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	v	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 $T = 12^s$ $v = 20$ $V = 300$.

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

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

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Un-defined	△	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
							45			[uncertain, masked by microseisms.
2	4	23								
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					
39	17	9	*i* 27 1				.9			Read on Benioff *Z*.
40	18	0					.0			Pacific Ocean. Faint.
41	20	6					.8			
42*	21*	7	*i* 14 12	23 49	19 4	*i* 24 35	.6			
43	21	7	*i* 38 6		*i* 38 12				75	Pacific Ocean.
44	21	8	*i* 1 17							» »
45	21	11	*i* 3 42				.5			» »
46	21	15	*i* 17 20				.7			» » . *P*+.
47	21	18					.1			

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Un-defined	△	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			9m.3 ; 15m.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				

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_eS_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.

BIANCO LUNOS BOGTRYKKERI A/S
KØBENHAVN

No. 42. 1937.

Geodætisk Institut

Proviantgaarden, Copenhagen, Denmark.

Bulletin

of the seismological station

KØBENHAVN

φ = 55°41′ N. λ = 12°27′ E. h = 13 m.

Lithologic foundation: chalk.

No. 42. April—June 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	$^1/_4$—$^7/_5$	—0.1	11.6	106
				$^7/_5$—$^{30}/_6$	—0.02	12.5	103
E	12.5	100	12.65	$^1/_4$—$^{17}/_4$	0.03	11.1	105
				$^{17}/_4$—$^{30}/_6$	0.1	12.7	103
Z	14.5	100	11.55	$^1/_4$—$^{10}/_6$	0.1	9	94
				$^{15}/_6$—$^{30}/_6$	0.1	11	95

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

Component	T	ν		ϱ	V
	sec			mm	
N	9.4	4.1	$^1/_4$—$^8/_5$	0.7	220
			$^8/_5$—$^{30}/_6$	0.3	220
E	9.5	4.1	$^1/_4$—$^8/_5$	0.8	190
			$^8/_5$—$^{30}/_6$	0.3	190
Z	5.4	4.4	$^1/_4$—$^8/_5$	0.3	165
			$^8/_5$—$^{30}/_6$	0.1	165

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

Wood Anderson seismograph, *E* component, $T = 2^s.7$. Dismounted $^{22}/_5$.

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

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Undefined	△	Remarks
	1937 April		m s	m s	h m s	m s	h m	h m	°	
1	1	18					.6			
2	2	5			*i* 48 52		1.1			
3	3	1					.4			Faint.
4	3	4			22.3	33.7	49			
5	3	12					3			
6	3	21			33 52		55			
7	4	15					46			
8*	5*	7	10 50		15 26	21 38				New Guinea.
9	6	0					.6			
10	7	18	37 54	43 21					34	Iran.
11	8	14			34 42					On Benioff *Z* only.
12	8	22					.5			Faint.
13	9	14					48			
14	11	5			58		1.4			
15	11	16					.7			
16	12	15					.7			
17	13	5					.9			
18	14	21					.8			
19*	16*	3			*i* 20 27	*i* 20 41				Pacific Ocean.
20	21	21	57 8	60 50	60 58		63		21	Greenland Sea.
21	22	16					.3			
22	23	13					.1			Faint.
23	24	5					.7			»
24	26	10			*i* 54 43					On Benioff *Z* only.
25	28	2	41 49	45 57	42 8	46 5*	49		23	Asia Minor.
26	28	14					.9			
27	29	1					.5			
28	29	18	17 6	21 33			24		25	*P*+. Atlantic Ocean.
29	29	19	*i* 3 47	12 57	13.6	17.2	21		70	*P*+. Alaska.
30	29	20	29 23	37 50	30 46	31 25			69	*e* 38m38s. *P*+. Japan. Focal depth [370 km.
31	30	19			50.3		62			
32	30	20					32			
	May									
33	2	0								
34	2	23					.1			
35	4	5					.3			
36	5	22					.6			Small preceding movement.
37	5	23					.1			
38	6	18					.5			
39	7	14	22 5				.7			
40	7	18					.7			The reading of *P* not quite certain. No
41	7	22			42 47		.8			[Galitzin records. South of Alaska.
42	9	14	58 16	67 48	*i* 58 18	68 39	.8			
43	10	15			44 12	46.6	81		74	*e* 76m.1. South of Kurile Islands.
44	11	16								*e* 47m.7.
45	11	17							26	
46	12	3			4 34	14.1	.2			
							.7			*SS* 20m.5. New Guinea.

