Felt at Dumaguete, Negros.
368	May 28	PNEZ S?NEZ L?EZ MNE F	18 42 55 18 50 10 18 58 30 19 06 30 19 39		5680?	
369	May 29	iPNZ iSNZ F	2 01 51 2 02 08 2 12		135	Dilatation from E. E-W component not operating.
370	May 29	PNZ SNE F	8 26 43 8 27 02 9 32		145	Compression from E. Probably about 14° 30' N; 122° 30' E. Felt in southern and southeastern Luzon. S from the wiechert.

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date	Phase	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks.
-----						
1931						
371	May 29	$\bar{i}$ PNZ	19 07 33		130	Dilatation from E.
		$\bar{S}$ NE	19 07 50			Felt in Manila and slightly in
		F	19 37			Ambulong.
						$\bar{S}$ from the Wiechert.
372	May 29	PNZ?	21 38 04		500?	
		$\bar{S}$ ?NZ	21 39 22			
		F	21 52			
373	May 30	$\bar{i}$ PEZ	9 43 27		160	Dilatation.
		$\bar{P}$ N	9 43 27			
		$\bar{i}$ SNEZ	9 43 47			
		F	10 00			
374	May 30	PNEZ	18 43 42		3180	
		SNEZ	18 48 26			
		LNE	18 51 39			
		F	19 18			
375	May 30	$\bar{P}$ NEZ	22 00 23		135	
		$\bar{S}$ NEZ	22 00 40			
		F	22 02			

Twenty-one insignificant or undecipherable disturbances in the following days of May: 1st, 5th, 9th(2), 10th 11th, 14th, 15th, 17th(3), 20th, 21st, 23rd(3), 24th(3), 27th and 28th.

## ADDITION TO REPORT FOR APRIL

April 8th, No. 257:  $1^{\circ}$  S and  $140^{\circ}$  E by Manila, Adelaide, Perth.

## CORRECTION TO NO. 281, APRIL 21st, 1931

S at 24:02:07, distance 8745 Km.

## CORRECTION TO NO. 288, APRIL 24th, 1931

P' at 18:44:22, distance 11745 Km.,  $33^{\circ} 46'$  N;  $118^{\circ} 29'$  W according to Pasadena.

M A N I L A . P . I .

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.  $\lambda=120^{\circ} 58' 41''$  E.  $h=2.40$  m. Alluvium.

WIECHERT.  $M=1000$  Kg.

GALITZIN-WILIP.

	$T_0$	V	$\epsilon$	$\frac{r}{T_0^2}$
N-S	4.4	195	2.2	0.039
E-W	4.9	204	2.0	0.025

	$T_0$	D	$T_1$	$\lambda$	$\mu^2$	K
N-S	12.43	100.5	12.5	11.52	.030	107
E-W	11.80	100.5	11.87	11.4	.017	133
Z	9.0	100.5	12.0	14.82	.017	131

No.	Date.	Phase	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks.
1931						
377	June 1	PNEZ S?NE L?NE F	0 49 53 0 52 42 0 54 22 1 09		1630?	
378	June 1	PNEZ SNEZ S <sub>c</sub> SNE LNEZ F	12 01 29 12 07 25 12 11 41 12 12 31 13 02		4320	Compression. Solomon Islands. No M phase.
379	June 2	PNEZ SNEZ LNE F	2 43 00 2 47 10 2 49 36 3 56		2665	Japan.
380	June 3	PNEZ SNEZ LNEZ MN F	14 02 16 14 04 14 14 05 20 14 07 34 14 46	11.4	1130	Felt at Cotabato and Jolo, southern Mindanao. Epicenter in Celebes Sea. Followed by two small undecipherable disturbances.
381	June 4	ePNEZ iSNEZ LNEZ F	9 55 07 9 59 10 10 01 28 10 45		2580	Followed by three undecipherable disturbances. Region of New Guinea according to Riverview.
382	June 4	$\bar{P}$ NEZ SNEZ F	13 32 25 13 32 49 13 39		190	
383	June 5	PNE SNE F	22 24 12 22 25 17 22 36		565	Probably in the neighborhood of the Camotes Islands. $10^{\circ} 40'$ N; $124^{\circ} 15'$ E. Z component stopped at 21:38.
384	June 6	PNEZ S?NE F	12 04 47 12 13 06 12 23		6765?	
385	June 6	PNZ SNEZ F	13 23 22 13 26 06 13 38		1585	

## M A N I L A , P . I .



## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase.	Greenwich Time h. m. s.	Per. s.	Dist. Km.	Remarks.
1931						
386	8th	PNEZ SNE F	2 07 23 2 08 19 2 13		370	
387	8th	PNEZ SNEZ F	14 32 39 14 35 55 14 53		1930	
388	9th	PNEZ S?NE LNZ F	5 14 19 5 18 09 5 20 10 5 45		2380?	Japan.
390	9th	PNEZ iE SNE LNE F	14 03 24 14 03 47 14 12 42 14 25 ca 15 22		7800	Compression.
391	9th	PNEZ SNEZ LNE MNE F	16 10 09 16 20 26 16 35 ca 16 40 ca 17 39		9000	Probable epicenter $38^{\circ}$ S; $174^{\circ}$ W according to Wellington.
392	10th	eNEZ eNEZ F	12 18 34 12 22 09 12 49			No definite phases.
394	11th	ePNEZ iSNEZ F	2 50 41 2 50 58 2 57		150	Dilatation.
395	11th	PNEZ SNE LNEZ F	6 21 11 6 25 33 6 28 19 6 47		2855	Felt in Tokyo, Japan.
396	11th	PNEZ SNEZ F	10 18 16 10 19 25 10 26		450	
397	12th	PNEZ S?NEZ F	1 50 35 1 54 36 2 12		2545?	
399	12th	PNEZ SNE? F	23 31 34 23 32 47 23 42		650?	Felt in Surigao and Butuan. Disturbed by microseisms. Probably in northern part of Mindanao Sea.
401	13th	PNEZ SNE LNE MNE F	14 17 32 14 20 32 14 22 00 14 23 43 14 47		1745	



M A N I L A , P . I .

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No.	Date	Phase.	Greenwich Time			Per. s.	Dist. Km.	Remarks.
			h.	m.	s.			
-----								
	1931							
402	13th	ePNEZ SNE	14	40	42 55		100 No. 401 still recording.	
403	13th	ePNEZ eSNE SPSNE LNE MNE F	15	45	31 24 39 30 30 55		8490 O=15:33:43	
404	14th	ePNE iPZ iSNEZ F	3	29	52 52 16 43		190 Compression. Felt at Boac, Marinduque.	
405	14th	ePNEZ iSNEZ F	14	52	44 57 56		100	
407	15th	ePNEZ SNE F	22	06	16 43 14		800 Felt slightly in Butuan. Probably 9° 55' N; 126° 30' E by Manila and Butuan,	
410	17th	ePNE iPZ iZ iNE iNE iE iSNE LNE F	12	15	14 14 58 20 36 14 41 29 37		2920 Japan.	
411	17th	PNEZ iSNE LN MNE F	17	08	26 32 14 ca 31		3520	
412	17th	PNEZ SNE F	23	26	32 30 41		1720	
416	18th	ePNEZ S?NEZ LNE MNE F	13	05	30 13 ca ca 14		5110?	
418	18th	ePZ ePNE SNE F	22	43	21 24 55 50		245	

