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No. 9.

1929.

Geodætisk Institut

Proviantgaarden, Copenhagen, Denmark.



Bulletin

of the seismological station

KØBENHAVN

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

No. 9. Jan.-March 1929.

Instruments:

Galitzin pendulums with galvanometric registration.

Constants:

| Component | l | T_1 | A_1 | | μ^2 | T | k |
|-------------|----------------------------|--------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------|------------------|
| N E Z | em 12.5 12.5 14.4 | sec 12.63 12.69 11.55 | 100 100 100 | ²¹ / ₂ — ²⁶ / ₃ ¹ / ₁ — ⁴ / ₃ | 0.16 0.12 0.2 | sec 12.6 11.8 9 | 106 103 90 |

Work was done on E and Z beyond the dates mentioned; records were nearly always obtained but the constants were undetermined.

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

| Component | T | ν | Q | V |
|-------------|-----|----------|-----|------------|
| om macom po | sec | pavaw on | mm | aunain, or |
| N | 9.0 | 3.9 | 0.8 | 221 |
| E | 9.1 | 3.7 | 0.5 | 199 |
| Z | 5.5 | 4 | 0.3 | 165 |

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

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Beginning with 1929 the bulletin of the seismological station København is worked out on new principles and published in a different form.

It is essential that the bulletin should contain the data which may contribute towards the determination of epicentres; therefore special care is given to the accurate measurement of the forerunners P and S in all cases where these phases can be identified, and special columns are reserved for them.

All recorded earthquakes are included in the bulletin, but the diagrams are not read in great detail. The beginning of a record is always read, unless it is impossible to fix the beginning owing to disturbance or microseismic movement. Forerunners are identified as such if possible; the movement is registered as "Undefined" when it cannot be decided whether it is due to a forerunner or to the main phase. Several forerunners may be included, but distinct and clearly marked phases only are read. The beginning of the main phase is read if it is not masked by movement due to the preceding phases; periods and amplitudes are not measured.

Well recorded earthquakes which may be of interest for further investigation receive special attention. Comments are made on the readings and additional readings are added under Notes.

Seismometric readings: Notation

P — normal first preliminary tremors, longitudinal waves.

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.

 $\overline{S_c}P_c\overline{S}$ — waves which traverse the mantle as transverse waves but are refracted through the core with longitudinal oscillation.

 $\overline{P_cP_cS}$ — 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.

 $\overline{S_cP_c}$ $\overline{P_cS}$ — 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.

 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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No. 9.

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1929.