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Undefined	△	Remarks
	1937 May		m s	m s	h m s	m s	h m	h m	°	
47	12	13	21.2		31 52		1.0			Sumatra.
48	13	10					.1			
49	13	17					.6			
50	13	19			11 50					
51	13	21						22		
52	14	10			*i* 57 21	*i* 57 24				
53	16	7					.1			
54	16	11			59 8	70.2	2.0			
55	20	12					58			
56	21	2					40			Small preceding movement.
57	21	13	25 27		35 32	35 53	1.0			Disturbed. *P* possibly earlier than [read; 25m21s? Colombia.
58	23	8	23 21	32 18			.7		68	Atlantic Ocean.
59	23	11		5 36			7			Asia Minor.
60	24	1					.5			Small preceding movement.
61	25	3					41			
62	27	4		57 34			1.3			Pacific Ocean.
63	28	14					21			
64	28	15	*i* 48 14		48 55	58 20				*P*+. *e* 58m33s; 59m33s; 59m58s. [Mexico. Depth ca. 160 km.
65	28	20	8 8	17 43	11 49	19 18				*e* 24m.3. Pacific Ocean. Deep focus.
66	29	15	27 47	31 51	28 3*	32 18	35		23	Asia Minor. Depth about 75 km.
67	30	12					.1			
68	31	6					.1			
69	31	15			51.8	68.7	1.5			
	June									
70	1	15					.5			
71	2	1	27 35	31 57			34		25	Atlantic Ocean.
72	2	21					.9			
73	5	10					36			
74	6	0					1.2			Small preceding movement.
75	6	18					.7			
76	7	4			6.0		.6			
77	7	13					.9			
78	7	16					.9			
79	7	22						6		The Alps.
80	8	3			59	68.5	1.6			
81	8	18	11 48	20 55	21 39				70	*S* small, uncertain. Kurile Islands.
82*	8*	22	41 59	52 22	42 46	53 41	65			Mexico.
83	10	1					.2			Faint.
84	10	1					49			Small.
85	10	15			22 27		29			
86	10	17					32			
87	12	18					.9			
88	13	23	36 54	47.6	47.4	53.4	1.1			*P* uncertain, no *Z* records.
89	14	12			50					[*PP* 40m18s. Mexico.
90	14	13					1.2			Phases in forerunners not clearly [marked. No Galitzin *Z* record.

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Undefined	△	Remarks
	1937 June		*m s*	*m s*	*h m s*	*m s*	*h m*	*h m*	°	
91	15	23					.3			
92*	19*	17			25 59	29 29	.9			Pacific Ocean.
93	20	19					.3			
94*	21*	15	*i* 26 39	*i* 38 6	37 12	39 27	55			Peru.
95	21	19					.8			
96	21	22					.9			
97	22	5						.9		
98	23	21					.4			
99	24	4					16			
100	24	13	24 24		34.1		.8			Off Costa Rica.
101	24	13	26 17		36.8	37.0				Off Costa Rica.
102	24	15					57			Faint.
103	24	20	7 20	13 16	8 46		17		38	Atlantic Ocean.
104	26	19					35			
105	28	20					.7			
106	30	14					.8			

København.

NOTES

No. 8. April 5. 7^h. New Guinea; △ = ca. 110°. Phases unusually clearly marked. P_Z 10^m50^s, small. P'_Z about $14^m.4$, small. *PP* 15^m26^s; *PPP* 17^m45^s. (*PKS*) $18^m.5$. *SKS* 21^m38^s, large on *E*. e_N (*SKKS*) $22^m.9$. *PS* 24^m40^s, large on *E*; *PPS* 25^m40^s. e_E (*PKKS*) $28^m.7$. e_N $29^m.2$. *SS* 30^m35^s. e_Z $34^m.3$. e_N $34^m.9$.

No. 19. April 16. 3^h. Pacific Ocean. Deep focus. *i* 20^m27^s quite small; *i* 20^m30^s; 32^s. *iP'* 20^m41^s followed by exceptionally large movement on *Z*; focal distance? *PP* 23^m59^s large on *N*. e_E 26^m57^s. $e_{N,E}$ $27^m.4$. *e* 29^m19^s and 30^m19^s large and clearly marked on *N*. $e_{N,Z}$ 33^m40^s; e_N 34^m14^s, large. $e_{N,Z}$ 35^m24^s. e_E $37^m.6$ and e_N 38^m5^s large. $42^m.2$, 43^m42^s and $44^m.6$ large, distinct phases on *E*. Corresponding movement on *N* large, but phases not clearly marked.

