

SEISMOLOGICAL BULLETIN 1919.

BATAVIA OBSERVATORY, JAVA.

PREFACE.

The astatic Seismograph of WIECHERT of 1000 K.G. has been registering regularly since December 6th 1908. The results are published from the beginning of 1909 (the Messina earthquake included) in a monthly bulletin.

The instrument is mounted on a heavy brick pillar in a room with thick walls (about 70 centimeters), that is protected against the sun's heat by open galleries around it. The components are placed in E.-W. and N.-S. direction respectively.

The pins are lifted electrically every hour for a period of 10 seconds by the Javanese observer on duty. A lifting of two seconds every minute is given by an electrical clock of PEYER FAVARGER by means of the second-dial passing through a drop of mercury.

For each month the mean constants for that month are applied. T_0 and ϵ , the oscillation period and the coefficient of damping, are determined every week. V , the magnification for very short waves, is determined occasionally only. It is found by direct measurement, giving the pendulum a displacement by means of the horizontal adjusting screws, the value of which can be determined easily from the pitch (a), the angle of displacement of the screws and the height of the screws (b) and of the centre of gravity (c) above the Cardanic suspension apparatus.

It was found:

- (a) = 1.407 millimeters.
- (b) = 1225 "
- (c) = 895 "

The constants used in 1918 are given below.

1918.	E-W component.			N-S component.		
	V.	T_0 .	ϵ .	V.	T_0 .	ϵ .
January	218	6.6	4.8	195	6.6	5.4
February	"	"	4.6	"	"	"
March.	"	"	4.4	"	"	5.6
April.	"	"	"	"	"	"
May.	"	"	"	"	"	"
June.	"	"	4.2	"	"	5.3
July.	"	"	"	"	"	5.2
August	"	"	4.4	"	"	5.3
September	"	"	"	"	"	"
October.	"	"	"	"	"	5.2
November	"	"	4.3	"	"	5.1
December.	"	"	"	"	"	"

The notation employed is that of the Göttingen Geophysical Institute.
The following abbreviations are employed:

CHARACTER OF THE EARTHQUAKE.

I = perceptible; II = moderately strong; III = strong.

d (terrae motus domesticus) = local.

v (vicinus) = near (less than 1000 K.M.).

r (remotus) = distant (1000 to 5000 K.M.).

u (ultimus) = very distant (over 5000 K.M.).

PHASES.

P (undae primae) = 1st preliminary tremors.

S (secundae) = 2nd

L (longae) = principal phase, long waves.

M (maximae) = maximum amplitude.

C (coda) = prominent waves among the after tremors.

F (finis) = end of perceptible movement.

PR₁, PR₂, ... SR₁, SR₂, ... = 1st, 2nd, ... reflected waves of P and S.

PS = waves changed by reflection from longitudinal to transversal oscillation.

WAVE-ELEMENTS, UNITS.

T = complete period in seconds.

A = amplitude, measured from median position in microns.

A_E = E.-W. component of A.

A_N = N.-S. " " "

i (impetus) = abrupt commencement, clearly defined.

e (emersio) = gradual " , not clearly defined.

1918		1919	
E.-W. component		N.-S. component	
T.	V.	T.	V.
4.4	195	4.8	218
"	"	4.6	"
5.6	"	4.4	"
"	"	"	"
"	"	"	"
5.3	"	4.2	"
5.2	"	"	"
5.3	"	4.4	"
"	"	"	"
5.5	"	4.8	"
"	"	"	"

SEISMOLOGICAL BULLETIN.

JANUARI 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Mean Greenwich time. S. Latitude 6° 11' 0". Height above sealevel 8 m.

E. Longitude 7^h 7^m 19^s.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).	Period in seconds.	Distance of epi- centrum.	Amplitude (half)		Remarks.
							A _E	A _N	
1	1	III	P iS M L F	h m s 1 58 42 1 45 5 1 44 2 1 2 39	6.2	2700	>631.7 >599.2	Clock contacts uncertain. Bosch, Weltevreden △ = 650. Wiechert, Malabar △ = 2670.	
2	1	III _u	iP iS M L F	5 11 34 5 21 9 5 22 5 49 4 9	6.5	8500?	>594.3 >722.8	Clock contacts failed. Bosch △ = 7690. Malabar △ = 7920.	
5	1	I	e M F	5 11 5 18 5 29				Clock contacts failed.	
4	4	I	e M F	5 15 5 15 5 21					
5	4	I	e M F	14 22 58 14 50 5 14 57	6.1		14.7 16.8		
6	5	I	e M F	20 12 14 20 12 54 20 16	5.9		7.5 9.9		
7	6	I	P M L F	22 55 45 22 45 8 22 55 52 25 44	5.9		30.8 12.9		
8	8	I	P iS=M F	22 10 54 22 11 11 22 16		153		Felt at Pitjoeng Poeger, Preanger, Java. Malabar eP—iS = 17,5 sec. △ = 153.	
9	10	I	e M F	5 0 25 5 4 45 5 14 25	5.4		21.6 15.1		
10	11	I	i F	9 45 19 9 54				SW — NE.	



No.	Date 1919.	Character.	Phase.	Time (Greenwich).	Period in seconds.	Distance of epi- centrum.	Amplitude (half)		Remarks.
							A _E	A _N	
11	14	Jan.	I,	e P 19 17 18 iS = M 19 17 41 F 19 20		210	μ		
12	18	"	II,	e P 5 45 19 S 5 54 48 M 6 0 4 F 6 54	5.5	820	590.5 318.2	Malabar P — S = 94 sec; Δ = 870. Felt at Padang, Sumatra.	
13	18	"	I	e 15 10 M 15 11 F 15 15				Minute-contacts failed. The seismograph was out of action from 0 ^h 48 ^m — 11 ^h 11 ^m Jan. 20; the clockwork of the drum has been repaired; the seismograph has been cleaned.	
14	21	"	I	e 7 24 11 M 7 26 23 F 7 39	6.0		6.8 11 0	Malabar faint.	
15	21	"	I _v	e 8 1 26 S = M 8 1 45 F 8 5		167		Malabar very faint.	
16	28	"	II,	P 9 8 53 S 9 8 53 M 9 10 18 F 9 26	5.7	160	209.1 228.5	Malabar faint.	



