No. 41. 1937.

Geodætisk Institut
Proviantgaarden, Copenhagen, Denmark.

Bulletin

of the seismological station

KØBENHAVN

$\varphi = 55°41'$ N. $\lambda = 12°27'$ E. $h = 13$ m.

Lithologic foundation: chalk.

No. 41. Jan.—March 1937.

Instruments:

Galitzin-Wilip seismographs.

Constants:

Component	l	A_1	T_1	μ^2	T	k
	cm	cm	sec		sec	
N	12.5	100	12.61	—0.08	12	104
E	12.5	100	12.65	0.05	11.4	105
Z	14.5	100	11.55	0.1	9	95

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

Component	T	ν	ϱ	V
	sec		mm	
N	9.3	3.9	0.7	210
E	9.4	3.9	0.7	190
Z	5.4	4	0.3	160

Milne-Shaw seismograph, E component, with the approximate constants $T = 12^s$ $\nu = 20$ $V = 300$.

Benioff vertical seismograph, $T_1 = {}^1/_4{}^s$ $T = 1^s$.

Wood Anderson seismograph, E component, $T = 2^s.7$.

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No.	Date	Hour	Forerunners P	Forerunners S	Forerunners	Forerunners	L	Undefined	△	Remarks
	1937 Jan.		*m s*	*m s*	*h m s*	*m s*	*h m*	*h m*	°	
1	2	14	9 7	13 12			17			Mediterranean Sea. *P* somewhat
2	4	23					45			[uncertain, masked by microseisms.
3	5	1					.0			
4	5	5					.8			
5	5	11	*i* 20 52							Japan. Deep focus.
6	5	22			0 2	5.2	.3			
7	7	6	23 51	33 33			.8		76	Japan. *P* not quite certain.
8*	7*	13	30 38	38 50	34.2	42.1	45		60	China.
9	7	18					17			
10	8	10					.4			Faint.
11	8	16					.2			
12	11	13	*i* 33 50		44 16		1.0			Mexico.
13	15	6					.1			
14	20	0					.7			
15	21	15					.1			
16	23	11			16.4	26.1	.8			Pacific Ocean.
17	25	6			55 21	56.6	1.5			*SS* 72m.3. Solomon Islands.
18	28	15					43			*e* 23m.0 on Benioff *Z*,
19	29	14					57			[masked by microseisms.
20	29	17			42 21		1.2			
21	29	22					.1			
22	30	1					.9			
23	30	6					1.2			Some preceding movement.
	Febr.									
24	1	9					1.1			Small preceding movement.
25	1	21					.7			
26	2	16			22 43		.8			22m43s read on Benioff *Z*.
27	3	10					2			
28	5	6					.4			
29	7	5					.4			
30	10	8	19 11	22 48			26		20	Mediterranean Sea.
31	10	20					.2			
32	11	12					.0			
33	12	5			13 40	19 44	.9			2 shocks.
34	12	20					.2			
35	13	2					.6			
36	13	6					.0			
37	13	11					.5			
38	17	3			15 1					Read on Benioff *Z*.
39	17	9	*i* 27 1				.9			Pacific Ocean.
40	18	0					.0			Faint.
41	20	6					.8			
42*	21*	7	*i* 14 12	23 49	19 4	*i* 24 35	.6		75	Pacific Ocean.
43	21	7	*i* 38 6		*i* 38 12					» »
44	21	8	*i* 1 17							» »
45	21	11	*i* 3 42				.5			» » . *P*+.
46	21	15	*i* 17 20				.7			
47	21	18					.1			

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No.	Date	Hour	Forerunners P	Forerunners S			L	Undefined	△	Remarks
	1937 Febr.		*m s*	*m s*	*h m s*	*m s*	*h m*	*h m*	°	
48	21	22	*i* 40 30	50 6	50 6		1.1		75	Pacific Ocean.
49	22	1					.0			
50	22	3	*i* 5 33	15.1	*i* 5 45		.5			*P*+.
51	22	4	*i* 47 30	57 16			1.2		77	
52	22	10					.4			
53	22	13	*i* 35 33	45 12			61		75	Pacific Ocean.
54	22	20					.1			
55	23	0					.7			
56	23	0	*i* 59 47	69 16	*i* 69 31		83		74	Pacific Ocean.
57	23	14					.5			
58	23	20					.0			
59	23	23						47		Small.
60	25	1					.4			
61	26	4					.9			
62	27	2					.0			
	March									
63	5	23					1.0			Small preceding movement.
64	6	1						.0		
65	7	19			21.8		26			
66	8	20					1			Small.
67	8	21					.3			
68	9	3					.7			
69*	9*	15	53 4	*i* 63 51	56 25	69.6	1.2			Panama.
70	9	20					.9			Faint.
71	10	5					.6			
72	12	10					.1			
73	14	3					.0			Faint.
74*	14*	12			14 12	20 39				Chile.
75	15	6					.8			Faint preceding movement.
76	16	15	58 16	68 40			1.5		84	Luzon.
77	17	14			22.2		.8			No Galitzin records.
78	19	18			31.3	40.6	1.0			Chile.
79	21	7					56			
80	21	16	22 49	31 15	31 38	35.7	.8		62	*P* small, the reading not quite [certain. Assam.
81	21	19	41 3		41 17	51.1	1.1			Japan.
82	22	10					.8			
83	23	1			5.9	7.0	.8			$9^m.3$; $15^m.9$.
84	23	19			20.0		.5			
85	24	1					.9			
86	24	14					.7			Faint.
87	25	17			11.6		.5			
88	26	10		11 31			.4			Indian Ocean.
89	26	16					.5			
90	26	21					.8			
91	28	19					5			
92	29	7					.0			
93	29	8			13 47	14 39				