No. 82. June 8. 22^h. Mexico. △ = 88°; *h* = 190 km. *P*, condensation, 41^m59^s. *pP* 42^m46^s. *PP* 45^m19^s. *pPP* 45^m59^s. *SKS* 52^m4^s (in time-mark); *S* 52^m22^s. *SP* (or *pS*) 53^m15^s; *PS* (or *sS*) 53^m41^s. *e* 54^m29^s. *SS* $58^m.9$.

No. 92. June 19. 17^h. Pacific Ocean. *PKP* 25^m59^s, on Galitzin *Z* only. *i* 26^m3^s; 9^s; 17^s; 22^s distinct pulses on the Benioff *Z* record. *i* 29^m29^s; 30^m31^s; 33^m51^s clearly marked on Galitzin *Z*. No clearly marked phases on *N*; no time-marks on Galitzin *E*. *L* small.

No. 94. June 21. 15^h. Peru; △ = ca. 100°. Phases exceptionally clearly marked. *iP* 26^m39^s (*x*, + 1.8, + 3.8; *x*, — 1.8, — 4.6). *e* 26^m50^s. PP_Z 20^m22^s; 33^s. e_E $30^m.7$. e_N 34^m37^s. *SKS* 37^m12^s, large on *E*. i_NS 38^m6^s, large on *N*. *PS* 39^m27^s, large on *Z* and very large on *E*. SS_N $44^m.6$; e_E 44^m57^s. SSS_E $50^m.2$. L_Q 55^m; L_R 61^m.

BIANCO LUNOS BOGTRYKKERI A/S
KØBENHAVN

No. 43. 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. 43. July—Sept. 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	0.0	12.7	103
E	12.5	100	12.65	0.1	12.9	103
Z	14.5	100	11.55	0.1	10	95

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

Component	T	ν	ϱ	V
	sec		mm	
N	9.6	4.6	0.3	220
E	9.6	4.5	0.4	195
Z	5.6	4	0.1	155

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

N component, $T =$ ca. 17^s.

Benioff vertical seismograph, $T_1 = 1/4^s$ $T = 1^s$.

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Un-defined	△	Remarks
	1937		m s	m s	h m s	m s	h m	h m	°	
	July						.7			
1	1	6								Preceding movement disturbed.
2	1	9					69			
3	1	12	2 15	*i*12 36	2 43	13 24	.5		83	*P*+. West of Sumatra.
4*	2*	2			56 29	59 1*	99			Coral Sea.
5	2	22					.1			
6	3	4					.8			
7	3	16					.0			
8	3	17					11			
9*	4*	6			14 50	18 8	48			Coral Sea.
10	4	7			0 43		33			» » Superposed on preceding [shock.
11	4	7			47 46	49 15	83			Coral Sea. Superposed on preceding [shock.
12	5	0					21			
13	5	2					.3			
14	5	23			*i*57 57					Read on Benioff *Z*.
15	6	7					2			
16	8	13			15.3		.6			No Galitzin records.
17	9	17			45 3	46 4				e_E 51^m20^s, 52^m12^s, $53^m.5$.
18	10	21			1 16	7.7	33			*PS* $10^m.1$. *SS* $16^m.0$. Celebes.
19	11	13	51 51	62 4			1.4		82	East of Japan.
20	11	17			43 15		1.1			Disturbed.
21	12	0			25 1*		.6			
22	12	12					24			
23	14	22	40 34	50 45	50 55		60		81	*P*+. East of Japan.
24	15	19	*i*14 19	23 10					67	*P*+. Sea of Okhotsk. Deep focus.
25	16	10		41 0*			1.0			East of Japan. Small preceding [movement.
26	17	17					18			
27	17	19			3.3		.3			
28	18	1			21.8		.6			
29	19	3			13 53	23.5	.9			
30	19	9					1.7			Preceding movement disturbed.
31*	19*	19	48 11	*i*58 54	48 54	*i*58 26				Ecuador. Deep focus.
32	20	7	4 30	7 0*			8		13	Yugoslavia.
33	21	0					.6			Faint.
34	21	16					.7			
35	22	13			32.9		.7			
36*	22*	17	*i*19 31	27 30	21 42	31 33				
37	23	0					.4		58	Alaska.
38	23	7		29 40			.8			
39	23	20	54 1*	58 34						Alaska.
40	25	13	23 33				62		26	Afghanistan.
							.7			Alaska.
41*	26*	3	59 41	*i*70 8	60 3	*i*69 55			85	Mexico. Deep focus.
42	26	8								Disturbed.
43	26	18			5 19	6 5				*e*$_N$ $9^m.7$.
44*	26*	20	8 22	18 7	11 20	18 35	.5		77	Japan.
45	30	14			17 9		1.3			Disturbed.
46	31	11					.5			