SEISMOLOGICAL BULLETIN.

FEBRUARI 1919.

BATAVIA OBSERVATORY, JAVA.

Dbl.

Foundation: River Quartair.

Mean Greenwich time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19^{\text{s}}$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.		Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Distance of epi- centrum.	Amplitude (half)		Remarks.
										A _E	A _N	
17	6	Febr.	I.	e	h	m	s		440	μ	μ	Malabar faint.
				iS=M	7	10	15					
				F	7	10	36					
18	17	"	II.	P	18	2	16	5.6	2350			E — W. Felt at Batjan, resid. of Ternate.
				iP	18	2	21					
				S	18	6	9					
				M ₁	18	6	23					
				M ₂	18	7	4					
				M ₃	18	10	19					
				M ₄	18	11	6					
F	18	20	49									
19	17	"	I	e	19	32	9	5.7		5.3	11.7	
				M	19	36	18					
				F	19	38						
20	18	"	I.	P	17	0	54		150			Malabar P — iS = 16.6 sec. △ = 146
				S=M	17	1	12					
				F	17	6						
21	26	"	I	e	10	13	31					Malabar very faint.
				M	10	14	18					
				F	10	21						

SEISMOLOGICAL BULLETIN.

MARCH 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Mean Greenwich time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19^{\text{s}}$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Character.	Phase.	Time (Greenwich).			Period in seconds.	Distance of epicentrum.	Amplitude (half)		Remarks.			
				h	m	s			A _E	A _N				
22	1	March	I	e	13	42	27	6.2	11.9	17.3				
				M	13	48	59							
				F	14	2	27							
23	2	"	I	e	3	49	21	6.0	12.6	27.8				
				M	3	49	41							
				eL ₁	4	36	1					18.9	12.7	63.3
				eL ₂	4	45	19							
				eL ₃	4	50	20							
24	2	"	I	e	12	7	42	5.2	11.7	24.8				
				M	12	8	15							
				eL ₁	12	53	57					20.9	35.4	104.3
				eL ₂	13	3	57					18.1	42.5	62.2
				eL ₃	13	8	57							
25	3	"	I	e	2	38	39	6.4	20.4	16.9				
				M	2	45	0							
				F	2	54								
26	3	"	II	eP	10	51	29	5.0	186.5	168.7	Recorded at Malabar.			
				S	10	31	53							
				M	10	33	29							
				F	10	50								
27	5	"	I	e	16	24	7				Malabar e—S = 12.5 sec. △ = 113 KM.			
				F	16	26								
28	4	"	I	eP	7	41	49	420			Recorded at Malabar. Felt at Redjang, (Benkoelen, Sumatra).			
				S=M	7	42	35							
				F	7	55								
29	6	"	II	eP	3	16	51	4.7	21.0	19.7	Malabar faint. Felt at Makasser, Mandar, Palopo, Mamasa, Watoe-taoe and Mamoedjoe, SW. Celebes.			
				S	3	20	25							
				M ₁	3	22	7					4.9	23.1	16.2
				M ₂	3	22	45							
				F	3	45								
30	6	"	I	e	4	0	59							
				F	4	7								

No.	Date 1919.	Character.	Phase.	Time (Greenwich).			Period in seconds.	Distance of epicentrum.	Amplitude (half)		Remarks.
				h	m	s			A _E	A _N	
31	6	March	I _r	e	7	24	55				
				S	7	28	49				
				M	7	29	8	6.0	25.2	32.9	
				F	7	37					
32	7	"	I	e	1	15					
				M	1	18					
				F	1	25					
35	7	"	I	e	25	55	19				Felt at Poeloeng (Madioen), Kepandjen, Toeren, Solpit Oerang (Pasoeroean) Java.
	8	"		F	0	6					
34	9	"	I _r	e	15	1	2	1270			Felt at Loeboek-Raja, Res. of Tapanoeli, Sumatra.
				S?	15	5	17				
				M	15	5	0	5.6	42.1	36.7	
				F	15	15					
36	10	"	I	e	21	27	11				
				M	21	34	9	6.6	45.6	35.4	
				F	21	42					
36	11	"	I	e	10	20	59				Malabar i P — i S = 11.9 sec. △ = 109 KM.
				F	10	24					Felt at Pitjoeng-Poeger, and Selecta, Preanger, Java.
37	13	"	I	P	14	21	8				Recorded at Malabar.
				M	14	26	35	5.7	30.5	28.7	
				F	14	40					
38	15	"	I	e	21	52	51				
				F	21	56					
39	16	"	II _r	P	7	58	52	2960			SW — NE. Malabar very faint.
				S	7	45	12				
				M	7	45	7	6.4	140.4	146.8	
				F	8	9					
40	16	"	I _r	eP	15	8	2	5430?			SW — NE.?
				eS?	15	13	15				
				M	15	15	55	6.2	15.1	29.1	
				F	15	23	2				
41	17	"	II _r	iP	5	59	16	314			S 58,° 5 E. Malabar P — S = 16,2 sec. △ = 142 KM.
				S	5	59	49				
				M	6	1	59	5.6	11.7	95.2	
				F	6	11					
42	21	"	II _r	P	1	7	59	4670			SE — NW.
				S	1	14	25				
				M ₁	1	14	39	6.8	60.4	58.9	
				M ₂	1	16	31	6.8	59.0	54.7	
				F	1	38					
45	21	"	I _r	e	12	54	39	480			Felt at Plalo and Redjang, Res. of Benkoelen, Su- matra.
				S	12	55	22				
				M ₁	12	56	42	4.6	27.3	17.7	
				M ₂	12	57	39	4.8	17.5	29.3	
				F	13						

No.	Date 1919.	Character.	Phase.	Time (Greenwich).			Period in seconds.	Distance of epicentrum.	Amplitude (half)		Remarks.	
				h	m	s			A _E	A _N		
44	21	March	I _r	e	16	10	14					
				S = M	16	17	25	6.6	5300	54.7	25.7	
				L	16	26	2					
				F	16	37						
45	21	"	I _r	eP	17	25	48		2700			
				S	17	30	9					
				M	17	31	38	6.1		25.5	16.9	
				F	17	52						
46	23	"	I	e	22	56	45					
				F	23	9						
47	26	"	I	e	19	53	14				Malabar P — i S = 10,7 sec. △ = 97 KM.	
				F	19	56						
48	29	"	I _r	P	1	56	59		2500			
				S	1	41	5					
				M	1	41	15	6.2		22.5	31.2	
				F	1	55						
49	30	"	I	e	10	47	6					
				M	10	52	45	6.1		10.5	24.1	
				F	11	9						

SEISMOLOGICAL BULLETIN.