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date	Phase.	Greenwich Time			Per. s.	Dist.	Remarks.
			h.	m.	s.			
	1931						Km.	
422	19th	ePNEZ	12	16	48		440	
		iSNE	12	17	42			
		eSZ	12	14	42			
		mE	12	20	12	8.0		
		F	12	40				
423	19th	ePNZ	22	03	20		255	
		ePH	22	03	24			
		iSNEZ	22	03	56			
		mE	22	05	28	7.2		
		F	22	20				
426	20th	ePNEZ	16	31	47		1600	Butuan distance $6.5^{\circ} \pm$
		iSNE	16	34	34			
		LNE	16	35	50			
		MNE	16	37	26			
		F	16	56				
427	21st	PNEZ	4	14	12		270	
		SNE	4	14	49			
		F	4	21				
430	22nd	ePNEZ	15	42	37		8820	Felt in New Zealand. Probable epicenter $39^{\circ}$ S; $179^{\circ}$ E according to Wellington.
		SNEZ	15	52	46			
		LNE	16	08	ca			
		F	16	37				
431	22nd	ePZ	16	48	40		200	
		ePNE	16	48	42			
		iSNEZ	16	49	06			
		F	16	54				
432	23rd	ePNEZ	6	20	51		3040	Japan. Felt in provinces north of Tokyo.
		SNEZ	6	25	26			
		LNE	6	28	32			
		F	7	43				
433	24th	PNEZ	8	44	33		1260	
		SNEZ	8	46	44			
		LNE	8	47	56			
		MN	8	49	03	11.6		
		ME	8	49	06	12.2		
		F	9	45				
435	25th	PEZ	0	45	08		3020	N-S traces lost by overlapping lines.
		SE	0	49	41			
		iE	0	50	08			
		F	1	28				
436	26th	PNEZ	2	27	16		1320	
		SEZ	2	29	33			
		F	2	35				
438	27th	ePNEZ	8	23	31		755	
		iSNE	8	24	54			
		LNE	8	25	50			
		F	8	47				

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No.	Date	Phase.	Greenwich			Per.	Dist.	Remarks.
			h.	m.	s.			
	1931							
439	27th	ePNEZ	12	53	25		160	
		iSE	12	53	45			
		eSNZ	12	53	45			
		F	12	57				
440	27th	ePNEZ	18	07	39		5520	O=17:58:37
		iE	18	09	44			
		iN	18	09	52			
		iE	18	11	37			
		iSNEZ	18	14	45			
		LEZ	18	22	39			
		F	19	47				
441	28th	PNEZ	9	25	40		120	
		SNEZ	9	25	55			
		F	9	29				
442	28th	ePNEZ	12	07	23		670	Felt in Samar. Epicenter in Philippine Deep about 11° 30' N; 126° E.
		SNE	12	08	38			
		F	12	15				
444	28th	PNEZ	16	35	55			
		S?NEZ	16	43	23			
		F	17	32				
445	29th	ePNEZ	16	47	57		2580	Japan.
		SNE	16	52	00			
		LNE	16	54	00			
		F	17	16				
446	29th	eP'EZ	20	43	10			N-S record defective.
		iE	20	44	47			
		F	21	03				

Twenty-one insignificant or undecipherable disturbances in the following days of June: 9th, 10th, 12th, 13th, 15th, 16th(2), 18th(4), 19th(3), 20th(2), 21st(2), 24th, 27th and 28th.

CORRECTION TO MAY 15, 1931.

S at 8h 00m 51s

Epicenter in region of 5° S; 175° E

by Manila, Batavia, Riverview and Pasadena.

MANILA OBSERVATORY  
SPECIAL BULLETIN OF PRINCIPAL EARTHQUAKES

JUNE, 1931

1st	PNEZ	12 01 29	Compression.	17th	ePNE	12 15 14	
	SNEZ	12 07 25			iSNE	12 19 41	
2nd	PNEZ	2 43 00		17th	PNEZ	17 08 26	
	SNEZ	2 47 10			iSNE	17 13 32	
3rd	PNEZ	14 02 16		18th	ePNEZ	13 05 30	
	SNEZ	14 04 14			S?NEZ	13 12 13	
4th	ePNEZ	9 55 07		20th	ePNEZ	16 31 47	
	iSNEZ	9 59 10			iSNE	16 34 34	
6th	PNZ	13 23 22		22nd	ePNEZ	15 42 37	
	SNEZ	13 26 06			SNEZ	15 52 46	
8th	PNEZ	14 32 39		23rd	ePNEZ	6 20 51	
	SNEZ	14 35 55			SNEZ	6 25 26	
9th	PNEZ	5 14 19		24th	PNEZ	8 44 33	
	S?NE	5 18 09			SNEZ	8 46 44	
9th	PNEZ	14 03 24	Compression.	25th	PEZ	0 45 08	
	SNE	14 12 42			SE	0 49 41	
9th	PNEZ	16 10 09		27th	ePNEZ	8 23 31	
	SNEZ	16 20 26			iSNE	8 25 53	
11th	PNEZ	6 21 11		27th	ePNEZ	18 07 39	
	SNE	6 25 33			iSNEZ	18 14 45	
13th	PNEZ	14 17 32		29th	ePEZ	20 41 07	
	SNE	14 20 32			SEZ	20 44 47	
13th	ePNEZ	15 45 31					
	eSNE	15 55 24					

MANILA, P. I.



SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.

$\lambda=120^{\circ} 58' 41''$  E.

h=2,40 m.

Alluvium.

WIECHERT. M=1000 Kg.

GALITZIN-WILIP

	$T_0$	V	$\epsilon$	$\frac{-E}{T_0^2}$
N-S	4.3	192	2.5	0.040
E-W	4.5	209	2.8	0.028

	$T_0$	D	$T_1$	l	$\mu^2$	K
N-S	12.43	100.5	12.50	11.52	.030	107
E-W	11.80	100.5	11.87	11.40	.017	133
Z	11.60	100.5	9.00	14.82	.017	131

No. and Date.	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 July				
No. 448 2nd	iPN ePEZ iN iZ iE SNEZ LNEZ F	3 43 34 3 43 34 3 43 40 3 43 56 3 43 58 3 49 04 3 50 52 4 25	2980	
No. 450 3rd	PNEZ SNEZ F	2 05 09 2 06 49 2 24	940	
No. 451 3rd	ePNEZ SNEZ F	12 26 24 12 27 38 12 39	670	Felt in Butuan, Mindanao.
No. 454 4th	ePNEZ iSNEZ F	22 10 30 22 10 47 22 18	135	Dilatation.
No. 456 6th	ePNEZ SNEZ F	12 53 39 12 54 02 13 04	180	Compression. Disturbed by microseisms.
No. 460 7th	PNZ SNZ F	18 14 14 18 15 18 18 20	420	Felt at Iloilo, Panay. Disturbed by microseisms. E-W component not in focus.
No. 461 7th	PNEZ iSNE F	19 35 22 19 35 42 19 43	160	
No. 462 8th	ePNEZ SNEZ F	1 25 15 1 26 26 1 30	460	Disturbed by microseisms.
No. 463 9th	PNEZ SNZ	16 17 13 16 18 15	405	Felt in southeast Luzon and Masbate. Disturbed by microseisms.
No. 464 9th	PNEZ SNEZ F	16 34 13 16 35 14 16 46	400	Felt in Masbate. No. 463 still recording. Disturbed by microseisms.