| | Købennavn. | | | | | | | | | | |
|----------|------------|------|--------------|----------|----------|---------|------|----------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| No. | Date | Hour | | 1 . | erunners | | L | Un- defined | Dis- tance | Remarks | |
| 1 | | , | P | S | | | | | | 8 1 9 1 | |
| | 1929 | | m s | m s | h m s | m s | h m | h m | 0 | me to me the state of the state | |
| 1 | Jan. | 13 | | | .9 | | | | | nd97 | |
| 2 | 1 | 17 | | | .9 | | a ar | .3 | | De las a ser las | |
| 3 | 2 | 3 | | | | | .1 | .0 | | | |
| 4 | 6 | 0 | | | d. | | 9 | | | La la lue | |
| 5 | 8 | 7 | | | .7 | | | | | Le le les | |
| 6 | 8 | 9 | | | | 2.1 | .7 | SE SA | | 53. I 51 51 47 | |
| 7 | 11 | 2 | | | I Bank | | 25 | 4 | | 56 10 17 | |
| 8 9* | 11 13* | 14 | i 14 9 | i23 9 | i 17 17 | 28.3 | 37 | | 67 | Kurile Islands. | |
| 10 | 13 | 19 | 114 9 | 123 9 | 11 11 | 20.3 | | .2 | 07 | Kuthe Islands. | |
| 11 | 14 | 3 | | | | 801 | | .1 | | or lar lar | |
| 12 | 14 | 5 | | | | | | .6 | | 13 71 100 | |
| 13 | 14 | 10 | | | | | .2 | -6.8 | | er er da | |
| 14 | 14 | 18 | 100 | | | | .3 | FF SX | | 112 00 100 | |
| 15 16 | 14 16 | 19 | 100 | 20 01 | : 20 24 | | .8 | 1918. TH | 3.2 | 00 1 7 20 100 13S 1400 | |
| 17 | 16 | 14 | 18.8 | 29 21 | i 30 34 | | .8 | | | Philippine Islands. | |
| 18 | 17 | 0 | | | | | .0 | 14 | | the en the | |
| 19* | 17* | 11 | 57 18 | 66 49 | | | | | 72 | Venezuela. | |
| 20 | 17 | 22 | | | 56 | | | | | | |
| 21 | 18 | 21 | | | 45.3 | | | | | | |
| 22 | 19 | 3 | | | 40 | 10 .0 | 20 | | | | |
| 23 | 20 | 15 | | | 12.4 | 19 43 | 10 | | | Moluccas. | |
| 24 25 | 21 21 | 5 10 | 39 37 | 48.2 | .6 | 10 | 1.0 | | 63 | Alaska. | |
| 26 | 21 | 16 | 39 31 | 40.2 | | | .2 | | 03 | Alaska. | |
| 27 | 22 | 14 | | 58.7 | | | - | | | Abessinia. | |
| 28* | 23* | 11 | 19 22 | i 23 22 | | | 27 | | 23 | Greece. | |
| 29 | 24 | 7 | | | | 188 | | .4 | | Let e l'er | |
| 30* | 24* | 20 | 49 25 | | 59 53 | K | 76 | | | Central America. | |
| 31 | 25 | 3 | abusalah - | | 52.1 | | 1.2 | 4.44 | | | |
| 32 | 26 | 15 | | | | | .1 | | | | |
| 34 | 27 | 16 | bed | 26 0 | | | .5 | | | 76 7 6 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 | |
| 35 | 28 | 22 | | | | 100 | .7 | 75 82 | | 78* 05 2 20 83 | |
| 36 | 30 | 17 | | | 18 37 | 0.1 | .7 | | | 73* 9* 11 | |
| 37 | 31 | 18 | | | .5 | | .8 | | | 1 01 08 | |
| | | | obestal | ALCOHOL: | | | 100 | 10.fm | | 81 01 18 | |
| | Febr. | | The state of | | | | | | | 82 10 23 | |
| 38* | 1* | 17 | i 22 9 | i 28 20 | i 29 40 | i 31 39 | | | 41 | 13 11 28 | |
| 39* | 2* | | i 10 53 | 19 27 | | 3.00 | | | 63 | Atlantic Ocean. | |
| 40 | 2 | 15 | | | | | .7 | | | b) 51 88 | |
| 41 | 3 | 3 | | | 6.6 | 8. | 27 | | | 91 61 78 | |
| 42 | 3 | 7 | | | | | 48 | | | is at les | |
| 43 44 | 3 | 17 | | | | 0. | 18 | | | 2 01 08 | |
| 44 45 | 3 4 | 18 | | | | | 49 | | | 81 81 100 | |
| 46 | 5 | 2 | | | | | .3 | 100 | | 81 81 10 0 81 C9 | |
| 47 | 5 | 4 | | | | | 28 | 55 | | 0 01 80 | |
| | | | | | | | | | | | |

No. 9.

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1929.

| | København. | | | | | | | | | | | |
|------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------|-------------------------------|----------|---------|--------------------------------------------------------------|----------------------|----------|-----------------------------------------------------------------------------------|----------------|---------------|---------------------------------------------------------------------------------------------------------------|
| No. | Date | Hour | P | F | orei | runners | | | L | Un- defined | Dis- tance | Remarks |
| 48 49* 50 51 52 53* 54 55 | 1929 Febr. 6 6* 8 8 9 10* 10 | 3 7 2 8 2 15 17 | m s i 0 16 51 47 | | s 16 | h m s 4.7 29 62 32 29 57 | m 10 63 | s 5 5 58 | h m 45 .3 47 | .5 33 | 67 | Caucase. |
| 56 57 58 59 60 61 62* 63 64* 65 | 15 15 16 17 18 20 22* 26 26* 27 28 | 6 8 19 21 19 21 20 4 9 20 | 52 4 i 12 1 | a samuel | 32 | 5.3 27.9 43 11 10 8.4 22 47 61 30 21 57 | 62 22 | 5 14 | .5 42 102 70 .5 32 4 | | 62 69 | Alaska. |
| 67 68 69 70 71 72 73 74 75* 76 77 78* 80 81 82 83 | March 1 1 1 3 3 5 7* 7 9* 9* 10 10 11 | 7 9 16 19 3 16 18 16 1 5 12 2 11 1 1 1 14 23 13 | 42 18 18 43 i46 14 56.8 24 43 | 55 | 44 | 57 41 24.5 35 27 11 51.6 49.4 | | 47 | 64 31 .4 .5 64 .8 39 70 59 1.0 1 23 30 1.1 | | 69 72 | Alaska. Afghanistan. Aleutic Islands. In preceding movement. Disturbed. Marianne Islands. Aleutic Islands. |
| 84 85 86 87 88 89 90 91 92 93 | 12 13 14 14 14 15 15 15 16 16 | 3 11 14 19 23 2 14 18 3 6 | 9.5 | 15 | 53 | 12 44 38.9 22 | VS Sh Sh VS | | .2 25 54 .4 .3 .6 | 000 | 43 | Turkestan. Strong micros. |

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No. 9.