APRIL 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Mean Greenwich time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\circ} 7' 19''$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.		Character.	Phase.	Time (Greenwich).			Period in seconds.	Distance of epicentrum.	Amplitude (half)		Remarks.
										A _E	A _N	
50	1	April.	I.	P	h	m	s	5.1	372	54.2	23.9	Malabar eP—iS=28,6 sec. △ = 256 KM.
				iS	14	17	54					
				M	14	18	35					
				F	14	19	59					
51	2	"	III.	iP	0	35	59					EW pen thrown off $0^{\text{h}} 36^{\text{m}} 1^{\text{s}}$. NS pen $0^{\text{h}} 36^{\text{m}} 26^{\text{s}}$. Readjusted $0^{\text{h}} 47^{\text{m}}$. Bosch seismograph, Batavia iP — iS = 33^{s} △ = 300 KM. Malabar iP — S = 42.4 sec. △ = 384 KM. Felt in the res. of Bantam and Batavia, Java, and Lampungs, Sumatra. Felt at sea near Vlakke Hoek, Sumatra: S. S. de Greve $5^{\circ} 35' \text{ S}$; $103^{\circ} 56' \text{ E}$ (strongly), S. S. Tambora $4^{\circ} 48' \text{ S}$; $102^{\circ} 42' \text{ E}$.
				F	1	45						
52	4	"	I.	e	15	55	9		650			Malabar very faint. Felt in the res. of Benkoelen. Sumatra.
				eS	15	56	20					
				M	15	57	13					
				F	16	5						
53	7	"	I.	P	16	26	44	5.6	190	13.0	14.4	E — W. Malabar very faint.
				S	16	27	5					
				M	16	28	32					
				F	16	39	8					
54	10	"	I	e	3	57	47					Malabar very faint
				F	3	42	22					
55	16	"	I.	e	16	45	26	5.2	115	51.8	36.7	Malabar eP—S=11,6 sec. △ = 106 KM.
				S	16	45	38					
				M ₁	16	47	58					
				M ₂	16	50	22					
				F	17	5	47					
56	17	"	I	e	9	32	18					
				F	9	46	1					

No.	Date 1919.	Character.	Phase.	Time (Greenwich).	Period in seconds.	Distance of epicentrum.	Amplitude (half)		Remarks.
							A _E	A _N	
57	17	April.	II _a	iP S M L M ₁ M ₂ M ₃ F	h m s 11 55 44 11 45 10 11 45 40 11 54 57 12 7 10 12 24 55 12 34 25 12 51 15	8100	μ μ 37.7 25.8 31.8 31.4 145.5 40.8	Azimuth ESE — WNW. Malabar faint. eP — eS? 9 ^m 42 ^s eP — L? 25 ^m 34 ^s . Δ = 8400 KM.?	
58	17	"	I	e F	21 13 55 21 30				
59	17	"	I _a	e L _{EW} M _{1EW} M _{2EW} F	21 45 2 22 12 41 22 29 56 22 40 44 22 55			Hardly any record on NS.	
60	17	"	I	i F	22 37 50 22 40			Disturbed by No. 59. Malabar P — iS = 17,0 sec. Δ = 150 KM.	
61	21	"	I	e M F	8 45 5 8 47 8 8 54 5	5.9	11.7 10.0		
62	21	"	I _a	e L F	11 45 56 12 40 14 12 52	10.4	13.9 —		
63	22	"	I	e M F	2 51 40 2 54 50 5 51	6.0	24.2 15.8		
64	23	"	I	e iS M F	16 25,6 6 16 26,1 1 16 27,9 9 16 32,9 9	±280		Clock contacts failed. e — iS = ± 51 sec. Malabar iP — iS = 19 sec. Δ = 170 KM. Felt in Banjoemas and Pekalongan, Java.	
65	24	"	I	P S=M	17 8 27 17 8 52	225		F In next record.	
66	24	"	III _a	iP iS	17 11 10 17 11 35	6.4	228 247.1 389.6	Deranged 17 ^m 11 ^m 55 ^s Readjusted 24 ^m 8 ^m Bosch, Batavia: iP — iS = 25,1 sec. Δ = 225 KM. Malabar iP — iS = 19,8 sec. Δ = 178 KM. Felt in West-Java.	
67	24	"	Bosch-record.	e S F	19 37 57 19 38 15 19 40 54	160?		Malabar P — S = 21,8 sec. Δ = 198 KM. Felt at Lebak Parai, res. of Bantam; Naringgoel, res. of Batavia.	
68	24	"	Bosch-record	e F	19 45 51 19 45 54			Malabar P — S = 18,6 sec. Δ = 166 KM.	

