No. 45. 1938.

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. 45. Jan.—March 1938.

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	—0.05	12.6	103
E	12.5	100	12.65	0.1	12.5	104
Z	14.5	100	11.55	0.1	9	95

On february 24th recording on E was suspended.

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

Component		T	ν	ϱ	V
		sec		mm	
N	$^1/_1$—$^3/_2$	9.5	4.3	0.3	215
E	$^1/_1$—$^3/_2$	9.3	4.0	0.4	190
Z		5.4	4.0	0.2	160

After february 3rd readjustments of the horizontal seismograph took place and the constants varied.

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

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

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No.	Date	Hour	Forerunners P	Forerunners S	Forerunners	L	Undefined	△	Remarks
	1938 Jan.		*m s*	*m s*	*h m s*	*h m*	*h m*	°	
1	1	11			41 33	48 57	1.1		Readings not certain. Masked by irregular microseismic movement.
2*	1*	23	*i* 40 49	51 30	44 18	57.3	1.2		Pacific Ocean.
3	2	11			3 58		6		Crete.
4*	2*	22		50 59	43 34	50 40			Mexico.
5	3	21			37.0		.7		
6	4	5					.4		
7	7	15					1.3		Small preceding movement.
8	7	18						55	
9	8	7						21	Read on Benioff *Z*. Seismic?
10	9	19						55	» » » » »
11	10	18					33		
12	10	21	*i* 6 35	16 38			.6	80	Pacific Ocean.
13	11	14						2	
14*	11*	15	*i* 23 58	33 54	27 2			78	Japan.
15	12	1					30		
16	13	9					.0		
17	16	15					.1		
18	18	4			44.3		1.2		Masked by strong microseisms.
19*	18*	9	36 46	43 1*	39.5	44.3		41	Afghanistan.
20	19	10						42	Read on Benioff *Z*. Seismic?
21	22	3					.0		
22	23	8					74		Preceding movement disturbed.
23*	24*	10			50.8				
24	25	17			11 45	13.5	1.1		
25	26	4					.0		
26	29	4					.8		Masked by strong microseisms.
27	30	17						44	
	Febr.								
28*	1*	19	19 5		23 42	29 51			Banda Sea.
29	2	14						34	Read on Benioff *Z*. Seismic?
30	4	0					49		
31	4	11					15		
32*	5*	2	36 0		36 40	37 0			Colombia.
33	7	14	*i* 54 48	64 30			1.4	76	Japan.
34	8	7			40 6	40.6	1.1		Ecuador.
35	8	14					.0		
36	8	14			45		1.2		
37	10	7					.2		
38	10	10					.5		
39	10	20	42 58				.8		*P* not quite certain, masked by microseisms.
40	11	15					.4		
41	13	8			23 50		1.2		Disturbed.
42*	14*	3	*i* 0 33	5 36	*i* 0 46	5 46		30	Golf of Karabugas.
43	15	3	*i* 36 15	43 5			48	47	*eP* ca. 36^m13^s. Atlantic Ocean.

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No.	Date	Hour	Forerunners P	Forerunners S	L	Undefined	△	Remarks
	1938 Febr.		*m s*	*m s*	*h m s*	*h m*	°	
44	15	7	*i* 5 42	12 36	20	48		Possibly a small earlier beginning [of *P*. Atlantic Ocean.
45	15	10				53		Read on Benioff *Z*. Seismic?
46	21	14			15			
47	22	5			.9			
48	22	6			25.3	32 26	1.1	*e* 42m.3.
49	26	12					.7	
50	27	1	*i* 40 52	50 20			1.1	73	*P*+. East of Japan.
51	27	12					.3		Faint.
	March							
52	2	0					.4		
53	4	14				50		Read on Benioff *Z*. Seismic?
54*	8*	5			55.6	61 16	1.5		Pacific Ocean.
55	9	2					1.3		Small preceding movement.
56	10	16			2.9		.4		
57	10	16			45.3		1.2		
58	11	14	55.0	58 26		60		19	Greece.
59	11	16	*i* 10 14			12			
60	11	17					.3		Small preceding movement.
61	12	13					.5		» » »
62	12	20					.5		» « »
63	13	6				56			
64	13	15				51			
65	13	17	49.8	53 0*	53 12	53 17	54	18	Greece.
66	13	21	14 14				.5		Baluchistan.
67	14	0	*i* 58 16		*i* 58 20		1.3		*P*+. Bengal.
68	14	5	*i* 24 57				.8		*P*+. China.
69	14	14						16	Read on Benioff *Z*. Seismic?
70	15	15						27	» » » » »
71	21	1					1.4		Small preceding movement.
72	22	15			*i* 24 5				Read on Benioff *Z*.
73*	22*	15	33 16	42 31	35.8	46.8		71	West of Queen Charlotte Islands.
74	22	22	38 49				1.1		*P*+. South of Queen Charlotte [Islands.
75	25	17					.0		
76	27	3				2			
77	27	3				32			
78	27	11	*i* 18 50			21			Small beginning on Benioff *Z* 18m48s. [Yugoslavia.
79	31	22	43 43	54 2*			1.2	83	*P*—. Southeast of Formosa.