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1929.

| | København. | | | | | | | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------|-----------------|------------------------------------------|----------------|-------------------------------------------------------------------------|----------------|---------------|-------------------------------------|--|--|
| No. | Date | Hour | P | Fore | erunners | 283 | L | Un- defined | Dis- tance | Remarks | | |
| 94 95 96 97 98* 99 100* 101 102 103 104 105 106 107 108 110 111 112 113 114 115 116 | 1929 March 16 18 18 18 19* 20 21* 22 23 25 26 27 27 27 27 27 27 27 27 28 28 30 31 31 31 | 12 2 15 23 21 21 2 3 20 4 5 0 5 7 10 21 22 3 20 17 3 5 20 | m s 32 59 6 33 49 44 | m s 42 52 33.4 | h m s 47 31 .2 17.0 60.4 33 47.6 54.1 | m s 22.7 66.3 | h m 40 .9 .58 .5 .53 .40 .52 .3 .42 .7 .7 .7 .30 .53 .68 .0 .6 .20 .57 | h m | 76 | Japan. Asia Minor. Strong micros. | | |

 N_0 . 9. -6 — 1929.

København.

NOTES

- No. 9. Jan. 13. 0^h. Kurile Islands. 155 E 47 N. Very strong. iP on N and Z; about ½ min. later there seems to be another phase (P_cP?). PP and PPP, 18^m 32^s, sharp on Z; first forerunners not very strong on E; on N very strong with many phases. iS_E; S not very large on N; on both followed by very large movement, possibly due to more than one phase. SS and SSS, 31^m.3, large. On N the beginning of L, 36^m.5, has very long periods and large amplitudes; on E the beginning not so well defined, but earlier. Large M groups.
- No. 19. Jan. 17. 11^h. Destructive in Venezuela. Faint first forerunners, no reflections. S not sharp; after S the movement continues strong until L, the beginning of which is not clearly marked; earliest on N.
- No. 28. Jan. 23. 11^h. Greece. The movement small, but P and S well defined.
- No. 30. Jan. 24. $20^{\rm h}$. Central America. The beginning of P faint, but on WZ clearly marked (no GZ). PP $52^{\rm m}$.5 about as big as P. The S phase, largest on E, begins $59^{\rm m}53^{\rm s}$ but increases shortly afterwards ($\overline{S_c}P_cS$ and S_n ?). PS $61^{\rm m}$ $13^{\rm s}$. SS $66^{\rm m}$.0, SSS $69^{\rm m}$.5, both distinct on E. E begins rather clearly on E; E shortly after E several, not very large, groups.
- No. 38. Feb. 1. 17^h. 39°.2 N 69°.0 E, Zèravchan, according to Pulkovo. The forerunners very strong with a continued, strong movement. The first forerunners strongest on Z and E, S strongest on N. Both P and S followed by several, clearly marked unidentified phases (due to succeeding shocks or to reflections?). SS large, continues into L, which is smaller (deep focus?). L very irregular.
- No. 39. Feb. 2. 0^h . Atlantic Ocean. $iP_{Z'}$. The movement increases about 11^m . 7 (P_cP_c); continues strong; varying, but without clearly marked phases. The beginning of S read on N; on E uncertain, perhaps earlier. After S strong movement continued in L, not very different in appearance.
- No. 49. Feb. 6. 7h. Sea of Okhotsk. Faint, but forerunners clearly marked. L irregular.
- No. 53. Feb. 10. 15^h. Central America. The phases clearly marked on Z and E, but strong microseismic movement makes the reading somewhat uncertain. Additional phases: PP 55^m13^s, about as big as P; SS 7^m.9. L regular, not large.
- No. 62. Feb. 22. 20^h. (Atlantic Ocean?). P and S very clearly marked, each by an oscillation of large amplitude; P begins faintly.