No.	Date 1919.	Character.	Phase.	Time (Greenwich).	Period in seconds.	Distance of epicentrum.	Amplitude (half)		Remarks.
							A _E	A _N	
69	24	April.	Bosch-record	e F	h m s 21 15 52 21 15 50		μ μ	Malabar eP — S = 28,0 sec. Δ = 188 KM. Felt at Lebak Parai.	
70	25	April.	I	P S=M F	16 25 14 16 25 52 16 29	160	μ μ	Malabar P — S = 26 sec. Δ = 250 KM.	
71	25	"	I	e F	16 41 14 16 44			Malabar faint.	
72	26	"	II _a	iP iS F	5 0 14 5 0 36 5 11	200		Malabar P — iS = 18,5 sec. Δ = 165 KM.	
73	26	"	I	e F	5 13 5 5 16			Malabar very faint.	
74	26	"	I	e F	4 48 58 4 52			Malabar faint.	
75	26	"	I	e S F	18 41 28 18 41 48 18 46	185		Malabar eP — S = 20,5 sec. Δ = 180 KM.	
76	27	"	II _a	eP iS M ₁ M ₂ F	0 27 8 0 31 8 0 55 30 0 37 3 1 21 51	2440	5.4 128.4 6.0 89.9	Azimuth N 48,2 E. Malabar eP — S = 4 ^m 29 ^s . Δ = 2810 KM.	
77	27	"	I	e F	1 49 25 1 51 52			Malabar eP — iS = 5,7 sec. Δ = 51 KM.	
78	27	"	I	e M F	2 48 52 2 49 5 2 55	6.4	14.6 15.8		
79	30	"	III _a	P M S M eL M ₁ M ₂ M ₃ M ₄ M ₅ M ₆ M ₇ M ₈ M ₉ M ₁₀ M ₁₁	7 29 14 7 31 12 7 39 34 7 40 38 7 51 45 8 8 6 8 15 14 8 16 22 8 24 33 8 29 45 9 4 53 9 6 47 9 20 16 9 25 49 10 7 54 10 27 48	9170	5.7 35.8 238 6.1 781.6 624 18.0 — 1666 18.0 — 2569 17.9 — 2077 18.0 — 1535 18.0 — 212 20.5 — 274 16.0 — 150 16.0 — 109 17.9 — 81.7 18.5 — 53.9	E — W. EW pen. thrown off. Malabar: P — iS = 9 ^m 53 ^s . P — L = 20 ^m 63 ^s . Δ = 8650 KM. Bosch, Batavia: eP — S = 10 ^m 2 ^s . eP — L = 16 ^m 2 ^s . Δ = 8840 KM.	

April 24, from 17^h 8^m to 22^h 22^m Malabar records 28 quakes. 12 readings give a mean distance of 185 KM. 11 Shocks have been registered by the Töpfer Schulze magnetograph at Buitenzorg, all on the same time as the corresponding ones at Malabar. Computed epicenter: 106,2 E; 8,2 S.

No.	Date 1919.	Character.	Phase.	Time (Greenwich).			Period in seconds.	Distance of epicentrum.		Amplitude (half)		Remarks.	No.
				h	m	s		m	p	A _E	A _N		
	April.		M ₁₂	10	58	16	18.6	15	21	68.8			
			M ₁₃	10	56	25	17.9	15	21	52.7			
			M ₁₄	11	4	27							
			M ₁₅	11	10	2							
			F	11	29								
80	30	I	e	11	14	19							
			F	11	18	31							
70	28												
71	28												
72	28												
73	28												
74	28												
75	28												
76	27												
77	27												
78	27												
79	20												



SEISMOLOGICAL BULLETIN.

MAI 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Greenwich Mean time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19^{\text{s}}$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Character.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epicentrum.	Remarks.			
								A _E	A _N					
81	Mai 1	I _n	e	h	m	s	6.2 19.0	15.5	15.1	8100				
			M	5	17	19						5	26	42
			eL	5	42	25						5	42	25
			F	5	57							5	57	
82	" 1	I	e	12	20	18								
			M	12	24	2								
			F	12	54									
83	" 2	I- Δ	e	0	58	54				Malabar e-S = 12 sec. Δ = 110 KM.				
			F	1	2									
84	" 2	I _n	e	2	18	41	6.5	29.0	11.9	9700				
			S	2	29	24								
			M	2	50	50								
			eL	2	51	56								
85	" 5	II _n	P	1	2	0				6500				
			S	1	10	7						5.8	42.0	89.5
			SR	1	15	55						5.9	47.5	62.2
			eL	1	20	21								
			M	1	36	36								
86	" 6	III _n	eP	19	45	33	6.0 54.0	165	215	6200	Hourmarks failed. Malabar eP - eS = 7 ^m 27 sec. eP - L = 14 ^m 51 sec. Δ = 5800 KM.			
			S	19	53	21								
			L	19	59	57								
			M	20	2	2								
			F	21	46									
87	" 7	I	e	4	12	50				Malabar faint.				
			F	4	14	22								
88	" 7	I _n	e	5	22	22	6.0	23.7	26.5	5800	E-W.			
			M	5	29	46								
			eL	5	59	22								
			F	5	49									
89	" 7	I	e	6	58	25	6.8	49.0	50.3	Felt at Kwandang (Menado) and Banggai-Isl., Celebes.				
			M	7	4	27								
			F	7	12									

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
				h	m	s		A_E	A_N		
90	Mai 7	I _v	e — P SM F	10 10 10	54 55 59	51 14 27			210	Malabar eP — S = 25.0. $\Delta = 185$, Felt at Lebak Parai (Bantam), Java.	
91	" 13	I	e F	6 6	17 24	17					
92	" 14	I	e M F	21 21 22	42 49 0	56 43	5.7	25.6	9.5		
93	" 17	I	e eS M ₁ M ₂ F	0 0 0 0	13 14 15 18	25 58 41 7 41	5.8	89.0	48.3	860 Malabar faint.	
94	" 21 " 22	I	e F	23 0	48 1	29					
95	" 22	I	e M F	6 6 6	55 55 40	51 49				Malabar very faint.	
96	" 26	I _v	i M F	5 5 5	52 55 56	6 15				Malabar iP — iS = 12 sec. $\Delta = 110$.	
97	" 28	I _v	e F	18 18	45 46	17 20				Malabar eP — iS = 10 sec. $\Delta = 90$.	
98	" 29	I	e eL _E F	11 11 11	7 19 54	7 55					
99	" 31	I	e F	14 14	15 19	9 46					

SEISMOLOGICAL BULLETIN.

JUNE 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartaire.

