

No. 48.

1938.

Geodætisk Institut

Proviantgaarden, Copenhagen, Denmark.

Bulletin

of the seismological station

KØBENHAVN

$\varphi = 55^{\circ}41' \text{ N. } \lambda = 12^{\circ}27' \text{ E. } h = 13 \text{ m.}$

Lithologic foundation: chalk.

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Instruments:
Galitzin-Wilip seismographs.
Constants:

Component	<i>l</i>	<i>A</i> ₁	<i>T</i> ₁		μ^2	<i>T</i>	<i>k</i>
	cm	cm	sec			sec	
<i>N</i>	12.5	100	12.59		—0.04	12.7	104
<i>E</i>	12.5	100	12.60		0.04	12.1	102
<i>Z</i>	14.5	100	11.52	¹ / ₁₀ — ¹⁵ / ₁₂	0.2	9	90
				¹⁵ / ₁₂ — ³¹ / ₁₂	0.0	11½	92

Wiechert 1000 kg. horizontal seismograph.
Wiechert 1300 kg. vertical seismograph.
Constants:

Component		<i>T</i>	ν	ϱ	<i>V</i>
		sec		mm	
<i>N</i>	¹ / ₁₀ — ²¹ / ₁₀	11	3.3	0.6	200
	²¹ / ₁₀ — ³¹ / ₁₂	9.4	3.2	0.4	195
<i>E</i>	¹ / ₁₀ — ²¹ / ₁₀	9.3	4.0	1.6	240
	²¹ / ₁₀ — ³¹ / ₁₂	9.3	3.5	0.6	210
<i>Z</i>		5.5	4	0.1	150

Milne-Shaw seismograph, *E* component (from ¹⁸/₁₀), with the approximate constants $T = 12^s \ \nu = 20 \ V = 300$.
Benioff vertical seismograph, $T_1 = \frac{1}{4}^s \ T = 1^s$.

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No.	Date	Hour	Forerunners				L	Un-defined	△	Remarks
			P	S						
	1938 Oct.		<i>m s</i>	<i>m s</i>	<i>h m s</i>	<i>m s</i>	<i>h m</i>	<i>h m</i>	°	
1	2	16			56.5		1.1			
2	4	9					.4			
3	5	11						12		Disturbed.
4	7	1					.7			Seismic?
5	7	7					.0			Small preceding movement, masked by microseisms.
6	7	16			45.6		1.2			Faint.
7	9	16			56.8	61 26	2.1			Small preceding movement.
8	10	3					.9			
9*	10*	21	2 3	13 35	12 37	15 0	.5			Celebes region.
10	11	0					1.0			Small preceding movement.
11	11	12						.6		Seismic?
12*	12*	0	46 15	55 54	<i>i</i> 49 6	56 25	72		75	East of Japan.
13	13	15					1.1			Small forerunners, phases not clearly marked.
14	14	18						6		Seismic?
15	16	2					30			Small preceding movement.
16	17	15	<i>i</i> 37 51	46 49			.8			Sea of Okhotsk. Deep focus.
17	17	23					.0			
18	19	1								
19*	19*	4	21 47	28 23	23 32	32 1*			45	Altai Mountains.
20*	20*	2	33 52	45 50	38 19	38 45				Lesser Sunda Islands.
21	20	12					.1			
22	20	13					.7			
23	21	6	<i>i</i> 56 33	64 51						Deep focus.
24	21	20	35 17	44 23	45 20		1.1		69	Indian Ocean.
25	21	23			55 34	56 11	2.0			
26	23	2			44.9		.9			
27	23	5					.6			
28	23	15	1 3 12	22 58			.7		77	Madagaskar.
29	26	17					.6			
30	28	5					.7			
31	28	15						25		Read of Benioff Z. Seismic?
32	29	13	<i>i</i> 20 29	30 28	30 45	32 20	.8		79	Japan.
33	29	23			17 28		.8			
34	29	23			<i>i</i> 30 18		1.5			
35	Nov. 4	3	<i>i</i> 54 39				62			
36*	5*	8	55 17	65 13	58 11	70.0			79	East of Japan.
37*	5*	11	<i>i</i> 2 10	12 2*	5.5	17.1			78	« « «
38	5	22					.1			
39	5	23					.0			
40	6	0					.2			
41*	6*	9	<i>i</i> 5 50	15 41	8 52	20.4	31		78	East of Japan.
42	6	14					.4			
43	6	17	<i>i</i> 31 11	41.1			1.0		78	East of Japan.