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase.	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 July				
No. 465 9th	ePNEZ iSNE eSZ F	18 18 10 18 19 32 18 19 32 18 33	520	Felt in Ormoc, Leyte. Disturbed by microseisms.
No. 466 9th	iPN ePEZ iSEZ F	22 54 35 22 54 35 22 55 36 23 37	400	Felt in southeast Luzon, Samar and Masbate. Disturbed by microseisms. Recorded on magnetic variometers at Antipolo.
No. 468 11th	PNEZ SNE F	8 47 50 8 49 50 9 06	1150	Disturbed by microseisms.
No. 469 12th	PEZ SEZ iZ F	10 14 12 10 15 02 10 15 35 10 31	400	Felt in Masbate. N-S component lost by overlapping lines.
No. 470 12th	PEZ SEZ iEZ F	14 43 23 14 44 13 14 44 27 15 00	400	Felt in Samar and Panay. Butuan 420 Km. N-S component lost by overlapping lines.
No. 471 12th	iPEZ iSNE	16 46 18 16 47 06	390	Compression. S from the Wiechert. Epicenter at 12° 25' N; 123° 50' E. O <sub>2</sub> 16:45:23 Felt throughout southern Luzon and northern Visayan Islands. Intensity VII-VIII R.F. in the epi- central area. Recorded on magnetic variometers at Antipolo.
No. 479 12th	PEZ SE? ME F	22 01 17 22 03 48 22 08 00 22 26	1455?	
No. 483 13th	PNEZ SNEZ F	19 54 26 19 58 27 20 09	2545	
No. 485 14th	ePNEZ iSNEZ F	11 37 17 11 38 13 11 51	400	Felt in Masbate and Samar.
No. 486 14th	iPEZ iSNEZ F	15 45 38 15 46 47 16 50	610	Compression. P in N-S component defective.
No. 490 14th	PNEZ SNE F	21 37 47 21 38 37 21 48	400	Felt in Masbate.
No. 491 15th	PNEZ SNEZ F	9 59 02 9 59 52 10 10	400	

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date.	Phase.	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 July				
No. 493 15th	iPZ ePE ePN SNEZ LNE MNE M <sub>2</sub> N M <sub>3</sub> E M <sub>4</sub> N F	16 35 49 16 35 50 16 35 51 16 43 00 16 50 33 16 55 00 17 00 06 17 02 12 17 05 42 18 20	5610	Compression.
No. 494 16th	P?NEZ S?NEZ F	8 36 47 8 41 06 9 08	2810?	
No. 498 17th 18th	iPNEZ SNEZ F	23 32 55 23 37 12 0 30	2780	
No. 499 18th	P'NEZ iE iEZ iZ F	5 47 00 5 47 06 5 51 28 5 51 56 6 37	18720	Dilatation. 5° S; 69° W, O=5:27:09 by U.S.C.G.S. 21° S; 71° W, O=5:27:04 by St. Louis, J.S.A.
No. 500 18th	ePNEZ SNE LNE ME F	11 32 45 11 39 57 11 48 30 12 02 21 13 43	5625	O=11:23:37 U.S.C.G.S. O=11:23:52, 53° N; 162° E. St. Louis, J.S.A. O=11:24:00, 58.3° N; 159° E.
No. 501 18th	ePNEZ SNEZ F	14 46 18 14 47 25 14 57	435	
No. 502 18th	ePNEZ SNE F	15 20 06 15 20 56 15 28	400	
No. 503 19th	ePNEZ SNEZ F	15 29 05 15 29 55 15 36	400	Compression.
No. 505 20th	PNEZ SNE LNE ME F	5 03 48 5 07 40 5 09 47 5 14 21 5 34	2420	
No. 506 20th	PNEZ SNE LEZ F	8 41 38 8 51 24 9 04 00 9 51	8350	

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date.	Phase.	Greenwich Time.			Dist. Km.	Remarks.
		h.	m.	s.		
1931 July						
No. 507 20th	PNEZ SNEZ SE F	14 14 14 14	17 18 19 54	18 30 00	640	Felt in southeastern Negros, Cebu and southwestern Bohol, Epicenter about $9^{\circ} 25' N$ ; $123^{\circ} 25' E$ by Manila and Butuan.
No. 508 20th	iPNEZ SNEZ F	19 19 19	16 16 35	36 50	110	Dilatation.
No. 509 20th	PNEZ SNEZ F	21 21 22	53 53 17	20 35	115	Dilatation. Felt in Batangas, Luzon.
No. 511 21st	PNEZ SNE F	2 2 3	59 59 04	08 30	175	
No. 512 21st	ePNE iPZ iSNEZ ME ME F	3 3 3 4 4 5	46 46 54 13 19 24	16 16 20 04 42	6530	Dilatation. $20^{\circ} S$ ; $169^{\circ} E$ by Manila, Hong Kong, Batavia, Koti, Medan, Honolulu, Pasadena. $O=3:36:09$ , $22^{\circ} S$ , $174^{\circ} E$ by St. Louis, U.S.A. $O=3:36:04$ , $22^{\circ} S$ , $174^{\circ} E$ , by U.S.C.G.S.
No. 514 21st	iPZ ePNE SNEZ F	14 14 14 15	43 43 46 00	27 27 27	1755	Compression.
No. 515 22nd	PNEZ SNE F	12 12 12	34 35 53	48 38	400	Compression. Felt in Masbate.
No. 517 22nd	PNEZ SNEZ F	22 22 22	12 13 31	44 34	400	Felt in Masbate and Southeast Luzon.
No. 518 23rd	PNEZ SNE LNE ME MN F	14 14 14 14 14 16	27 33 38 41 42 05	59 41 32 44 36	4090	$3^{\circ} S$ , $154^{\circ} E$ by Manila, Amboina, Batavia, Koti, St. Louis. $O=14:20:37$ , $1^{\circ} S$ , $156^{\circ} E$ by U.S.C.G.S.
No. 520 24th	PNEZ SNE LNZ F	0 0 0 1	27 28 29 11	02 30 40	800	Felt at Butuan. Epicenter $9^{\circ} 45' N$ ; $126^{\circ} 30' E$ .
No. 522 25th	PNEZ SNE F	2 2 2	30 34 50	00 03	2580	In the region of $4^{\circ} N$ ; $143^{\circ} E$ .



## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date.	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 July				
No. 523 25th	PNEZ SNE F	7 56 15 7 57 05 8 17	400	Dilatation.
No. 524 25th	PNEZ SNE F	11 30 24 11 32 14 12 16	1040	Compression.
No. 525 25th	PZ PNE SNEZ LNE MN F	12 45 15 12 45 20 12 49 49 12 52 46 12 55 33 13 40	3035	Compression.
No. 528 25th	PNEZ SNEZ F	23 23 51 23 24 45 23 49	440	Dilatation.
No. 529 26th	PNEZ SNEZ? F	11 21 25 11 22 29 11 33	420?	
No. 530 26th	PNEZ SNEZ F	21 12 28 21 14 04 21 34	900	In the Philippine Deep.
No. 531 27th	PNEZ SNEZ F	5 34 04 5 34 54 5 45	400	Felt in Masbate.
No. 532 27th	eP'NEZ F	16 48 33 18 04	16280	O=16:28:30, 1° S; 90° W by U.S.C. and G. S.
No. 533 28th	ePNE iPZ SNE LNE ME F	3 43 19 3 43 19 3 48 08 3 51 29 4 00 11 4 32	3270	Compression.
No. 535 29th	PNEZ SNEZ F	0 11 37 0 11 56 0 20	150	
No. 537 29th	PNEZ SNEZ F	8 27 21 8 28 11 8 36	400	
No. 540 29th	ePNEZ SNEZ ME F	17 15 04 17 19 28 17 28 30 18 03	2880	Dilatation.