Greenwich Mean time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\circ} 7' 19''$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).	Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
						A _B	A _N		
100	June 1	I,	e M S M ₁ M ₂ F	h m s 6 58 9 7 1 1 7 3 32 7 4 45 7 5 28 7 18	5.2	40.6	43.8	5600	
101	" 1	II,	e eS M F	14 52 58 14 54 52 14 56 7 15 11 34				870	Felt at Sandaran-Agoeng, Loeboek Kilangan and Padang, Sumatra.
102	" 5	I	e S F	2 3 14 2 4 35 2 22 14					N — S.
103	" 5	I	e F	17 53 25 18 0 44					
104	" 7	I	e F	11 50 21 11 51 21					
105	" 7	II,	iP iS M F	11 0 35 11 0 47 11 1 55 11 7 2	5.3	294	155	125	Malabar iP — iS = 10 sec. $\Delta = 90$ KM. Felt at Tjianten (Batavia), Java.
106	" 7	I	e F	20 20 9 20 21 17					Malabar faint.
107	" 10	I	e S? F	21 24 50 21 25 46 21 40 53					Malabar very faint.
108	" 11	I	e F	7 51 58 7 54 7					Malabar P — S = 14 sec. $\Delta = 125$ KM.
109	" 15	I	e M F	14 39 53 14 44 13 14 51 49					
110	" 17	II,	e S? M ₁ M ₂ M ₃ F	15 24 5 15 24 52 15 25 37 15 26 55 15 27 45 14 43	6.4 6.2 6.6	82.4 14.7 126	60.2 95.4 869	430?	N — S? Malabar e — S? = 29 sec. $\Delta = 260?$

No.	Date 1919.	Character.	Phase.	Time (Greenwich).	Period in seconds.	Amplitude (half)		Distance of epicentrum	Remarks.
						A _E	A _N		
11	June 17	I	e	15 48 20					Malabar e — S = 56,5 sec. Δ = 525.
			F	13 57					
12	" 17	I	e	14 22 5					Malabar e — S = 54,4 sec. Δ = 514.
			F	14 57					
13	" 19	I,	e	3 55 41				410	N — S?
			S	3 54 26					Malabar P — S = 25 sec. Δ = 255.
			M ₁	3 55 28					
			M ₂	3 55 57					
			M ₃	3 56 32	5.8	49.7	34.1		
			F	3 46					
14	" 19	I	e	22 45 21				310?	N — S?
			S?	22 45 55					Malabar faint.
			M ₁	22 45 1					
			M ₂	22 45 27					
			F	22 51 21					
15	" 21	I	e	4 58 52				310?	N — S?
			S?	4 59 26					Malabar faint.
			M	4 40 14					
			F	4 52 29					
16	" 21	II	e	9 12 10				520?	Malabar faint.
			S?	9 15 7					
			M ₁	9 14 30	5.7	99.3	81.5		
			M ₂	9 14 41	5.0	10.3	93.6		
			F	9 27					
17	" 21	I	e	20 51 1					Malabar faint.
			M	20 51 57					
			F	20 56					
18	" 22	II,	eP	6 58 20				310	Malabar e — S = 52 sec. Δ = 290.
			iS	6 58 54					
			M ₁	6 59 10					
			M ₂	7 0 44	5.0	25.0	24.7		
			F	7 17 25					
19	" 23	I	e	2 59 55					Malabar faint.
			M ₁	3 2 55	6.1	59.1	19.7		
			M ₂	3 7 41	6.1	27.0	18.8		
			F	3 13					
20	" 24	I	e	18 40 20					
			F	18 55 35					
21	" 25	I	e	4 47 57					
			M	4 50 15	5.3				
			F	5 2					
22	" 28	I,	iP	5 58 25				194	SSW — NNE.
			iS=M	5 58 47					Malabar P — iS = 23,2 sec. Δ = 212.
			F	4 6 9					
23	" 28	I,	e	4 46 14				3880	
			M	4 51 54	6.2	36.2	50.6		
			eL	4 54,6					
			F	5 5					

No.	Date 1919.	Character.	Phase.	Time (Greenwich).	Period in seconds.	Amplitude (half)		Distance of epicentrum.	Remarks.
						A _E	A _N		
124	June 28	I	e	10 45 5					
			F	10 49					
125	" 29	I	e	23 34 19					
			F	23 53					
126	" 30		L	0 51 24					
			F	1 2 4					
127	" 30		e	7 57 50				8000	Some long waves; E W record faint.
			S	7 47 8					
			eL	8 3 18	19.0	52.7	30.0		
			M	8 6 6					
			F	8 12 34					

SEISMOLOGICAL BULLETIN.

JULY 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Greenwich Mean Time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19^{\text{s}}$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
								A _E	A _N		
128	July 2	I	e	h	m	s	6.0	μ	μ	250	Malabar very faint. F in next record.
			M	1	50	45		10.5	—		
			F	1	55	51					
129	" 3	II	e?	1	59	51	6.0	85.6	41.1	250	Malabar faint
			M ₁	2	2	58					
			M ₂	2	8	50					
			F	2	27						
150	" 3	I	e	7	0	2	6.0	—	250		
			F	7	12						
151	" 4	I	e	12	49	18	6.0	—	250		
			M ₁	12	51	42					
			M ₂	12	52	58					
			F	12	57						
152	" 4	I _v	i	16	3	22	6.0	—	250	Malabar faint.	
			eS	16	5	48					
			F	16	8	35					
153	" 4	I	e	22	26	15	6.0	—	250		
			F	22	30						
154	" 7	I	e	14	1	57	6.0	—	250		
			F	14	18						
155	" 8	I _u	i	21	17	56	6.0	35.0	11.8	8440	EW comp. strong.
			eM	21	18	25					
			M ₁	21	18	59					
			M ₂	21	20	25					
			M ₃	21	22	56					
			M ₄	21	25	4					
			eS	21	27	29					
			SP	21	28	23					
			M	21	30	4					
			eL	21	41	4					
			M ₁	21	45	4					
			M ₂	21	49	21					
			M ₃	21	58	4					
			M ₄	22	21	58					
F	22	29									
156	" 9	I	e	7	10	57	25.2	99.2	68.8	250	
			F	7	16						