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			P	S						
	1938 Nov.		<i>m s</i>	<i>m s</i>	<i>h m s</i>	<i>m s</i>	<i>h m</i>	<i>h m</i>	°	
44	6	19					.1			
45	6	20					.1			
46	6	21	15 55				.7		78	Japan.
47*	6*	21	50 44	60 38	53 37		77		78	«
48	7	0	<i>i</i> 59 56	69.8	60 5		1.5		78	«
49	7	1	50 21	60 14	50 24	50 30	1.3		78	«
50	7	1			57 21	<i>i</i> 57 31				
51	7	2	6 21				.4			<i>e</i> 6 ^m 25 ^s , 6 ^m 33 ^s .
52	7	4								Small.
53	7	4	<i>i</i> 27 29		<i>i</i> 27 39					Japan.
54	7	4			28 1	37 48	57			<i>i</i> (B. Z) 28 ^m 4 ^s . Japan.
55	7	13						.2		
56	7	19	<i>i</i> 24 36	34 25	39.3		.9		77	Japan.
57	7	19	45 34							Japan. Superposed on preceding shock.
58	8	3	13 42				16			South of Wien.
59	8	11					.8			
60	8	12					.4			
61	8	13					.9			
62	8	21					.0			
63	9	4			41		.8			
64*	9*	9	27 55	37 55	37.0				51	East of Japan.
65	9	14								<i>i</i> 51 ^m 34 ^s read on Benioff Z.
66	9	16	20 50				50			
67	10	3					.1			
68	10	7					26			
69	10	11		9.1			.5			
70*	10*	20	29 47	39.0					71	Disturbed. South of Alaska.
71	10	22	2 9							
72	10	22	6 58							
73	10	22	34 19							
74	11	0			<i>i</i> 20 30					20 ^m 16 ^s uncertain.
75	11	1	<i>i</i> 8 51	17 59	19 10		.5		70	
76	11	3		19 47			.6			
77	11	5					.4			
78	11	8	41 56				1.2			Disturbed.
79	11	15					.2			
80	11	22	<i>i</i> 44 48							
81	12	8					.8			
82	12	15	1 28	10.8			.4		72	South of Kurile Islands.
83	12	15			<i>i</i> 35 29					
84	12	20	<i>i</i> 35 15				1.1			
85	13	3					.7			
86	13	5					.7			
87	13	13	<i>i</i> 25 9	34 31	29 55	35 48	48		72	Some preceding movement.
88*	13*	22	43 31	53 30	46.9	58.6	67		79	Kurile Islands.
89	14	2		58 19			1.3			Pacific Ocean.
90	14	6					.5			Japan.

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			P	S						
	1938		<i>m s</i>	<i>m s</i>	<i>h m s</i>	<i>m s</i>	<i>h m</i>	<i>h m</i>	°	
91	Nov. 14	12					8			
92	14	12					21			
93	14	12			26.5	36.2	1.0			
94	15	10	3 5	12.2	3 24	13.4	25		70	S small, uncertain. South of Alaska.
95	15	15			44 32		1.1			
96	15	20					.0			
97*	15*	21	13 26	24 24	17.1	24.0	.8		91	Indian Ocean.
98	16	5	<i>i</i> 47 20	56.7			74		72	Pacific Ocean.
99	16	11	20 2	29 55			46		78	Japan.
100	16	15			<i>i</i> 33 43					Read on Benioff Z.
101*	17*	4	5 43	14 47	8 22	15 55			69	South of Alaska.
102	17	13						4		Seismic?
103	18	14			34 41					No Galitzin records.
104	18	19					4			
105	18	21					.4			
106	19	0					.1			
107	19	5	<i>i</i> 51 8	60 47			75		75	Pacific Ocean.
108	21	1			30.3		.8			
109	21	7					.7			
110*	22*	1	<i>i</i> 26 3	36 0*			.9			Japan.
111	22	8			35.5		.9			
112	23	0					59			
113	23	14					.8			
114	25	0					20			
115	25	8	<i>i</i> 32 21	42.2					78	East of Japan.
116	25	23					.0			
117	26	4					.3			
118	26	10					.8			
119	29	13	<i>i</i> 51 32	61 28			81		78	East of Japan. Strong microseisms.
120*	30*	2	41 47	51 39	44.7	46.7	1.1		79	Japan.
121	30	16					.0			
	Dec.									
122	1	2			44.1		1.0			Masked by microseisms.
123	2	22			32 6		44			
124	3	1					.4			
125	3	12	<i>i</i> 23 40	33 33			.9		78	East of Japan. <i>P</i> —.
126	4	6	<i>i</i> 24 2		<i>i</i> 24 15		.9			Japan.
127	4	16			44.9		1.4			Pacific Ocean.
128	5	1					.1			
129	5	19					.6			
130	6	9						.3		Disturbed.
131	6	23	<i>i</i> 13 8		23.4	23 46	.6			Formosa. SS 29 ^m .4.
132	7	10					.9			
133	7	13	<i>i</i> 16 9	26 19			.7		81	East of Japan.
134	7	14					.3			
135	7	15					.7			
136	9	4	6 17	15.1			.4		66	