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Un-defined	△	Remarks
	1937		m s	m s	h m s	m s	h m	h m	°	
	July									
47*	31*	20	*i*46 48	55 49	49 25	58.8	68		69	China.
	Aug.									
48*	1*	10	52 4	61 5	54 41	62 5	73		69	China.
49	2	10	27 47	31.2			33		19	Italy.
50	2	15	57 2	66 13	57 25		80		70	Kurile Islands.
51	3	18					13			
52	3	22					.7			
53	3	23					.8			
54	4	14					.6			
55	4	23	47 31	57 33	47 49	57 54	1.3		80	*P*+. e_E 58^m48^s, North of Sumatra.
56*	5*	15			2.6	4 1	.6			
57	7	21					.6			
58	7	23					.5			
59	8	5	*i* 7 36		23		25			Tien-Shan.
60	8	11					.0			
61	8	16					.2			
62	9	13					.4			
63	9	15					.4			Some preceding movement.
64	9	20					.1			Faint.
65	10	16					.8			
66*	11*	1	*i* 8 54		11 7	13 19				Off Java. Deep focus.
67	12	1					.3			
68	13	1					.2			Faint.
69	13	12			8		1.1			
70	15	4	39 45	50 4			69		83	*P*+. Luzon.
71	15	11	*i*46 55				1.1			Burma.
72	17	13	*i*22 22	32 39			53		83	*P*+. Pacific Ocean.
73	18	5					.9			Small preceding movement.
74	18	9					.2			
75	18	15		25.7			35			Atlantic Ocean.
76*	20*	6	51 26		54.7	62 1*				Indian Ocean.
77	20	12	12 12	22 41	15.8		35		85	*P*+. Luzon. L_R 44^m, very large.
78	21	23	14 29	24 50			45		83	*P*—. East of Japan.
79	22	2			37.2		1.1			
80	22	11	42 1				1.0			Atlantic Ocean.
81	23	3					.5			
82	23	17			.0		.9			
83	24	18			47 24	50 23	99			51^m7^s. Tonga Islands region.
84	24	23			14 21		23			
85	25	22					.7			
86	26	16					.5			Faint.
87	26	19	*i* 6 12	16.4			33		82	Japan.
88	26	23			54 53		60			
89	27	14					.9			
90	29	7					.9			Faint.
91	29	18					.6			
92	31	2			50 34	51 37	1.6			*e* 48^m11^s, small, not quite certain.
93	31	14	25 56	34 43	35 57	39.0	48		77	*P*—. e_N $42^m.0$. Burma.

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Undefined	△	Remarks
	1937		m s	m s	h m s	m s	h m	h m	°	
	Sept.									Northeast of New Zealand.
94*	1*	8			*i* 58 36	62 37				
95	1	18					.5			Northeast of New Zealand.
96*	1*	22			1 5		.9		75	Aleutian Islands.
97*	3*	18	*i* 59 31	*i* 68 47			79			
98	3	23					.2			
99	4	6			33.9	36 41	1.2			e_N 37m36s.
100	5	21					.8			Faint.
101*	8*	0			59.6	65 13	1.4			South Atlantic.
102	9	17			*i* 40 31					Read on Benioff *Z*.
103	10	0					.2			Faint.
104	14	2					.5			»
105	15	0					.8			
106*	15*	12			46 35	48 42	82			Solomon Islands region.
107	16	0	1 33		4.9	11 55	25			*SS* 17m.7. *SSS* 21m.9. Off Guatemala.
108	16	16			*i* 30 58	33 40				On Benioff *Z* only.
109	17	9			60.3		1.4			Forerunners disturbed.
110	17	12						26		Faint.
111	19	16					33			
112	20	7			20 17	27 22	45			
113	20	15					.8			
114	21	8			7.9		.4			
115	21	9			58.2	64 18	1.5			*e* 66m44s.
116	21	21					.6			
117	22	3			35.2		.9			
118*	23*	13			24 53	26 21	58			Solomon Islands.
119	25	4	35 22	40.2			41		28	Atlantic Ocean.
120*	27*	9	9 5	20 41	19 41	20 7				Java.
121	27	12					.1			
122	27	20					44			
123	28	6	33.6		44.2	45.4	1.0			Guatemala.
124	28	13			35.5	41 34	69			
125	28	18			42.9		63			Guatemala.
126	29	12					8			
127	30	21			53 42	54 20	1.0			

København.