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
								A _E	A _N		
137	July 16	I	e F	h 16 16	m 23 26	s 21 20		μ μ			
138	" 17	I	" F	9 10	56 7	7					
139	" 17	II _v	iP iS M F	20 20 20 20	2 5 5 25	59 56 58	5.7	321.8 238.2	530	NS. Malabar iP — iS = 20 sec. Δ = 180.	
140	" 17	II _v	P S M F	21 21 21 21	4 5 7 24	44 20 54	6.0	105.5 100.6	520	NS. Malabar records 2 quakes. iP — iS = 16 sec Δ = 140 P — S = 24 sec Δ = 220.	
141	" 18	I	e M F	10 10 11	54 57 2	14 25				Malabar faint.	
142	" 20	I _v	e eS M F	8 8 8 8	1 4 5 18	18 0 28	5.5	34.1 27.6	1550	Malabar e — S = 2 ^m 25 sec. Δ = 1570. Felt at Waingapoe, (Soemba-Isl), and Reo, (Flores).	
143	" 20	II _a	iP S M F	15 15 15 15	59 59 40 54	19 38 25	5.8	329.8 75.2	180	SW—NE. Malabar i — S = 26 sec. Δ = 250. Felt in the residences of Bantam and Batavia, Java.	
144	" 21	I	e M F	5 5 5	25 26 59	25 57 25					
145	" 21	II _v	iP S M ₁ M ₂ F	19 19 19 19 19	5 6 8 9 50	57 59 43 56 45	5.4 6.9 6.1	524.0 596.9 205.6 188.1	750	Azimuth N 52° W. Malabar P — S = 1 ^m 19 sec. Δ = 720 KM; SE—NW. Felt at Indaroeng. (Padangsche Benedenlanden) Lais (Benkoe- len) and Korintji (Djambi) Sumatra.	
146	" 22	I	e F	15 15	19 24	44					
147	" 23	I	e M F	0 0 0	52 54 59	55 2 59					
148	" 24	I _u	e M ₁ M ₂ eL F	2 2 2 2 2	12 15 21 53 50	55 57 10 58	5.9 6.4	11.9 15.5 21.9 16.8			
149	" 24	I	e F	4 4	5 17	1				Malabar faint.	
150	" 29	I	e M F	15 15 15	28 28 45	21 57 21				Malabar faint. Felt at Saumlakki (I. of Jamdeni, Tanimbar-Islands).	

SEISMOLOGICAL BULLETIN.

AUGUST. 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Greenwich Mean Time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19^{\text{s}}$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

N ^o .	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
				h	m	s		A _E	A _N		
151	Aug. 3	I _v	e	6	20	25		μ	μ	900	Malabar e — iS = 1 ^m 25 sec. △ = 780. Felt in Eastern Java and Bali.
			eS	6	22	3					
			M	6	23	32					
			F	6	29	32					
152	" 3	I _v	e	16	47	33				Felt at Kroë and T. Sakti (Benkoelen), Sumatra.	
			F	16	31						
153	" 3		iP	21	1	55	6.4	125.8	350.1	130	SW — NE. Malabar i — S = 12 sec. △ = 110. Felt at Tjampaka (Preanger), Java.
			iS	21	2	10					
			F	21	4	25					
154	" 6	I	e	5	39	57					
			M	5	43	33					
			F	5	50						
155	" 6	I	e	18	2	42					
			M	18	5	51					
			F	18	11						
156	" 16	I	e	22	56	25					
			M	22	57	29					
			F	23	3						
157	" 17	I	e	2	24	42					
			M	2	27	30					
			F	2	34						
158	" 18	II _u	P	17	6	35	6.4	125.8	350.1	7800	ESE — WNW. Malabar P — S = 8 ^m 58 sec. △ = 7700.
			iS	17	15	58					
			M	17	15	49					
			eL	17	28						
			F	17	55						
159	" 20	I _v	P	11	12	54				140	Malabar P — iS = 15 sec. △ = 130. Felt in the Preanger, Java.
			S = M	11	15	10					
			F	11	20						
160	" 21	I	e	7	25	38					Felt at Lais (Benkoelen), Sumatra.
			M	7	28	22					
			F	7	55						
161	" 21	I _v	e	16	41	2				180	Malabar P — S = 21 sec. △ = 190.
			iS = M	16	41	23					
			F	16	44	40					

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.	
								A _E	A _N			
162	Aug. 25	I.	P _N	h	m	s		μ	μ	4150	SSE — NNW?	
			S _E	20	2	51						
			M	20	8	48						
			eL _E	20	9	59						
			M	20	15	55						
			F	20	16	41						
			F	20	28							
163	» 27	I	e?	5	29	51						
			M	5	53	22						
			F	5	46							
164	» 29	II.	eP	5	48	45				2480	Malabar eP — S = 3 ^m 42 sec. △ = 2220; SW — NE. Felt in the Moluccas, rather severely on P. Soeanggi (Amboina).	
			S	5	52	46						
			M ₁	5	53	19	6.6	340.1	362.7			
			M ₂	5	54	35	6.3	364.9	253.2			
			F	6	45							
165	» 29	I	e	15	56	46						
			S	14	4	41						
			F	14	16	1						
166	» 31	II	e	17	50	42					Appears to be the confused record of several shocks. Malabar record too difficult to decipher.	
			i ₁	17	31	19	6.5	112.5	24.7			
			i ₂	17	32	0	6.6	87.0	156.0			
			M	17	40	29	6.1	525.2	211.1			
			eL	17	51							
			F	18	48							

Corrections. Earthquake No. 64 read: 25.6
26.1
27.9
32.9

Earthquake No. 104 occurred on June 6, not June 7.

SEISMOLOGICAL BULLETIN.

SEPTEMBER 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Greenwich Mean Time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19''$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
								A _E	A _N		
167	Sept. 1	I	e M F	0 0 0	24 27 31	5 50 5		μ μ			
168	" 4	II	eP M F	12 12 12	27 29 40	26 56 29	6.3	148 148			
169	" 6	I _v	e M F	21 21 21	4 5 12	19 35				Felt at Tandjong Sakti and Manna (Benkoelen), Sumatra.	
170	" 8	I	e S? M F	4 4 4 4	15 17 20 34	19 36 19	6.7	25.3 72.3			
171	" 11	I	e F	12 12	15 20	59 59					
172	" 12	I _v	eP iS=M F	1 1 1	23 25 28	1 16 25			150	Malabar P — S = 19' sec. $\Delta = 170$. Felt at Tjidaoen (Preanger) Java.	
173	" 12	I	e M ₁ M ₂ S L F	6 6 6 6 6	17 18 20 26 44 58	20 35 39 38 36	6.0 18.6				
174	" 13	I	e	0 0	52 57	20					
175	" 14	I	e M ₁ M ₂ F	13 13 13 13	31 35 40 47	43 15 30					
176	" 21	I	i M ₁ M ₂ F	4 4 4 4	6 8 11 17	5 39 13	4.9			WSW — ENE.	