## M A N I L A , P I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date.	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 July				
No. 542 31st	PNEZ SNE F	4 51 12 4 52 05 5 14	435	
No. 543 31st	$\bar{P}$ NE SN F	19 51 14 19 51 34 20 00	160	

Thirty-nine insignificant or undecipherable disturbances in the following days of July: 1st, 2nd, 4th(2), 5th, 6th, 7th, 10th, 12th(8), 13th(3), 14th(3), 15th, 16th, 17th(2), 20th(2), 21st, 22nd, 23rd, 24th, 25th(2), 28th, 29th(3) and 30th.

M A N I L A , P . I .

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.  $\lambda=120^{\circ} 58' 41''$  E.  $h=2.40$  m. Alluvium.

WIECHERT.  $M=1000$  Kg.

GALITZIN-WILIP.

	$T_0$	V	$\epsilon$	$\frac{r}{T_0^2}$
N-S	4.4	190	2.4	0.028
E-W	4.4	231	2.6	0.044

	$T_0$	D	$T_1$	$l$
N-S	12.23	100.5	12.50	11.52
E-W	11.80	100.5	11.87	11.40
Z	11.60	100.5	9.00	14.82

No. and Date	Phase	Greenwich Time			Dist. Km.	Remarks.
		h.	m.	s.		
1931 August						
No. 544	PNE	15	02	46	940	Felt slightly at Butuan. Epicenter in Philippine Deep.
1st	PZ	15	02	55		
	SNE	15	04	26		
	LNE?	15	05	53		
	F	16	15			
No. 545	PNEZ	19	25	45	7270	
1st	S?NE	19	34	33		
	F	20	27			
No. 546	PNEZ	20	15	39	3110	Approx. $11^{\circ}$ N; $149^{\circ}$ E by Manila and Zikawei.
2nd	SNE	20	20	18		
	LNE	20	23	23		
	F	20	56			
No. 547	PNEZ	23	39	20	2600	
2nd	SNE	23	45	24		
3rd	$\bar{i}E$ F	23 0	44 10	16		
No. 550	$\bar{P}NE$	23	14	42	160	Felt at Boac, Marinduque.
3rd	SNE	23	15	02		
	mE	23	16	41		
No. 551	PNE	23	21	16	295	
3rd	SNE	23	21	56		
	F	23	38			
No. 552	PNE	5	45	26	2710	Z record defective.
4th	SE	5	49	38		
	$\bar{i}N$	5	49	39		
	$\bar{i}E$	5	53	16		
	F	6	17			
No. 553	PNE	7	22	37	2810	
4th	SNE	7	26	56		
	ME	7	31	44		
	F	7	44			
No. 554	PNE	11	07	30	400	
4th	SNE	11	08	20		
	F	11	15			

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase.	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 August				
No. 556 6th	ePNEZ SNE LNE F	15 27 54 15 32 46 15 36 12 16 32	3305	
No. 557 6th	PNEZ SNE? LNE MNE F	18 23 55 18 30 33 18 37 32 18 41 14 19 11	5035?	
No. 558 7th	iPZ iPNE SNE SR <sub>1</sub> N SR <sub>2</sub> N LNEZ MNE F	2 17 23 2 17 26 2 22 26 2 24 17 2 24 48 2 27 32 2 29 ca 5 40	3480	Compression. Approx. 1° 30' S; 145° E by Manila, Riverview, Amboina, Hong Kong, Zikawei, Phu-Lien, Medan.  LNE at 2:29:33 from the Wiechert.
No. 560 7th	PEZ SE F	11 53 38 11 54 02 12 11	190	Disturbed by microseisms. N-S record defective.
No. 562 8th	PNZ SNEZ LEZ MN F	4 13 04 4 17 21 4 20 12 4 22 38 4 51	2790	Disturbed by microseisms.
No. 563 8th	PEZ SE LZ F	21 02 25 21 05 40 21 07 26 21 32	1930	Disturbed by microseisms. N-S record defective.
No. 564 8th	PEZ SEZ F	21 49 17 21 49 36 21 53	150	Disturbed by microseisms. N-S record defective.
No. 565 10th 11th	iPZ SNE PSN LNE MN F	21 26 29 21 33 15 21 33 24 21 40 29 21 44 48 0 10	5180	Dilatation. In region of 49° N; 87° E by Zikawei, Phu-Lien, Manila, Koti, Hong Kong. Horizontal data from the wiechert. Galitzin records masked by micros.
No. 566 11th	PZ SZ F	10 41 33 10 42 32 10 48	500	Horizontal data from the Wiechert. Galitzin horizontals disturbed by microseisms.
No. 567 12th	PNE SNE F	7 17 47 7 18 07 7 21	155	From the Wiechert. Galitzin records masked by microseisms. August 17th to 19th Galitzin not op- erated because of strong microseisms.

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No. and Date	Phase.	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 August				
No. 568 18th	PNE SNE LNE MNE F	14 28 52 14 35 13 14 41 17 14 44 55 16 02	4745	O=14:20:41 47° 30' N; 89° E by Manila, Phu-Lien, Koti, Zikawei, Hong Kong. From the Wiechert. Galitzin records masked by microseisms. O=14:21:15, 49° N; 90° E by U.S.C. G.S.
No. 569 22nd	PNEZ SNEZ F	16 38 21 16 39 12 16 54	410	Felt at Cape Bojeador and by some persons in Baguio.
No. 572 24th	PNE SNE LN MN F	21 44 26 21 51 55 22 00 ca 22 06 ca 22 50	5925	From the Wiechert. Galitzin masked by microseisms. O=21:35:18, 33° N; 69° E by U.S.C.G.S.
No. 575 25th	PNE SNE F	14 02 37 14 03 19 14 06	320	Felt at Aparri. From the Wiechert. Disturbed by microseisms. Galitzin not operating.
No. 576 27th	oPNEZ SNE LNE MNE ME <sub>2</sub> ME <sub>3</sub> MN <sub>4</sub> MN <sub>5</sub> ME <sub>6</sub> F	15 36 29 15 43 49 15 52 ca 15 56 ca 16 00 35 16 03 31 16 03 34 16 06 06 16 07 09 17 55	5780	O=15:27:11 Dilatation. In region of 30° N; 68° E. Quetta, Beluchistan. O=15:27:12, 30° N; 68° E by U.S.C.G.S. Horizontal data from the Wiechert.
No. 577 29th	iPNEZ SNE F	2 15 43 2 15 59 2 45	125	Felt at Batangas, Ambulong and Mani- la. Horizontal data from the Wiechert.
No. 578 29th	PNEZ SNE F	22 58 56 22 59 47 23 05	415	Felt slightly at Cape Bojeador, N. Luzon.
No. 579 31st	iPZ oPNE iE iE iN SNEZ LNEZ ME MN F	6 39 29 6 39 29 6 39 39 6 39 53 6 39 56 6 43 38 6 46 07 6 48 20 6 48 39 7 51	2580	O=6:34:06 Dilatation. Felt in Guam. 11° N; 144° 30' E by Manila, Guam, Koti.