NOTES

No. 4. July 2. 2h. Coral Sea; △ = ca. 130°. *P′* 56m29s clearly marked on *Z*. *PP* 59m1s. *PKS* 60m0s, large and clearly marked on *N* and *E*. Later phases small, not clearly marked. *e* 72m.1. *SS* 76m.5. *L* 99m.

No. 9. July 4. 6h. Coral Sea; △ = ca. 130°. P'_Z 14m50s. *PP* 17m.0, e_E 17m15s. e_Z 17m54s. *PKS* 18m8s. e_E 20m11s. e_{NE} 21m15s. e_N 22m38s. *SS* 34m.3.

No. 31. July 19. 19h. Ecuador; △ = 92°. Depth about 170 km. iP_Z 48m11s, condensation. $pP_{E,Z}$ 48m54s, large. $e_{E,Z}$ 51m17s. *PP* 51m49s. *pPP* 52m27s. *iSKS* 58m26s and *iS* 58m54s large. *pS* 59m40s; $e_N(SP)$ 60m10s. sPS_Z 61m9s. *L* small.

No. 36. July 22. 17h. Alaska. *iP* 19m31s (+ 2.9, x, — 3.4; — 2.9, x, + 4.8). (P_cP) 19m58s. PP_Z 21m42s; 58s. *PPP* 23m8s. *S* preceded by movement of long period, e_E 26m.8, e_N 27m.0, eS_N 27m30s, eS_E 27m40s, e_E 27m47s. *S* followed by large oscillations. SS_N 31m33s, increasing oscillations. e_E 34m.0, *SSS* or L_Q? L_R 37m.

No. 41. July 26. 3h. Mexico. Depth about 80 km. *iP* 59m42s (+ 0.8, — 2.0, — 5.3; — 1.1, + 2.9, + 8.7), preceded by a small pulse on *Z*, 59m41s. *pP* 60m3s. *PP* 62m52s; (*pPP*) 63m19s; (*sPP*) 63m40s. e_N 64m26s, e_E 65m21s; 67m.3. e_E 69m12s. e_N 69m45s. *iSKS* 69m55s. *iS* 70m8s, very large. SP_Z 70m55s; $PS_{N,E}$ 71m4s. $e_{N,Z}$ 71m46s. e_N 73m.6; 74m.7. *SS* 75m24s, very large on *E*. *L* not large, the beginning uncertain.

No. 44. July 26. 20h. Japan. iP_Z 8m22s, condensation, small. $i_{N,E,Z}$ 8m29s, large. e_Z 8m49s. *PP* 11m20s, 37s. *PPP* 13m.1. *e* 14m.5. $i_N e_E S$ 18m7s. i_{NE} 18m35s, large, e_Z 19m.0. *SS* 22m.5. SSS_N 26m.4.

No. 47. July 31. 20h. China. Forerunners small. iP_Z 46m48s; *PP* 49m25s. *S* 55m49s e_E 58m.8. e_N 63m.5. *eL* 68m, of long period. iL_N 73m0s, iL_E 73m10s, very large.

No. 48. Aug. 1. 10h. China. Forerunners small. iP_Z 52m4s; *PP* 54m41s. *e* 60m55s; *S* 61m5s. e_E 62m5s. e_N 68m.8. *eL* 73m. iL_N 78m16s; iL_E 78m20s, large.

No. 56. Aug. 5. 15h. △ = ca. 120°. Focus probably deeper than normal. *P′* 2m.6. e_Z 3m27s. *PP* 4m1s. *e* 4m42s. *PS* 13m53s; $e_{N,E}$ 14m30s. *SS* 21m.0.

No. 66. Aug. 11. 1h. Off Java; △ = ca. 105°. Depth about 600 km. *iP* 8m55s, condensation. *pP* 11m7s. i_Z 12m22s. $e_{E,Z}$ 13m5s. *PP* 13m19s, 25s. *pPP* 15m16s; *PPP* 16m14s. $e_{E,Z}$ 17m23s. *SKS* 18m29s, large on *E*. $e_{N,E}$ 19m17s. S_N 19m48s. e_E 20m.1. *iSP* 21m27s and *SPP* 22m28s, large. *sS* 23m.8. *isSP* 25m28s, large on *E*. *SS* 27m26s; *SSS* 30m.5. e_N 38m.0.

No. 76. Aug. 20. 6h. Indian Ocean; △ = ca. 95°. *P* 51m26s, condensation. e_Z 54m.7. *SKS* 62m1s; *S* 62m37s. *PS* 63m59s (in time-break). *SS* 69m.0. *L* small, the beginning uncertain.