N ^o .	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
								A _E	A _N		
177	Sept. 26	I _r	P	h	m	s		μ	μ	2500	SW — NE. Malabar e — eS = 5 1/2 ^m
			M ₁	9	12	36					
			M ₂	9	17	19	7.5	57.5	92.5		
			M ₃	9	17	44	6.1	75.9	76.4		
			M ₄	9	21	29	6.1	68.3	66.3		
			M ₅	9	25	48	6.3	59.2	55.3		
			F	9	48						
178	" 26	II _r	iP	19	44	26				2500	SW — NE. Malabar iP — S = 3 ^m 42 sec. Δ = 2560; SW — NE.
			M _p	19	46	57					
			S = M	19	48	31	7.4	251	202		
			eL	19	52	59					
			M ₁	20	2	5	6.2	97.9	99.9		
			M ₂	20	5	1	8.9	87.3	87.3		
			F	20	55						
179	" 26	I	eP	21	45	1				2490	
			S	21	47	5					
			eL	21	50	1					
			F	22	15						
180	" 26	I	eP	22	55	18				2590	SW — NE.
			S	22	57	14					
			eL	23	2						
			F	23	50						
181	" 27	I	e	6	46	55					
			F	6	58						
182	" 27	I	e	10	59	45				1560	Malabar e — S = 2 ^m 8 sec. Δ = 1310. Felt on Soembawa and Bali.
			S	11	2	25	5.6	57.5	70.1		
			M	11	5	59					
			F	11	20	59					
185	" 30	I	e	1	4	19					
			M	1	6	19					
			F	1	18						

SEISMOLOGICAL BULLETIN.

OCTOBER 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Greenwich Mean Time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19^{\text{s}}$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
								A _E	A _N		
184	Oct. 2	I _v	e M F	h 25 25 25	m 42 43 47	s 11 20 25		μ μ		Malabar eP — iS = 41 sec. Δ = 560 KM.	
185	" 3	I _u	e M eL M ₁ M ₂ F	9 9 10 10 10 10	48 58 15 18 50 38	23 10 25 11 23	6.2 19.4	18.5 25.5			
186	" 4	I _v	iP iS=M F	10 10 10	50 50 54	22 41			190	Malabar iP — iS = 14 sec. Δ = 120; SW. Felt at Lebak Parai (Bantam), Java.	
187	" 4	I	P M F	17 17 18	54 59 10	41 4	6.0	60.0 40.4			
188	" 4	I	eP M ₁ M ₂ F	19 19 19 19	52 53 56 45	15 56 12	5.8	70.6 75.2			
189	" 5	I	e M F	1 1 1	25 28 59	7 40 46				Felt on the Isle of Mentawai, Sumatra.	
190	" 8	I	e M F	4 4 5	49 49 28	17 36					
191	" 9	I _v	P S F	1 1 1	7 7 10	14 54 51			170	Malabar eP — iS = 13 sec. Δ = 110. Felt in Western Java.	
192	" 9	II	P S? M ₁ M ₂ F	6 6 6 6 7	52 55 55 57 56	41 41 56 29	5.2 6.2	219 132 245 158	560?	E — W. Felt at Tandjoeng Sakti (Ben- koelen), Sumatra.	
193	" 9	I	e F	9 9	26 50	56					

No.	Date 1919.	Character.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epicentrum.	Remarks.
				h	m	s		A _E	A _N		
194	Oct. 9	I	e M ₁ M ₂ F	16 16 16 16	19 21 23 35	58 54 12		μ μ		Felt probably at Tandjoeng Sakti (Benkoelen). Sumatra.	
195	" 10	I	e M F	5 5 5	10 11 15	23 55					
196	" 11	I	eP M ₁ =S? M ₂ F	9 9 9 9	16 17 18 25	22 8 44			410?	E—W. Felt at Kasoei (Lampongs) and Koeboe Prahoe (Benkoelen), Sumatra.	
197	" 12	III,	iP S M	21 21 21	49 50 51	49 57 58			620	W 17,6 N; pens thrown off. Bosch-record P—S=1 ^m 5 sec. Δ = 590 KM. Malabar P—S = 75 sec. Δ = 680. 20 records from Southern Sumatra. Computed epicentrum 4,5 S 101,5 E.	
198	" 13	I	P eS M F	5 5 5 5	40 44 47 52	49 58 11			2560	ENE.	
199	" 17	I	e M F	22 22 22	46 47 48				6.2		
200	" 19	I	e M F	5 5 5	29 32 34	2					
201	" 20	I	e F	5 5	7 10	24					
202	" 21	I	e F	21 21	29 44	0					
203	" 22	I	e S M ₁ M ₂ F	2 2 2 2 2	11 12 15 14 20	25 29 26 15 32			580	Malabar P—iS = 42 sec. Δ = 370. Felt in Central Java.	
204	" 23	I	P S F	16 16 16	8 12 24	11 23					
205	" 24	I	P S F	2 2 2	48 48 51	14			± 120	P in hour mark. Malabar P—S = 18 sec. Δ = 140.	
206	" 24	I	eP S M ₁ M ₂ F	5 5 5 5 5	21 25 25 26 40	10 55 18 54			1590		
							5.9 6.4	58.2 53.7	29.7 43.3		

No.	Date 1919.	Character.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epicentrum.	Remarks.
				h	m	s		A _E	A _N		
207	Oct. 26	I	P eS M F	18 18 18 18	9 15 15 18	57 58 18 2		μ μ	2710	ENE.	
208	" 26	I,	iP S M F	18 19 19 19	55 0 1 7	56 11 48			2630	ENE.	
209	" 28	I,	e F	17 18	57 0	25 46				Malabar P—iS = 12 sec. Δ = 110.	
210	" 28	I,	e F	18 18	4 10	57				Malabar P—iS = 10 sec. Δ = 90.	
211	" 31	I,	e eS M F	15 15 15 16	48 53 56 6	24 45 6			3540		
212	" 31	I	e M eL F	19 19 19 19	9 15 25 35	10 54 8					

SEISMOLOGICAL BULLETIN.