Ten insignificant or undecipherable disturbances in the following days of August: 3rd(2), 5th, 7th(2), 22nd, 23rd, 24th, 25th and 31st.

M A N I L A , P . I .

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.

$\lambda=120^{\circ} 58' 41''$  E.

$h=2.40$  m.

Alluvium.

WIECHERT.  $M=1000$  Kg.

	$T_0$	V	$\epsilon$	$\frac{r}{T_0^2}$
N-S	4.4	190	2.4	0.032
E-W	4.7	204	2.5	0.034

GALITZIN-WILIP

	$T_0$	D	$T_1$	l
N-S	12.43	100.5	12.50	11.52
E-W	11.80	100.5	11.87	11.40
Z	11.60	100.5	9.00	14.82

No. and Date	Phase	Greenwich Time			Dist. Km.	Remarks.
		h.	m.	s.		
1931 September No. 581 1st	PNZ SNE LNE F	15	07	26	1960	
No. 582 6th	PNEZ SNE LNE MN MN ME F	5	43	24	2480	
No. 585 7th	PNEZ SNE F	5	11	07	195	
No. 587 8th	PNE SNE F	11	12	34	930	
No. 588 8th	PNEZ SNE mE F	19	15	01	1060	In region of $7^{\circ} 30'$ N; $127^{\circ} 20'$ E by Manila and Butuan.
No. 590 9th	PNE SNE LNE F	18	02	28	1635	
No. 591 9th	PNEZ SNE LNE F	20	43	30	3030	$20^{\circ}$ N; $148^{\circ} 30'$ E by Zikawei, Manila and Batavia. Horizontal data from the Wiechert.
No. 593 11th	PNE SNE F	20	13	38	1635	
No. 594 11th	PNEZ S?NE F	21	11	30	5355?	



## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued,



No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 September				
No. 595 11th	PNE S?NE F	22 34 42 22 43 26 23 40	7200?	
No. 596 12th	P?NE S?NE F	2 01 46 2 05 29 2 45	2290?	
No. 599 12th	<u>PNEZ</u> SNE F	20 07 11 20 08 20 20 21	450	
No. 600 13th	PNE SNE F	19 59 12 20 01 08 20 12	1100	In region of 5° N; 124° E by Manila and Butuan.
No. 601 14th	<u>PEZ</u> <u>SE</u> F	3 40 50 3 41 39 3 45	330	N-S component lost by overlapping lines.
No. 602 14th	<u>PNEZ</u> SNE F	9 23 03 9 24 40 10 33	905	Horizontal data from the Wiechert.
No. 603 14th	<u>PNEZ</u> SNE F	14 40 53 14 41 09 14 45	125	
No. 604 15th	<u>PNEZ</u> SNE F	12 04 29 12 05 03 12 11	245	
No. 605 15th	<u>PNEZ</u> SNE F	16 33 03 16 34 14 18 12	630	Compression. Approx. 11° N; 126° E by Manila and Butuan. Horizontal data from the Wiechert.
No. 606 15th	PNZ S?N F	21 20 09 21 29 52 22 09	8250?	E-W cylinder stopped at 19:29.
No. 607 16th	PNZ SNZ F	0 37 52 0 39 06 0 54	660	E-W cylinder stopped at 6:09.
No. 608 16th	<u>PNEZ</u> SNE F	6 32 49 6 34 09 6 49	510	
No. 609 16th	PNEZ SNE LNE F	12 48 42 12 53 14 12 56 42 13 54	3000	Felt in Tokyo, Japan.
No. 612 17th	PNEZ SNE F	21 58 19 21 59 45 22 20	780	In region of 10° N; 126° 30' E by Manila and Butuan.

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No. and Date	Phase	Greenwich Time			Dist. Km.	Remarks.
		h.	m.	s.		
1931 September No. 613 18th	PNEZ SNE F	4	43	46 01 54	485	Felt at Iloilo.
No. 614 18th	PNE SNE LNE F	15	40	09 09 17 33	1155	Approx. 5° N; 125° 35' E by Manila and Butuan.
No. 616 19th	PNE iPZ SNEZ LNE MN F	7	44	31 31 00 20 46 28	1430	Probably in region of Talaud Islands, N.E.I. Disturbed by microseisms.
No. 618 21st	PEZ SNE LNE F	2	26	04 50 45 20	3220	In region of 36° N; 140° E, U.S.C.G.S. Horizontal data from the Wiechert. Disturbed by strong microseisms.
No. 619 21st	PEZ SNE LNE ME MN F	10	29	31 35 20 45 59 30	1195	O=10:26:55 19° 30' N; 111° E by Hong Kong, Zikawei, Manila, Koti; Felt in Hong Kong. Horizontal data from the Wiechert. Disturbed by strong microseisms.
No. 620 21st	eEZ F	13	46	00 24		Disturbed by strong microseisms.
No. 621 21st	PNE SNE F	16	56	53 10 03	135	From the Wiechert.
No. 624 22nd	iPNEZ SN F	1	26	06 25 32	150	Dilatation. Approx. 15° 10' N; 122° 15' E. Felt in Manila and Central Luzon. S from the Wiechert.
No. 625 22nd	eNEZ F	9	42	ca 15		Disturbed by microseisms.
No. 627 24th	PNEZ SNE F	22	25	42 02 36	160	
No. 628 25th	PNEZ SNE LNE MNE F	6	05	31 45 15 00 06	3665	O=5:58:37 Compression. S Sumatra according to Batavia. Horizontal data from the Wiechert.
No. 629 25th	PNEZ SNE LNE F	16	47	12 16 45 46	4465	



## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks
1931 September				
No. 630 25 <sup>th</sup>	PNEZ SNE F	20 46 37 20 51 46 21 31	3580	
No. 631 25 <sup>th</sup>	PNEZ SNE LN LE MNE F	21 37 25 21 42 47 21 47 04 21 17 14 21 50 42 22 34	3780	
No. 632 26 <sup>th</sup>	PNE SNE F	7 05 36 7 07 14 7 26	920	
No. 633 26 <sup>th</sup>	PNE S?NE L?NE F	20 11 17 20 22 30 20 42 ca 22 30	10390?	
No. 634 27 <sup>th</sup>	PEZ SE LE F	0 29 40 0 34 51 0 39 05 1 07	3600	N-S component overlapping lines.
No. 637 28 <sup>th</sup>	PNEZ SNE L?NE MNE F	17 24 24 17 29 16 17 32 08 17 35 08 18 28	3310	
No. 638 29 <sup>th</sup>	PNE iPZ SNE LN F	5 17 59 5 17 59 5 21 37 5 23 30 6 48	2210	Compression. Horizontal data from the Wiechert.
No. 640 29 <sup>th</sup>	PNEZ SNE	9 31 45 9 32 33	385	
No. 641 30 <sup>th</sup>	iPZ PNE SNEZ F	9 45 27 9 45 27 9 49 35 10 00	2710	
No. 642 30 <sup>th</sup>	PNEZ SNE LE F	11 23 37 11 28 23 11 31 36 12 15	3215	

SEVENTEEN insignificant or undecipherable disturbances on the following days of September: 6th(2), 8th, 9th, 11th, 12th(2), 17th(2), 18th, 19th, 21st(2), 24th, 28th(2) and 29th.