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NOTES

No. 8. Jan. 7. 13^h. China. Strong record. *eP* 30^m38^s, first movement quite small. PP_Z 32^m52^s, small. e_E 34^m2^s; *PPP* $34^m.2$, large. eS_E 38^m41^s; *S* 38^m50^s, large. e_N 39^m17^s; e_E 39^m36^s. S_cS_N 40^m32^s. e_N $42^m.1$. *SS* $42^m.8$. The beginning of *L* not clearly marked, about 45^m.

No. 42. Febr. 21. 7^h. Pacific Ocean; 44°.5 N 150°.0 E according to Tokyo. Large earthquake. iP_Z 14^m12^s, (—2.1, —1.7, +3.0); *i* 14^m16^s, 21^s followed by large oscillations on Benioff *Z*. *PPP* 19^m4^s; *e* $20^m.0$. *eS* 23^m49^s, *i* 59^s larger. $iPS_{N,Z}$ 24^m35^s. e_E $27^m.5$. *SS* 29^m29^s; *SSS* $32^m.1$. *L* about 36^m.
On the Galitzin records surface waves continue until about $12^h.5$; part of the movement recorded is due to aftershocks; the beginning of one separate *L* is distinguished at $11^h.5$. In addition to the *P*'s at $7^h38^m6^s$ and $8^h1^m17^s$, Benioff *Z* records a number of distinct pulses, the interpretation of which is not clear: *i*(*P*) 24^m5^s; *i* 24^m23^s; *i* 25^m13^s, 25^s. *i*(*P*) 28^m21^s, quite small. *i* 40^m53^s; *e* 41^m7^s, 16^s. (*P'P'* of the main shock should be at about $41^m.7$). Recording was interrupted from 8^h6^m to 8^h11^m; the end of an earthquake record is seen after the break. Further readings: *i*(*P*) $9^h32^m57^s$; 33^m8^s. *e*(*P*) $10^h24^m15^s$. *i*(*P*) $10^h35^m40^s$. *i*(*P*) $10^h39^m41^s$. *i*(*P*) $11^h48^m41^s$.

No. 69. March 9. 15^h. Panama; △ = ca. 85°. *P* 53^m4^s; *i* 53^m11^s larger. *PP* 56^m25^s; *PPP* 58^m15^s. *e*(*SKS*) $63^m.6$; *iS* 63^m51^s. *PS* $64^m.7$. SS_E $69^m.6$. *L* not large, possibly some depth of focus.

No. 74. March 14. 12^h. Chile; △ = ca. 105°. $PP_{E,Z}$ 14^m12^s, small. $SKS_{N,E}$ 20^m39^s, large on *E*; S_N 22^m0^s. $PS_{E,Z}$ 23^m39^s. SS_N $29^m.0$. The beginning of *L* not certain, about 39^m.

Seismometric readings: Notation

P — normal first preliminary tremors, longitudinal waves.
P+ — first wave condensational (away from the epicentre).
P— — first wave dilatational (towards the epicentre).
P (±a, ±b, ±c) — a, b and c are trace amplitudes in mm. of first swing on NS, EW and vertical component Galitzin records respectively. + indicates ground motion directed to N, to E or up, — indicates ground motion to S, to W or down. When a second set of amplitudes is given it refers to the second swing. If an amplitude is not measurable the number is replaced by x.
PP... — longitudinal waves reflected at the earth's surface.
S — normal second preliminary tremors, transverse waves.
SS... — transverse waves reflected at the earth's surface.
PS; *PPS*;... — waves reflected at the earth's surface which travel partly as longitudinal, partly as transverse waves.
SKS — waves which traverse the mantle as transverse waves but are refracted through the core with longitudinal oscillation.
PKS — waves which pass the mantle on one side of the core as longitudinal waves, on the other side as transverse waves and are refracted through the core with longitudinal oscillation.
SKKS — waves which traverse the mantle as transverse waves, are refracted through the core with longitudinal vibration and are reflected on its inner boundary.
L — long, or surface, waves; main phase.
M — waves of greatest amplitude in the surface waves.
i — sharply defined beginning of a phase.
e — gradual beginning of a phase.
Δ — arcual distance from the station to the epicentre.
*) affixed to time of phase indicates that the beginning is in a time-mark.
*) affixed to number and date refers to Notes.

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