No. 94. Sept. 1. 8h. Northeast of New Zealand; △ = ca. 155°. *PKP*, condensation; on Benioff *Z* three distinct pulses 58m36s, 46s, 58s. Galitzin records disturbed.

No. 96. Sept. 1. 22h. Probably a repetition of no. 94. *PKP*, read on Benioff *Z*, 1m5s, 15s, 27s.

No. 97. Sept. 3. 18h. Aleutian Islands. Depth about 160 km. iP_Z 59m31s, dilatation, small. *i* 59m33s, larger. $i_{N,E,Z}$ 59m48s, large. *i*(*GZ*) 60m2s; *i*(*BZ*) 60m12s; *i*(*GZ*) 60m28s. e_N 62m.3, 62m.9. $e_{N,Z}$ 64m.4; $e_{N,E,Z}$ 64m52s, e_Z 65m42s; e_N 65m52s. iS_{NE} 68m47s. e_E 69m2s, e_N 69m24s, $e_{E,Z}$ 69m42s, very large. L_E 79m, L_N 83m, not large.

No. 101. Sept. 8. 0h. South Atlantic; △ = ca. 115°. Focus deeper than normal. Masked by rather strong, irregular microseismic movement. e_Z 59m.6; e_Z 60m46s. $e_{N,E}$ 62m.1. $e_{N,E}$ 65m13s; e_N 65m59s; e_{NE} 66m32s. $PS_{N,E,Z}$ 69m9s, large. e_E 74m.0; *SS* 75m.1. *SSS* 79m.9. *L* not large.

No. 106. Sept. 15. 12h. Solomon Islands region; △ = ca. 130°. P'_Z 46m35s. $e_{N,Z}$ 48m29s; *PP* 48m42s; $e_{E,Z}$ 48m58s. $PKS_{N,E}$ 49m57s. e_E 54m.7. *PS* 58m.7. *SS* 66m.

No. 118. Sept. 23. 13h. Solomon Islands; △ = ca. 125°. P'_Z 24m53s, 25m6s. *PP* 26m21s, 30s, large. PPP_N 29m31s. $e_{E,Z}$ 31m.0; *SKS* 32m.1; *SKKS* 33m26s. $e_{E,Z}$ 36m.0. *PS* 36m.5; *PPS* 37m.6, 37m53s. e_Z 41m.0. *SS* 42m.6, 43m.3. *SSS* 46m.4, 47m.4.

No. 120. Sept. 27. 9h. Java; △ = ca. 105°. Deeper than normal. P_Z 9m5s, small. e_Z 9m19s, 33s, 56s. *PP* 13m13s. *e* 13m38s, 52s. $iSKS_E$ 19m41s, large. $SKKS_E$ 20m7s: S_N 20m41s. *PS* 22m2; *e* 23m.9. *SS* 27m.4. *L* not large.

BIANCO LUNOS BOGTRYKKERI A/S
KØBENHAVN

No. 44. 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. 44. Oct.—Dec. 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	$^1/_{10}$—$^{20}/_{10}$	—0.1	13.0	103
				$^{20}/_{12}$—$^{31}/_{12}$	—0.04	12.6	104
E	12.5	100	12.65		0.1	12.8	103
Z	14.5	100	11.55	$^1/_{10}$—$^{20}/_{12}$	0.3	7	93
				$^{20}/_{12}$—$^{31}/_{12}$	0.0	$9^1/_2$	96

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

Component	T	ν	ϱ	V
	sec		mm	
N	9.5	4.4	0.3	220
E	9.5	4.1	0.5	190
Z	5.5	3.9	0.2	160