MANILA, P. I.

SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.  $\lambda=120^{\circ} 58' 41''$  E.  $h=2.40$  m. Alluvium.

GALITZIN-WILIP

WIECHERT.  $M=1000$  Kg.

	$T_0$	D	$T_1$	$\lambda$
N-S	12.43	100.5	12.50	11.52
E-W	11.80	100.5	11.87	11.40
Z	11.60	100.5	9.00	14.82

	$T_0$	V	$\epsilon$	$\frac{r}{T_0^2}$
N-S	4.4	184	2.4	0.022
E-W	4.4	221	2.6	0.031

No. and Date	Phase	Greenwich Time h. m. s	Dist. Km.	Remarks
1931 October				
No. 643 1st	eEZ ME?	12 10 39 12 42 ca	13110	N-S cylinder stopped about 6:40. $O=11:45.4, 29.4^{\circ}N, 114.6^{\circ}W$ by U.S.C. and G.S. $O=11:45:26, 29.8^{\circ}N, 115.2^{\circ}W$ by Saint Louis, J.S.A.
No. 644 2nd	PNEZ SNE LN F	14 23 42 14 28 12 14 31 05 15 05	2955	
No. 646 3rd	PNEZ SNE? F	10 48 37 10 53 25 11 22	3245?	
No. 647 3rd	PNEZ PR <sub>1</sub> N SNE SR <sub>3</sub> E LNE	19 21 49 19 23 43 19 28 35 19 33 54 19 35 ca	5180	$O=19:13:05, 11^{\circ}S, 161^{\circ}E$ by Apia, Manila, Zikawei, Koti, Amboina, Ade- laide, Riverview, Honolulu, Spokane, Pasadena, Osaka, St. Louis, Ottawa. Destructive sea wave at San Cristobal Island, Solomon Group. Horizontal data from the Wiechert. $O=19:12.8, 14^{\circ}S, 160^{\circ}E$ by U.S.C.G.S. $O=19:13:10, 10^{\circ}S, 161.4^{\circ}E$ by St. Louis, J.S.A.
No. 648 3rd	PNE	22 04 07		No. 647 still recording. Phases not distinguishable; but probably after- shock of No. 647. From the Wiechert.
No. 649 3rd	PNE S?NE LNE? MNE? M <sub>1</sub> E	22 56 19 23 01 16 23 05 06 23 07 30 23 07 43	3390?	No. 648 still recording. Phases not certain. From the Wiechert.
No. 650 4th	PZ SZ F	0 57 27 0 59 31 1 24	1195	N-S overlapping lines; E-W began at 5h.
No. 651 4th	PNEZ SNEZ F	6 51 31 6 54 19 7 29	1620	

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 October No. 652 4th	PNEZ SNE F	8 09 03 8 10 53 8 18	1635	<del>Compression.</del> Compression.
No. 653 5th	PNEZ SNE LNE ME F	4 54 38 4 57 48 4 59 25 5 01 00 5 26	1865	
No. 654 5th	PNEZ SNE? F	7 15 22 7 16 20 7 30	495?	
No. 656 5th	PNE iPZ SNE LNE ME F	22 40 00 22 40 00 22 44 49 22 48 08 22 50 47 23 54	3255	Compression.
No. 657 6th	eEZ iE F	17 11 16 17 13 35 17 45		N-S cylinder stopped at 3:56.
No. 658 6th	PEZ SE LE ME M <sub>1</sub> E F	18 22 38 18 26 48 18 29 20 18 31 40 18 33 13 19 15	2690	
No. 659 7th	PNEZ SNE F	8 37 33 8 38 15 8 51	320	Felt at Legaspi, SE Luzon.
No. 662 8th	PNEZ SNEZ F	14 14 10 14 15 10 14 30	510	Dilatation. Galitzin records seriously disturbed by microseisms until the end of October.
No. 664 9th	eNE F	6 16 09 6 43		
No. 665 9th	eEZ F	15 46 21 16 04		N-S cylinder stopped at 15:32.
No. 666 10th	PNEZ SNE SR <sub>2</sub> E L?NE ME	0 28 26 0 35 32 0 40 48 0 42 34 0 45 11	5520	Compression. Probably aftershock of October 3, by Manila, Zikawei, River-view, Phu-Lien, Osaka. C=0:19:48, 8°S, 146°E by U.S.C.G.S. C=0:19:53, 9.1°S, 160.2°E by St. Louis, J.S.A.
No. 667 10th	PNE S?NE	1 17 26 1 22 10	3180?	From the Wiechert. No. 666 still recording.
No. 668 10th	PNE S?NE	1 39 43 1 45 33	4235?	From the Wiechert. No. 666 still recording.

## M A N I L A , P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 October				
No. 670 10th	PNE SNE F	18 32 18 18 32 54 18 36	260	From the Wiechert.
No. 672 12th	PNE SNE F	0 33 06 0 33 42 0 37	260	From the Wiechert. Oct. 12-13 no records in the Galitzin, due to strong microseisms.
No. 673 14th	P?NZ S?N F	6 22 06 6 26 31 7 12	2900?	E-W component lost by overlapping lines.
No. 675 16th	PNEZ SNE MNE F	13 33 09 13 36 09 13 39 30 13 54	1745	
No. 676 16th	PNEZ SNEZ F	19 32 17 19 33 11 19 41	440	
No. 677 17th	PNEZ SNE LN F	15 38 31 15 42 22 15 44 34 16 29	2405	Horizontal data from the Wiechert.
No. 678 17th	PNEZ S?NE F	17 26 24 17 28 34 17 52	1255?	S from the Wiechert.
No. 680 18th	PNE SNE F	22 26 49 22 27 48 22 37	500	Felt at Calbayog, NW Samar. Oct. 18-22 no records in the Galitzin. From the Wiechert.
No. 681 19th	PNE SNE F	5 41 53 5 42 08 5 44	120	From the Wiechert.
No. 682 22nd	PNEZ PE SNE F	18 18 54 18 18 56 18 19 17 18 25	180	
No. 685 23rd	PZ SZ F	20 15 11 20 16 28 20 27	1320	N-S and E-W components defective.
No. 686 24th	PNEZ? SNE F	6 31 00 6 34 00 7 19	1150?	
No. 688 24th	PNEZ SNE F	12 39 05 12 40 54 13 12	1030	

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.



