

No. 37.

1936.

# Geodætisk Institut

Proviantsgaarden, Copenhagen, Denmark.

## Bulletin of the seismological station

# KØBENHAVN

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

Lithologic foundation: chalk.

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Instruments:

Galitzin-Wilip seismographs:

Constants:

Component	$l$	$A_1$	$T_1$		$\mu^2$	$T$	$k$
	cm	cm	sec			sec	
$N$	12.5	100	12.61		-0.1	12.4	104
$E$	12.5	100	12.65		0.0	11.9	104
$Z$	14.5	100	11.55	$\frac{1}{1} - \frac{26}{2}$	0.1	9	90
				$\frac{26}{2} - \frac{31}{3}$	0.0	10	95

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

Component	$T$	$\nu$	$\rho$	$V$
	sec		mm	
$N$	9.3	4.0	0.6	215
$E$	9.3	3.9	0.7	190
$Z$	5.4	4.1	0.2	170

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

Wood-Anderson torsion seismometer,  $E$  component,  $T = 2^s.7$ .



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No.	Date	Hour	Forerunners				L	Un-defined	△	Remarks							
			P		S												
			m	s	m	s	h	m	s	m	s	h	m	h	m	°	
47	1936 Febr. 26	3										.5					Faint. No Galitzin records 27 <sup>d</sup> 8 <sup>h</sup> —28 <sup>d</sup> 10 <sup>h</sup> . Banda Sea.
48*	27*	10					23	15			28	48					
49	27	17												.6			
50	28	3												.7			
51	28	17												.1			
52	29	9											17				
	March																
53	1	10										36.5	41	2*			$i_N$ 41 <sup>m</sup> 46 <sup>s</sup> . Superposed on preceding shock.
54	1	10										64	41	1.4			P+. No G.E record. SS 45 <sup>m</sup> .5. Yeso. Small preceding movement.
55	2	3	i30	42	40	12	33	27			40	34		.9		74	
56	4	15													46		
57	4	17													48		
58	6	12														42	
59	6	14					45	11						1.6			P'+.
60	7	19												.4			Faint.
61	7	20										58.9		1.3			
62	8	1												.2			
63	8	2												.3			
64	8	10												.5			Faint.
65	10	8										33	56	.8			
66	10	12			26	15								.7			Aleutian Islands.
67	10	20	47	33	57	2*	50	17	i57	24				1.2		74	P+. Yeso.
68	11	0	55	40	65	25								1.4		76	P+. S uncertain, possibly earlier. Japan. Small preceding movement.
69	11	9												.1			
70	11	11													37		
71	11	15													57		
72	11	18												.0			
73	14	9												1.4			Disturbed.
74	17	20			12	47								.6			Indian Ocean.
75	20	18										8.2			21		
76	20	19			9.6							10.3		.4			Central America.
77	21	0										12.8	15.5	.9			$i_Z$ 16 <sup>m</sup> 6 <sup>s</sup> ; $e_N$ 16 <sup>m</sup> 25 <sup>s</sup> . Pacific Ocean.
78	21	2					i15	28			21.0			.5			Indian Ocean.
79	22	5													.1		
80	22	7												.4			Faint.
81	22	12					36	53			42.7			1.2			SS 53 <sup>m</sup> .8; SSS 59 <sup>m</sup> . Pacific Ocean.
82	22	23												.5			
83	24	16													53		
84	24	22												.7			
85	25	7													5		
86	25	8	46	58	51	14									53		North Atlantic Ocean. P and S small, the readings not certain.
87	25	9	4	3*	8	23	4	51			8	31		10		25	North Atlantic Ocean. 2. swing: P (+ 2.8,—7.3,—6.4).
88	25	11	38	17	42.7										44		North Atlantic Ocean.
89	25	20												.6			

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No.	Date	Hour	Forerunners				L	Un-defined	△	Remarks
			P	S						
			m s	m s	h m s	m s	h m	h m	°	
90	1936 March 25	23					64			Small forerunners.
91	26	3					17			
92	26	9					53			
93	27	2			29.9		1.1			Small preceding movement.
94	29	21			33 37		35			Greece.
95	29	23					.0			
96	31	3			55 45	57 40	1.3			SS 62 <sup>m</sup> .8. No G. records; readings from M-S. E.