NOVEMBER 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Greenwich Mean Time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19''$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

N ^o .	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
				h	m	s		A _E	A _N		
213	Nov. 4	I _r	iP	13	54	24	5.7	72.6	49.9	2210	N 72 E.
			S	13	58	6					
			M	13	38	18					
			F	13	56						
214	" 4	I _v	e	15	7	37				320	Felt at Tanjong Sakti (Ben- koelen), Sumatra.
			M	15	10						
			F	15	14						
215	" 8	I _v	e	12	5	11				320	Malabar eP — S = 38 sec. △ = 550 KM.
			S	12	5	48					
			M	12	5	16					
			F	12	15						
216	" 9	I _r	e	7	14	16					Felt on the isle of Timor.
			M	7	25						
			F	7	31						
217	" 15	I	e	6	58	57					
			M ₁	7	0	7					
			M ₂	7	7	34					
			F	7	16						
218	" 15	I _v	P	21	5	48				720	
			S = M ₁	21	7	7					
			M ₂	21	8	16					
			F	21	15						
219	" 14	I _v	e?	15	18	18	5.9	17.4	19.4	430?	Felt in the resid. of Benkoelen, Sumatra.
			S	15	19	6					
			M	13	20	40					
			F	15	18						
220	" 16	I _r	iP	5	10	58	6.1	76.5	85.6	2430	N 66,5° E.
			S	5	14	58					
			M ₁	5	17	5					
			M ₂	5	17	59					
			F	5	28						
221	" 16	I _v	e	6	44	55					Felt in Kroë (Benkoelen), Su- matra.
			F	6	50						
222	" 18	I _r	iP	4	5	56				2700	Azimuth E. Malabar eP — S = 251 sec. △ = 2580 KM.
			S	4	8	17					
			M	4	9	26					
			eL	4	12						
			M	4	58						
			F	4	58						
			Fel								

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
				h	m	s		A _E	A _N		
223	Nov. 18	I _u	e	22	6	52		μ	μ	9400?	
			M=S?	22	17	21					
			M	22	19	51					
			L	22	51						
			F	22	48						
224	» 20	II _u	P	14	21	29				6580	ESE — WNW. Malabar P — S = 463 sec. Δ = 6180.
			S	14	29	25					
			L	14	54	37					
			F	15	18	50					
225	» 21	I _v	e _E	2	10,6					Probably felt at Hollandia N. N. Guinea.	
			M _E	2	19,0						
			F _E	2	25						
226	» 21	I	eP	10	50	1				480	Probably felt at Tapan, (Su- matra's Westkust), Sumatra.
			iS	10	50	55					
			F	11	15						
227	» 25	I	P	6	5	4	21.5				
			M	6	6	34					
			L	6	54	24					
			F	6	58						
228	» 25	I	e	8	31						
			M	8	53						
			F	8	58						
229	» 24	I	e	11	9	51					
			M	11	11	5					
			F	11	19						
250	» 27	I	e	4	6	24					
			M	4	7	44					
			F	4	10						

SEISMOLOGICAL BULLETIN.

DECEMBER 1919.

BATAVIA OBSERVATORY, JAVA.

Foundation: River Quartair.

Greenwich Mean Time. S. Latitude $6^{\circ} 11' 0''$. Height above sealevel 8 m.

E. Longitude $7^{\text{h}} 7^{\text{m}} 19^{\text{s}}$.

WIECHERT Horizontal Pendulum, 1000 kilograms.

The symbols are according to WIECHERT.

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.	Amplitude (half)		Distance of epi- centrum.	Remarks.
								A _E	A _N		
				h	m	s		μ	μ		
241	Dec. 12	I	e	5	51	45					
			M	5	58	45					
			F	4	5						
252	" 12	III,	P	18	8	59				195	N 67° 20' W.
			iS	18	9	21					Malabar eP — eS = 39 sec.
			M ₁	18	9	44	5.5	> 525	528		Δ = 350.
			M ₂	18	11	24	5.5	255	245		Felt in Western Java and
			F	18	27						Lampongs (Sumatra).
255	" 14	I _a	e	1	21	51				8600	
			M^m	1	26	14					
			iS	1	31	55					
			eL	1	50	5					
			M	1	54	14	21.0	55.8	69.4		
			F	2	8						
254	" 15	I	e	16	51						
			M	16	54	50					
			F	16	10						
255	" 17	I _r	e	25	44,7					± 2900	No minute marks.
			M^m	25	47,6						
			iS	23	51,5						
	" 18		F	0	7						
256	" 20	I _r	iP	19	40	52				4210?	SW — NE.
			M ^m	19	41	50					
			eS?	19	46	52					
			M	19	46	59					
			eL	19	52	58					
			F	20	18						
257	" 20	I _r	P	20	45	56				5540	
			S	20	49	15					
			M^m	20	51	7					
			M^m	20	52	52					
			eL	20	56						
			M	21	4		16.0	90.3	72.5		
			M	21	7	52					
			F	21	59						
258	" 21	I	e	9	38	55					
			M	9	40	55					
			F	9	45						

No.	Date 1919.	Cha- racter.	Phase.	Time (Greenwich).			Period in seconds.		Amplitude (half)		Distance of epi- centrum.	Remarks.
				h	m	s	A_E	A_N				
259	Dec. 25	I _r	eP	15	52	12			4930			
			M	15	54	12						
			eS?	15	58	51						
			F	15	46							
240	» 25	I	e	14	2	55			Probably felt at Posso (Menado), Celebes.			
			M	14	5	8						
			F	14	17							
241	» 29	I	e	9	54	28						
			M	9	57	32						
			F	10	6							