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

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

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Undefined	△	Remarks
	1937 Oct.		m s	m s	h m s	m s	h m	h m	°	
					36 13	36 35	1.6			Kermadec Islands region.
1	1	19					.1			Faint.
2	4	9								On Benioff *Z* only. Seismic?
3	4	14			27 34					Small preceding movement.
4	5	6					1.0			
5	6	9	*i*59 56	*i*70 34	60 19	71 0	1.4			*P*—. Deep focus. Mexico.
6*	6*	17			25 15	32 19	1.0			Solomon Islands.
7	6	22			7.4		.3			
8	7	8			10 51					Disturbed.
9	9	19					.3			
10	9	21			3 29	3 44				Felt in Sweden.
11	10	5					.1			
12	11	22					.5			
13	12	13			*i*16 13					On Benioff *Z* only. Seismic?
14	12	16					.7			
15*	12*	21			5.5	9 36				Chile.
16	13	8			54 58					On Benioff *Z* only. Seismic?
17	13	19			*i*17 3					» » » » .
18	13	19			*i*26 12					» » » » .
19	13	19					.8			
20	17	4	59 7	69 3	74.0		1.4		79	Japan.
21	17	10	*i* 2 44							Italy.
22	20	1		40.3	44.1					India.
	20*									
23	22	1			*i*10 42	13 25				
24	22	16	27 0	37 39			1.1		87	West of Sumatra.
25	23	17					1.3			Some preceding movement.
26	24	11	46 32	55 5	56 18	62.4	69		64	Alaska.
27	25	11					.9			
28	25	23					.9			
29*	29*	7	34 15	40 16	35 48	43.7			42	
30	30	20					.9			Faint.
	Nov.									
31	2	11					.9			Small preceding movement.
32	5	10					.5			
33	7	10					.0			Faint.
34	7	19	16 2		16 12		32			India.
35	8	10			42 54					
36	9	1					.7			
37	9	7					.1			
38	9	10					33			
39	10	7					.8			
40	10	20					9			
41	11	0		18 2*			.5			
42	13	10			10 30	10 42	1.3			Baluchistan.
43	13	12					.3			
44	13	19					.3			
45	14	5					15			

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Undefined	△	Remarks
	1937 Nov.		m s	m s	h m s	m s	h m	h m	°	
46*	14*	11	5 53	*i*12 7	7 41	14 58			43	Afghanistan.
47	15	0					.6			
48	15	21	46 3*	53 10	48 4	56.7	59		51	Kashmir. Deeper than normal.
49	16	23					4			
50	17	14			58 26					On Benioff *Z* only.
51	18	4					.0			
52	18	5					.1			Faint.
53	21	20		41 2			44			Azores.
54	22	18					.3			Faint.
55	23	14			12 21		1.0			
56	24	3					.0			
57	24	12			23 24	23 29				Seismic?
58	25	5					1.1			Faint preceding movement.
59	25	9					.3			Faint.
60	26	10	57 22	67.5			1.4		81	East of Formosa.
61	27	14					.6			
62	27	20	14 6				20			The reading of *P* not quite [certain. Greenland Sea.
63	28	5	36 53		47 33	48 18				*P*—. West of Sumatra.
64*	30*	0	*i*52 31	62 28	55 41	67.7	1.3		79	West of Sumatra.
65	30	13	7 21	14 54	17.1		21		54	Abessinia.
	Dec.									
66	1	13						.5		Faint.
67	2	11			19 17					Seismic?
68	2	18					.1			Faint.
69	5	16					.7			Small preceding movement.
70	6	4		56 22			76			East of Japan.
71	6	22					.4			
72	7	9					46			
73	7	18					.8			
74	8	2			47 47		1.0			
75	8	8	44 25	54 33	47 30	60.3	71		81	e_N 54^{m}48^s. Formosa.
76	8	17					.8			
77	8	21			1.3		19			
78	9	0					.3			
79	9	3					.9			
80	10	13			51 3		70			
81	10	18					9			Italy.
82	11	6					.6			
83	12	9					.5			Masked by microseisms.
84	13	11			4 30					Seismic?
85	13	19	6 16	16 24	9 28	17 20	1.5		81	Formosa.
86	13	23	7 42	14 58			20		51	Atlantic Ocean.
87	14	17					.4			
88	15	21					33			
89	16	8			36 43					Seismic?
90	16	17	*i*40 15	44 4	40 34	44 19	47			e_Z 44^{m}31^s. Ionian Sea. Deep [focus.

København.

No.	Date	Hour	Forerunners P	Forerunners S			L	Un-defined	△	Remarks
					h m s	m s	h m	h m	°	
	1937 Dec.		m s	m s			.2			
91	16	19					.5			Faint.
92	17	5					70		81	$P+$. Formosa.
93	17	9	44 30	54 39	54 52	60.3	.7			
94	17	19							41	Turkestan.
95*	18*	13	25 31	31 41	27 2*		.5			
96	18	21					.7			
97	20	4					.5			
98	20	5								Seismic?
99	21	13			0 14					Off Mexico.
100*	22*	3			61 3*	62 22				
101	22	8					.4			Mexico.
102*	23*	13	30 47		34 11		55			»
103	23	23			44 57	50 54	1.1			Peru.
104	24	6		45 48	45 5	*i*45 53	1.1			
105	25	1			38		1.2			
106	25	10	4 54	12 30			20		54	Siberia. Masked by microseisms;
107	25	22					.5			[the readings uncertain.
108	27	0					.4			
109	27	16					.0			Faint.
110	28	4					.2			
111	28	6	30 3*	38 48	39 10	40 14	46		66	P—. e_E 42^m2^s. Atlantic Ocean.
112	30	2					17			
113	30	11					.8			Faint.
114	30	12					.4			
115*	31*	17	54 16		57 41	64 44	83			Mexico.