No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 October No. 690 25th	PEZ SE F	11 47 16 11 48 41 12 01	780	Felt at Zamboanga, Mindanao. N-S component defective.
No. 692 25th	PNEZ SNEZ F	16 20 41 16 21 07 16 25	200	
No. 693 26th	PNEZ SNE LNE F	11 59 41 12 03 09 12 04 52 13 56	2090	<sup>20</sup> Horizontal data from the Wiechert.
No. 694 26th	PNEZ SNE F	14 43 29 14 44 29 16 32	510	
No. 695 27th	eEZ ME F	1 35 12 1 40 09 2 20		N-S component lost by overlapping lines.
No. 698 28th	PNEZ SNE F	5 36 19 5 37 14 7 22	460	Felt in northern and northwestern Luzon. S from the Wiechert.
No. 701 29th	P?EZ S?E F	8 45 27 8 47 30 9 22	1190?	N-S component defective.
No. 702 30th	PNEZ SNEZ F	8 45 17 8 46 08 8 48	420	
No. 703 30th	PNEZ SEZ F	17 01 21 17 01 40 17 06	150	
No. 704 30th	PNEZ SNE F	20 27 04 20 28 36 20 52	850	Felt at Butuan, Mambajao and Surigão, Mindanao.
No. 705 31st	PNEZ SEZ LE ME F	7 06 24 7 08 40 7 09 51 7 11 17 7 37	1310	
No. 706 31st	P?EZ SEZ F	10 17 43 10 20 15 10 52	1465?	

Nineteen insignificant or undecipherable disturbances on the following days of October: 2nd, 5th, 7th, 8th, 10th(2), 14th, 18th, 23rd(2), 24th, 25th(2), 27th(2), 29th(2) and 31st.

MANILA, P. I.

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.

 $\phi = 14^{\circ} 34' 42''$  N. $\lambda = 120^{\circ} 58' 41''$  E.

h=2.40 m.

Alluvium.

GALITZIN-WILIP

	$T_0$	D	$T_1$	l
N-S	12.43	100.5	12.50	11.52
E-W	11.80	100.5	11.87	11.40
Z	11.60	100.5	9.00	14.82

WIECHERT. M=1000 Kg.

	$T_0$	V	$\xi$	$\frac{r}{T_0^2}$
N-S	4.3	193	2.4	0.023
E-W	4.6	206	2.8	0.031

No. and Date	Phase	Greenwich Time			Dist. Km.	Remarks.
		h.	m.	s.		
1931						
November						
No. 708 1st	PNEZ	9	22	19	2420	Galitzin seriously disturbed by microseisms until November 12th, caused by typhoons.
	SNE	9	26	11		
	LE	9	28	23		
	F	10	04			
No. 709 1st	PNE	15	04	11	1745	
	SNE	15	07	11		
	F	15	20			
No. 710 1st	ePNEZ	18	57	48	2355	
	SNEZ	19	01	36		
	F	20	13			
No. 711 1st	PNEZ	21	45	31	1090	
	SNE	21	47	26		
	F	21	57			
No. 714 2nd	PNE	4	40	00	2980	
	SNE	4	44	30		
	F	5	09			
No. 716 2nd	PNEZ	10	07	34	2260	O=10:02:53. Compression. In the region of $51^{\circ}W$ ; $134^{\circ} 30'E$ by Manila, Koti, Batavia. Horizontal data from the Wiechert.
	SNE	10	11	15		
	LNE	10	13	15		
	MNE	10	16	32		
	F	14	04			
No. 717 2nd	PNE	11	00	04	245	From the Wiechert. No. 716 still recording.
	SNE	11	00	38		
No. 718 2nd	PNEZ	17	09	42	3245	$8^{\circ}S$ ; $146^{\circ}E$ by Riverview, Manila, Hong-Kong, Koti, Batavia, Amboina. O=17:02:47
	SNE	17	14	30		
	MNE	17	20	39		
	F	18	46			
No. 720 3rd	PNEZ	2	41	11	2810	Approx. $12^{\circ} 30'N$ ; $146^{\circ} 30'E$ by Manila and Guam as on July 17, 1931.
	SNEZ	2	45	30		
	F	3	22			
No. 721 3rd	PNEZ	16	26	22	3365	O=16:19:52
	SNE	16	31	16		
	LNE	16	34	39		
	MNE	16	37	21		
	F	17	25			

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 November				
No. 722 4th	PEZ? SEZ? F	3 00 09 3 02 20 3 12	1260?	N-S lost by overlapping lines.
No. 723 4th	PEZ SEZ F	4 22 52 4 23 53 4 27	510	N-S lost by overlapping lines.
No. 724 4th	PNEZ SNE F	6 28 22 6 29 52 6 35	570	
No. 725 4th	PNEZ SNE LNE F	7 29 35 7 32 23 7 34 23 8 09	2355	
No. 726 4th	PNE PZ SNE mNE F	12 25 35 12 25 36 12 27 12 12 28 20 12 35	615	
No. 727 4th	eNEZ F	15 30 05 15 50		
No. 728 4th	PNEZ SE? LNE? F	17 34 33 17 37 26 17 38 56 17 52	1675?	
No. 729 4th	PEZ PN SNE LNE F	18 01 24 18 01 25 18 08 22 18 16 ca 18 57	5400	
No. 730 4th	PEZ SEZ F	22 55 54 22 56 27 23 02	240	N-S trace off the paper.
No. 733 5th	PNEZ SNE LNE MN ME F	12 27 22 12 31 56 12 35 20 12 37 38 12 37 52 14 06	3035	O=12:22:48
No. 735 11th	PNEZ SNEZ F	15 48 35 15 49 26 15 55	415	
No. 736 12th	PE SEZ F	1 55 54 1 57 39 2 30	985	About 8°N; 127°E by Manila and Butuan. Dilatation at Butuan. N-S trace off the paper.

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued



No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks
1931				
November				
No. 737 12th	PNEZ SNE MNE F	16 27 48 16 31 32 16 37 30 17 19	2300	
No. 739 14th	PNEZ SNE LE F	11 38 39 11 41 37 11 43 15 12 20	1720	
No. 740 15th	P?EZ S?E MNE F	4 58 20 5 02 17 5 11 34 5 26		Uncertain. N-S lost by overlapping lines.
No. 741 15th	PNEZ SNEZ F	6 41 57 6 42 39 6 52	320	
No. 742 16th	PEZ SEZ ME F	2 23 24 2 25 07 2 28 14 2 52	970	N-S trace off the paper.
No. 744 17th	PNEZ SNEZ L?NE ME F	9 38 19 9 40 57 9 42 24 9 44 36 10 20	1520	N.E.I by Manila and Butuan.
No. 747 18th	PEZ SE ME F	3 43 39 3 51 12 4 04 27 5 06	6000	N-S trace off the paper.
No. 749 20th	PNE S?NE F	14 25 05 14 32 00 15 06	5240	11°S; 161°E by Riverview, Manila, Hong Kong, Koti, Amboina, Sitka, Pasadena, Georgetown. From the Wiechert. Disturbed by microseisms. Galitzin not operating because of microseisms, from Nov. 20th to 24th.
No. 750 22nd	PNE SNE F	10 54 05 10 54 22 10 57	135	From the Wiechert. Disturbed by micros.
No. 751 28th	PNEZ SNEZ F	7 15 34 7 16 17 7 25	330	
No. 752 28th	PNEZ S?NE LNE F	9 37 18 9 40 32 9 42 11 10 07	1920?	





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## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase	Greenwich Time			Dist. Km.	Remarks
		h.	m.	s.		
-----						
1931						
November						
No. 754	PEZ	3	37	41	1280?	N-S trace off the paper.
29th	S?EZ	3	39	54		
	F	3	49			
No. 755	PNEZ	5	01	12	1190?	
29th	S?NE	5	03	15		
	F	5	17			
No. 756	PNE	20	03	09	2645?	
29th	S?NE	20	07	17		
	F	20	32			
No. 757	P?NEZ	17	09	07	3990?	
30th	iE	17	09	59		
	iN	17	20	27		
	S?NE	17	14	42		
	F	17	36			
No. 758	PNEZ	23	40	51	1720	
30th	SNE	23	43	49		
	F	23	53			

Thirteen insignificant or undecipherable disturbances in the following days of November: 1st, 2nd(3), 5th(2), 11th, 13th, 16th, 17th(2), 19th and 29th.