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	1938 Dec.		<i>m s</i>	<i>m s</i>	<i>h m s</i>	<i>m s</i>	<i>h m</i>	<i>h m</i>	°	
137	9	5					46			
138	9	9			47.6		1.3			
139	12	19					57			
140	13	0					.3			
141	13	3					.3			
142	13	17	<i>i</i> 37 25	47.2			1.1		77	Faint. E of Japan.
143	16	5					.3			
144	16	11	7 55				15			
145*	16*	17			41 30	42 13	1.4			New Zealand.
146	16	23			46	50.1	1.4			SS 59 ^m .4. New Zealand.
147	17	16	<i>i</i> 44 4	51.0	<i>i</i> 45 55	54.6	57		48	Mongolia.
148	18	7			48		1.1			
149	18	22			<i>i</i> 2 36	19	26			
150	19	18	<i>i</i> 35 18	44 45			1.0		73	Japan.
151	20	15					33			
152	21	12			41.8	51.7	1.3			<i>e</i> 54 ^m .6. Lesser Sunda Islands.
153	22	4					.1			
154	22	14						9		
155	22	17					.6			Small forerunners, masked by microseisms.
156	23	1						47		Faint.
157	23	2					.5			
158	23	18	25 51	34 58			.9		70	South of Alaska.
159	24	21					.0			
160	26	7					.4			
161	26	12					.1			
162	26	22	<i>i</i> 6 40	10 11	10 47		13		19	
163	29	0					15			
164	29	21					.7			
165	30	3					.8			
166	31	1					.2			