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NOTES

No. 2. Jan. 1. 23^h. Pacific Ocean; $\triangle$ = ca. 90°. iP_Z 40^m49^s, dilatation. *PP* 44^m18^s, 31^s. *SKS* 51^m18^s. *S* 51^m30^s. *PS* 52^m31^s. e_N $56^m.5$. *SS* $57^m.3$.

No. 4. Jan. 2. 22^h. Mexico; $\triangle$ = ca. 88°. e_Z 40^m12^s, possibly preceded by quite small movement, masked by microseisms, beginning about $40^m.0$. *PP* 43^m34^s. *SKS* 50^m40^s; *S* 50^m59^s; *PS* 51^m56^s. e_E $53^m.1$. *SS* $56^m.3$. *e* $63^m.5$. The beginning of *L* not certain.

No. 14. Jan. 11. 15^h. Japan. Possibly deeper than normal. iP_Z 23^m58^s, dilatation. $i(pP)$ 24^m13^s. *PP* 27^m2^s; *e* $27^m.4$. e_E 33^m44^s. *S* 33^m54^s, followed by several oscillations; phases not clearly separated. *L* not large, the beginning uncertain.

No. 19. Jan. 18. 9^h. Afghanistan. Deep Focus. Masked by strong microseisms. *iP* 36^m46^s. *e* $39^m.2$, $39^m.5$. *S* 43^m1^s. e_E $44^m.3$. *e* $46^m.2$, $46^m.5$.

No. 23. Jan. 24. 10^h. Masked by strong microseisms, readings uncertain. e_Z $50^m.8$. $e_{N,Z}$ 52^m26^s. e_E $53^m.3$; e_N $53^m.8$. *e* $55^m.9$. e_E 57^m50^s. e_E 58^m20^s, e_N $58^m.6$. $e_{E,Z}$ 59^m19^s. *e* $62^m.4$, $63^m.4$.

No. 28. Febr. 1. 19^h. Banda Sea; $\triangle$ = ca. 110°. Large earthquake. Galitzin records not readable. *eP* 19^m5^s, condensation. *P'* 22^m55^s. *PP* 23^m42^s very large. *PPP* 25^m54^s. e_N $27^m.4$; $28^m.0$. e_E $29^m.1$. *e* 29^m23^s. *SKS* 29^m51^s very large. e_N $30^m.9$. $e_{N,E}$ $31^m.3$, oscillations of long period. *e* $32^m.7$. *PS* $33^m.2$ and *PPS* $34^m.0$ very large on *N* and *E*. e_E $37^m.4$. *SS* 38^m55^s very large on *N*. *e* 40^m1^s very large on *E*. L_Q 49^m, very large oscillations of period of more than 1 minute.

No. 32. Febr. 5. 2^h. Colombia; $\triangle$ = ca. 85°. *h* = ca. 160 km. Records masked by strong microseisms. P_Z 36^m0^s. *pP* 36^m40^s, *sP* 37^m0^s. *PP* $39^m.8$. *e* $42^m.4$. (*S*) $46^m.2$. *e* $47^m.0$, $47^m.5$.

No. 42. Febr. 14. 3^h. Golf of Karabugas, Caspian Sea. Deeper than normal. *iP* $0^m32^s.5$, condensation. *ipP* 0^m46^s. *S* 5^m36^s. e_Z 5^m46^s. Movement of short period prevailing; strong Benioff *Z* record.

No. 54. March 8. 5^h. Pacific Ocean; $\triangle$ = ca. 125°. *PP* about $55^m.6$, not clearly marked. *SKS* 61^m16^s. *SKKS* 62^m52^s. *PS* $65^m.5$. *SS* $72^m.3$.

No. 73. March 22. 15^h. West of Queen Charlotte Islands. *P* 33^m16^s, not clearly marked, possibly two seconds later. e_E 34^m4. *PP* $35^m.8$. e_E $41^m.4$, e_N 41^m40^s. S_E 42^m31^s. e_N $42^m.9$, $43^m.4$. e_N $46^m.5$, *SS* $46^m.8$. *SSS* $50^m.0$.

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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