## ADDITION TO REPORT OF SEPTEMBER, 1931

September 9th at 20h 43m 30s;  $20^{\circ}$  N;  $148^{\circ} 30'$  E confirmed by Phu-Lien, Amboina, Hong Kong.

September 29th at 5h 17m 59s; In region of Halmahera Island by Amboina, Batavia, Manila, Hong Kong.

## CHANGES IN THE BAGUIO OBSERVATORY

The Omori type pendulums which have been in operation since 1909 were discontinued on November 2nd. On November 10th a 200 Kg. Wiechert Inverted Pendulum was put into operation.

MANILA, P. I.



SEISMOLOGICAL BULLETIN OF THE OBSERVATORY

$\phi=14^{\circ} 34' 42''$  N.

$\lambda=120^{\circ} 58' 41''$  E.

h=2.40 m.

Alluvium.

GALITZIN-WILIP

WIECHERT. M=1000 Kg.

	$T_0$	D	$T_1$	$\lambda$
N-S	12.43	100.5	12.50	11.52
E-W	11.80	100.5	11.37	11.40
Z	11.60	100.5	9.00	14.82

	$\bar{m}_c$	V	$\epsilon$	$\frac{r}{T_0^2}$
N-S	4.4	192	2.4	0.024
E-W	4.6	203	2.8	0.030

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931				
December				
No. 760 1st	PEZ S?E ME F	3 33 02 3 37 13 3 43 00 4 16	2700?	N-S trace off the Paper. Phases doubtful.
No. 761 1st	PNE S?NE F	18 23 06 18 26 19 18 39	1915?	Phases uncertain.
No. 762 2nd	PNEZ SNE LE F	12 09 09 12 13 03 12 15 11 12 32	2450	
No. 763 2nd to 3rd	PEZ SEZ L?E ME F	23 57 53 0 02 14 0 04 40 0 07 47 1 01	2845	N-S trace off the paper.
No. 764 3rd	eEZ ME F	4 00 04 4 08 43 4 24		N-S overlapping lines.
No. 765 4th	PNE SNE LN MNE F	10 29 07 10 31 27 10 32 39 10 34 10 11 15	1350	Disturbed by microseisms. No time mark in Z component.
No. 766 6th	PNE SNE F	13 00 07 13 00 30 13 14	185	Dilatation. $15^{\circ} 33'N$ ; $119^{\circ} 40'E$ by Manila and Baguio. Felt at Iba, Ambulong and in Manila. From the Wiechert. Disturbed by microseisms.
No. 767 6th	eNE MNE F	23 14 50 23 18 ca 23 31		From the Wiechert. Disturbed by microseisms.
No. 768 7th	eEZ F	16 04 32 16 17		
No. 773 14th	PNEZ SNEZ F	14 43 41 14 44 07 14 46	200	

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## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks
1931 December				
No. 774 15th	<u>P</u> NEZ SNE F	6 37 08 6 37 25 6 39	135	
No. 775 15th	<u>P</u> NEZ SNEZ F	20 51 50 20 52 12 20 56	175	
No. 776 16th	PNEZ SNE LNE F	4 15 05 4 18 01 4 19 38 4 44	1700	
No. 777 16th	<u>P</u> NEZ SNE F	10 38 12 10 38 48 10 43	255	
No. 778 16th	PNEZ SNE mNE F	17 22 02 17 23 26 17 25 40 17 57	770	Felt at Basco, Batanes Islands.
No. 779 16th	PNEZ SNE mNE F	17 59 26 18 00 56 18 03 20 18 20	830	
No. 782 18th	PNEZ SE LE ME F	9 55 09 10 00 21 10 04 22 10 07 40 11 52	3610	
No. 784 19th	<u>P</u> NEZ SNEZ F	12 23 48 12 24 09 12 27	165	
No. 785 20th	PNEZ SNEZ LNE F	1 33 30 1 37 04 1 38 52 1 54	2165	
No. 786 20th	P?NEZ S?NE F	10 58 37 11 02 05 11 29	2090?	
No. 787 20th	ePNE SNE F	15 54 06 15 56 41 16 11	1500	
No. 788 21st	PNEZ SNE LNE F	11 10 39 11 13 38 11 15 00 11 55	1735	Disturbed by microseisms.

No. 62.

December, 1931.

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SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued.

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks.
1931 December No. 789 22nd	PNE P?Z SNE LE MNE F	13 11 41 13 11 46 13 16 12 13 19 08 13 24 ca 13 47	2990	Disturbed by microseisms.
No. 791 22nd	PNE Z SNE mNE F	19 52 09 19 54 02 19 56 58 20 13	1070	Disturbed by microseisms.
No. 793 24th	PNE Z SNE LNE F	22 01 33 22 03 14 22 04 34 22 29	950	In the Philippine Deep.
No. 794 24th	PNE Z SNE Z SNE F	23 33 24 23 34 24 23 34 43 23 48	510	
No. 795 25th	PNE Z SNE LN MN F	3 15 34 3 24 28 3 36 ca 3 42 10 4 40	7380	O=3:04:46 Disturbed by microseisms.
No. 796 26th	PNE Z S?NE L?NE ME F	1 47 26 1 50 31 1 52 16 1 53 44 2 25	1810?	Disturbed by microseisms.
No. 797 27th	PZ PNE SNE Z F	5 09 46 5 09 47 5 10 05 5 13	150	
No. 799 28th	PNE Z SNE F	9 18 37 9 19 39 9 46	530	Dilatation.
No. 800 29th	PNE S?NE F	16 49 18 16 53 18 17 20	2560?	
No. 801 30th	PE SE F	9 06 52 9 07 38 9 19	360	N-S and Z components not operating.



## M A N I L A , . P . I .

## SEISMOLOGICAL BULLETIN OF THE OBSERVATORY.--Continued

No. and Date	Phase	Greenwich Time h. m. s.	Dist. Km.	Remarks
1931				
December				
No. 802 30th	PNE	16 24 10	525	Z component not operating.
	SNE	16 25 12		
	F	16 30		
No. 803 30th	PNE	20 52 33	230	
	SNE	20 53 04		
	F	20 55		
No. 804 30th	PNE	21 05 39	480	
	SNE	21 06 36		
	F	21 16		
No. 805 31st	PE	1 14 29	550	Disturbed by microseisms. N-S and Z components not operating.
	SE	1 15 33		
	mE	1 16 54		
	F	1 34		
No. 806 31st	PNEZ	11 38 45	850	Felt in eastern Mindanao. Epicenter probably in eastern mountain range. Disturbed by microseisms.
	S?N	11 40 10		
	F	12 34		
No. 807 31st	PNEZ	16 11 21	235	Disturbed by microseisms.
	SNEZ	16 11 53		
	F	16 23		

Eleven insignificant or undecipherable disturbances in the following days of December: 1st, 7th, 11th(3), 17th(2), 19th, 22nd, 23rd and 27th.