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NOTES

- No. 9. Oct. 10. 21^h. Celebes region; $\Delta = \text{ca. } 100^\circ$. P 2^m3^s, dilatation. PP 6^m.0, PPP 8^m.5. $e_{E,Z}$ 11^m.2. SKS 12^m37^s large. S 13^m35^s. PS 15^m0^s, in time-break. PPS 16^m.1. e 17^m.6, 18^m27^s, 19^m.4. SS 20^m.2, 21^m.0. SSS 24^m.3.
- No. 12. Oct. 12. 0^h. East of Japan. P 46^m15^s, condensation. iPP 49^m6^s. S 55^m54^s; PS 56^m25^s. e_N 57^m0^s, e_E 57^m30^s. SS 60^m.9.
- No. 19. Oct. 19. 4^h. Altai Mountains. P 21^m47^s, dilatation. PP 23^m32^s large; PPP 24^m21^s. S_N 28^m23^s, S_E 28^m28^s. e 29^m40^s, 30^m21^s. SS 31^m41^s; 32^m1^s, in time-break.
- No. 20. Oct. 20. 2^h. Lesser Sunda Islands; $\Delta = \text{ca. } 110^\circ$. Deeper than normal. P_Z small, 33^m52^s. $PP_{E,Z}$ 38^m19^s large, $ppP_{E,Z}$ 38^m45^s larger. PPP 40^m42^s. e 41^m.4, 42^m.7. $iSKS$ 44^m19^s large. $SKKS_E$ 44^m58^s. e 45^m17^s. S 45^m50^s. e_N 46^m28^s. iPS 47^m28^s, large on E and Z . PPS 48^m18^s, i_E 48^m31^s. e_N 52^m44^s. SS 53^m.7; SSS 57^m.9; e_E 59^m.0.
- No. 36. Nov. 5. 8^h. East of Japan. Large shock. Onsets masked by groups of large, increasing oscillations. P 55^m17^s, condensation. PP 58^m11^s, PPP 60^m15^s. e_N 64^m49^s. S_N 65^m13^s, S_E 65^m17^s. e_E 66^m.2. SS 70^m.0.
- No. 37. Nov. 5. 11^h. East of Japan. Large shock, superposed on the preceding one. iP (Benioff Z) 2^m10^s, condensation; e 2^m33^s larger. e_Z 4^m.8; PP 5^m.5. e_E 6^m.8; e_Z 7^m5^s; $e_{N,E}$ 7^m20^s. eS 12^m2^s (in time-break); e 12^m24^s very large. SS 17^m.1. SSS 20^m.9.
- No. 41. Nov. 6. 9^h. East of Japan. Galitzin records interrupted until 9^h10^m; the recorded movement very large; phases read on Benioff and Wiechert records. iP 5^m49^s.5, condensation; i_Z (B.) 5^m51^s; i_Z (W.) 5^m59^s. i_Z (B.) 8^m41^s. PP 8^m52^s. PPP 10^m36^s. S 15^m41^s very large. e_E 16^m13^s, 17^m28^s. $e_{N,E}$ 18^m4^s. SS 20^m.4; SSS 24^m.3, 24^m.6. L_E 31^m, L_N 32^m.
- No. 47. Nov. 6. 21^h. Japan. eP_Z (B.) 50^m44^s, (W. and G.) 45^s. i_Z (B.) 50^m51^s, 51^m4^s. e_Z 52^m56^s. PP 53^m37^s. e 54^m.4. S 60^m38^s. $e_{N,Z}$ 61^m.0.
- No. 64. Nov. 9. 9^h. East of Japan. Deeper than normal. Beginning of Galitzin records disturbed. P 27^m55^{1/2}^s; i (Benioff Z) 28^m10^s. e 30^m55^s. e 37^m.0. eS 37^m55^s. SS 42^m.9. L not large, but of long duration.
- No. 70. Nov. 10. 20^h. South of Alaska. Very large earthquake. P_Z 29^m47^s small, condensation. i_Z 29^m55^s, i 29^m58^s; very large increasing oscillations. Later onsets not distinct owing to continued large oscillatory movement. $eS_{N,E}$ 39^m.0. L very large.
- No. 88. Nov. 13. 22^h. Pacific Ocean. P 43^m31^s, the beginning small, not very clearly marked. PP 46^m.9; PPP 48^m.8. S 53^m30^s; e 53^m.9. SS 58^m.6.
- No. 97. Nov. 15. 21^h. Indian Ocean. P 13^m26^s, condensation. PP 17^m.1, PPP 19^m17^s. SKS 24^m.0, S 24^m24^s. PS_Z 25^m36^s. e 26^m.0, 26^m.2, 27^m.4. SS 30^m.5.
- No. 101. Nov. 17. 4^h. South of Alaska. iP 5^m42^s.5 (—8.0, x , +9.5; +11.2, x , —17.0). PP 8^m22^s; PPP 10^m15^s. S 14^m47^s. e_N 15^m0^s (in time-break). $(S_eS)_N$ 15^m55^s. e 18^m.0. SS 19^m.5. SSS 22^m.3, immediately followed by L .
- No. 110. Nov. 22. 1^h. Japan. Deeper than normal. iP 26^m3^s. e 29^m.1, 29^m.3. S 36^m0^s (in time-break). e_N 37^m.2, e_E 38^m22^s.
- No. 120. Nov. 30. 2^h. Japan. P 41^m47^s, condensation. e_Z 43^m16^s. PP 44^m.7, PPP 46^m.7. S 51^m39^s. SS 56^m.5.
- No. 145. Dec. 16. 17^h. New Zealand. Masked by microseisms, phases not clearly marked. P_1' 41^m30^s, P_2' 42^m13^s. PP 45^m55^s. e_E 50^m.5. e_N 52^m.2, 53^m.7. $SKSP_E$ 56^m.9. PPS 59^m.7. SS 66^m.4.