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NOTES

- No. 4. Jan. 2. 22<sup>h</sup>. Sumatra;  $\Delta = \text{ca. } 85^\circ$ .  $iP_z$  condensation, followed by rather large oscillations.  $e_{E,Z}$  54<sup>m</sup>.8.  $iS$  57<sup>m</sup>56<sup>s</sup>, large oscillations on  $N$  and  $E$ .  $SS$  63<sup>m</sup>.8.  $SSS$  68<sup>m</sup>.0.
- No. 8. Jan. 14. 14<sup>h</sup>. Argentina;  $\Delta = \text{ca. } 105^\circ$ . Deep focus. Masked by strong microseisms.  $i_{N,E}$  35<sup>m</sup>11<sup>s</sup>.  $i_{N,E}$  35<sup>m</sup>58<sup>s</sup>.  $i_E e_{N,Z}$  38<sup>m</sup>10<sup>s</sup>.  $e$  42<sup>m</sup>.1; 44<sup>m</sup>.0; 47<sup>m</sup>.7.  $L$  small.
- No. 18. Jan. 20. 17<sup>h</sup>. Southeast of the Philippines;  $\Delta = \text{ca. } 100^\circ$ .  $P$  small, the reading not certain owing to microseisms.  $PP$  13<sup>m</sup>.9.  $iSKS_E$  20<sup>m</sup>23<sup>s</sup>.  $iSKKS$  20<sup>m</sup>50<sup>s</sup>, large on  $N$  and  $E$ .  $eS_N$  21<sup>m</sup>.6.  $iPS$  23<sup>m</sup>5<sup>s</sup> followed by  $PPS$ , not clearly separated from it.  $i$  24<sup>m</sup>36<sup>s</sup>.  $e_E$  26<sup>m</sup>.9.  $SS$  28<sup>m</sup>.
- No. 36. Febr. 15. 13<sup>h</sup>. Banda Sea;  $\Delta = \text{ca. } 110^\circ$ .  $P$  1<sup>m</sup>.5 small.  $P'_z$  5<sup>m</sup>28<sup>s</sup>.  $PP$  6<sup>m</sup>8<sup>s</sup> large.  $PPP$  8<sup>m</sup>.5.  $SKS$  12<sup>m</sup>11<sup>s</sup> large.  $SKKS$  13<sup>m</sup>.0.  $PS$  15<sup>m</sup>31<sup>s</sup> very large, followed by large oscillations.  $SS$  21<sup>m</sup>.2.  $SSS$  26<sup>m</sup>.0.
- No. 43. Febr. 22. 15<sup>h</sup>. Pacific south of New Zealand;  $\Delta = \text{ca. } 165^\circ$ .  $P'_1$  52<sup>m</sup>0<sup>s</sup>;  $P'_2$  52<sup>m</sup>50<sup>s</sup>.  $PP$  56<sup>m</sup>31<sup>s</sup>;  $PPP$  60<sup>m</sup>.5. ( $SKKS$ ) 62<sup>m</sup>46<sup>s</sup>;  $e_E$  63<sup>m</sup>36<sup>s</sup>; 64<sup>m</sup>.2; 65<sup>m</sup>.2.  $SKSP$  66<sup>m</sup>.4.  $PPS$  70<sup>m</sup>30<sup>s</sup>.  $SS$  76<sup>m</sup>.8.  $SSS$  83<sup>m</sup>.6.
- No. 44. Febr. 22. 19<sup>h</sup>. Aftershock to no. 43. Galitzin  $Z$  disturbed.  $e_E$   $P'_2$  43<sup>m</sup>.9.  $PP$  47<sup>m</sup>.5;  $PPP$  51<sup>m</sup>.2. ( $SKKS$ ) 53<sup>m</sup>.8.  $e$  54<sup>m</sup>.8. ( $PPS$ ) 60<sup>m</sup>.7.  $SS$  67<sup>m</sup>.7;  $SSS$  74<sup>m</sup>.0.
- No. 48. Febr. 27. 10<sup>h</sup>. Banda Sea;  $\Delta = \text{ca. } 110^\circ$ . No Galitzin records.  $PP_z$  23<sup>m</sup>15<sup>s</sup>. Following readings from  $M-S E$ :  $SKS$  28<sup>m</sup>48<sup>s</sup>;  $SKKS$  29<sup>m</sup>47<sup>s</sup>;  $S$  30<sup>m</sup>.4;  $PS$  32<sup>m</sup>.1;  $SS$  38<sup>m</sup>.2.

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).  
 $P(\pm a, \pm b, \pm c)$  —  $a$ ,  $b$  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.  
 $\Delta$  — 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.