København.

NOTES

No. 6. Oct. 6. 17^h. Solomon Islands; △ = ca. 120°. *PP* 25^m15^s. *SKKS* 32^m19^s. *PS* $35^m.3$; *PPS* $36^m.3$. *SS* $42^m.0$.

No. 15. Oct. 12. 21^h. Chile; △ = ca. 110°. *e* $5^m.5$. *PP* 9^m36^s. *SKS* 15^m32^s. *SKKS* 16^m19^s. *PS* $18^m.4$. *L* small.

\- - Oct. 20. Small groups af waves, possibly not of seismic origin, recorded on Benioff *Z*: $8^h44^m49^s$; $9^h9^m35^s$; $9^h31^m12^s$; $9^h52^m15^s$; $10^h31^m0^s$; $10^h53^m1^s$; $12^h8^m59^s$; $13^h7^m15^s$; $13^h41^m45^s$; $14^h5^m40^s$; $14^h35^m9^s$; $15^h7^m53^s$.

No. 29. Oct. 29. 7^h. 38°.5 N 70°.0 E according to *RSSU*; △ = ca. 42°. *h* = ca. 220 km. *iP* 34^m15^s (*x*, — 1.4, + 1.8), very large on Benioff *Z*. *pP* 35^m3^s; *sP* 35^m24^s. *PP* 35^m57^s; *pPP* $36^m.6$; *sPP* 37^m2^s. iS_N 40^m23^s. (*sS*) 41^m46^s, well defined. *SS* $43^m.7$. *L* small.

No. 46. Nov. 14. 11^h. Afghanistan; △ = ca. 43°. *h* = ca. 220 km. Large earthquake. Galitzin records not readable. ePZ 5^m53^s; $iP_{E,Z}$ 5^m55^s (*x*, — 34.9, + 14.6). *pP* 6^m48^s; *sP* 7^m10^s. *PP* 7^m41^s; pPP_E 8^m22^s; *isPP* 8^m51^s. e_E 11^m33^s;. *iS* 12^m7^s large on *N*. *sS* 13^m26^s. *eSS* 14^m58^s; i_E 15^m22^s. $i(S_cS)_{N,E}$ 15^m37^s, very large; i_E 15^m42^s, an exceptionally large oscillation.

No. 64. Nov. 30. 0^h. West of Sumatra. *iP* 52^m31^s on Benioff *Z*; beginning quite small in other records. *e* 52^m40^s. *PP* 55^m41^s, *PPP* 57^m26^s. *S* 62^m28^s. $e_{N,E}$ 62^m42^s; e_E 63^m12^s, 25^s. *SS* $67^m.7$; *SSS* $71^m.2$. *L* not large.

No. 95. Dec. 18. 13^h. Turkestan. *iP* (*x*, — 1.3, + 1.4). $e_{E,Z}$ 25^m39^s, larger. *PP* 27^m2^s, large. S_N 31^m41^s, e_E 31^m47^s.

No. 100. Dec. 22. 3^h. Off Mexico; △ = ca. 90°. No *GZ* record. PP_E $54^m.3$. *SKS* 61^m3^s; *PS* 62^m22^s. *SS* $67^m.3$. *e*(*L*) 74^m.

No. 102. Dec. 23. 13^h. Mexico; △ = ca. 87°. Large earthquake. No *GZ* record. The beginning of *P* small, 30^m47^s or 48^s; *i* 52^s large. *PP* 34^m11^s large. $e(SKS)_N$ 41^m0^s; *e* 41^m27^s, 50^s very large. $PS_{E,Z}$ 42^m40^s. *SS* 47^m0^s. SSS_E $51^m.2$. L_Q 55^m.

No. 115. Dec. 31. 17^h. Mexico; △ = ca. 88°. The beginning of *P* quite small, the reading not certain. *PP* 57^m41^s. *SKS* 64^m44^s. (*SKKS*) 65^m5^s. PS_N 66^m15^s. *SS* $71^m.0$. *SSS* $74^m.7$.

BIANCO LUNOS BOGTRYKKERI A/S
KØBENHAVN