 The movement continues strong after P and stronger after S; no marked PR or SR. 62^m5^s a phase very clearly marked on E. L begins distinctly, with large amplitudes; shortly afterwards M.
- No. 64. Feb. 26. $9^{\rm h}$. Alaska. iP on Z and N, large amplitudes. S small, following phases $(S_cP_cS?)$ larger. L regular, begins earliest on E with waves of long period.
- No. 75. March 7. 1^h. Aleutic Islands. Very strong record. P has very large amplitudes on Z and N; the following movement strong. S has very large amplitudes and the movement continues strong. The beginning of L distinctly marked on N and Z; the first waves have long period and large amplitudes. M very large.
- No. 78. March 9. 2h. Bonin Islands region; △ = c. 90°. P and PP faint. Some increase of movement before 35^m27^s.
- No. 79. March 9. 11^h. New Zealand region; △ = c. 160°. No Galitzin records; other records disturbed by change of sheets. Increasing movement without clearly marked phases. The first part of L has long periods and rather large amplitudes; regular M groups about 20 minutes later.
- No. 98. March 19. 21^h . Central America; $\triangle = c. 90^\circ$. Forerunners more clearly marked on E than on N. L regular.
- No. 100. March 21. 2^h . Central America; $\triangle = c$. 88°. P and PP, 53^m4^s , very clearly marked on Z, about equally big. S phases not clearly separated. PS c. 61^m .5. L not very regular, the beginning uncertain.

Bianco Luno 48

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No. 10.

1929.

Geodætisk Institut

Proviantgaarden, Copenhagen, Denmark.

Bulletin

of the seismological station

KØBENHAVN

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

Lithologic foundation: chalk.

No. 10. April-June 1929.

Instruments:

Galitzin pendulums with galvanometric registration.

Constants:

| Component | l . | T_1 | A_1 | μ^2 | T | k |
|-------------|----------------------------|--------------------------------|-------------------|---------------------|---------------------------|-------------------|
| N E Z | em 12.5 12.5 14.4 | sec 12.63 12.69 11.55 | 100 100 100 | 0.16 0.06 0.1 | sec 12.6 12.3 10 | 105 100 100 |

During the greater part of May E was not recording.

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

Constants:

| 1400 | T | ν | ę | V |
|-----------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------|
| | sec | | mm | |
| 1/4-11/4 | 9.0 | 3.9 | 0.8 | 221 |
| 11/4-16/5 | 9.1 | 3.9 | 0.3 | 221 |
| 1/4-16/5 | 9.1 | 3.8 | 0.5 | 199 |
| | 5.5 | 4 | 0.3 | 165 |
| | 1/4—11/4 11/4—16/5 1/4—16/5 | $ \begin{array}{c ccccc} & 1/4 & -11/4 & 9.0 \\ & 11/4 & -16/5 & 9.1 \\ & 1/4 & -16/5 & 9.1 \\ \end{array} $ | 1/4—11/4 9.0 3.9 11/4—16/5 9.1 3.9 1/4—16/5 9.1 3.8 | 1/4—11/4 9.0 3.9 0.8 11/4—16/5 9.1 3.9 0.3 1/4—16/5 9.1 3.8 0.5 |

On May 16. recording of the Wiechert horizontal seismograph was suspended.

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

No. 10.

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1929.

| | København. | | | | | | | | | | | |
|----------------------|----------------------|---------------------|--------|-------------------|---------------|-------------|-----------------|----------------|--------|---------------------------------|--|--|
| No. | Date | Hour | P | Forer | unners |) A | L | Un- defined | Δ | Remarks | | |
| 1 | 1929 April 2 | 3 | m s | m s | h m s | m s | h m 58 | h m | 0 | | | |
| 3 4 | 5 5 6 | 9 23 4 | 45 5 | | 46.3 | ifell | .8 .6 | | | | | |
| 5 6 7 8 | 7 8 8 9 | 19 1 10 3 | 45 5 | | 55.6 38 58 | sorgoia | .4 | DUA 10 | | Earlier forerunners disturbed. | | |
| 9 10 11 | 9 9 10 | 4 7 5 | | N | 14.4 | 17 11 | 理是 | .9 | A | | | |
| 12 13 14 | 10 10 11 | 6 18 0 | | , an | Si ke s. (d | reges) u | .8 .7 17 | 14 14 | V | | | |
| 15 16 17 18 | 11 11 12 12 | 1 1 0 5 | | | | | 39 | 46 | | | | |
| 19 20 21 | 13 13 13 | 0 7 21 | oV. | | 13.9 31.2 | | .7 42 1.1 | | | Indiamatal | | |
| 22 23 24 | 13 16 16 | 23 1 5 | 4 55 | 15 10 | 21.0 | | .8 | 52 | 81 | Japan. | | |
| 25 26 27 28 | 16 17 17 17 | 14 3 11 19 | | 24 7 | 31.9 | , A. | 1.0 28 | 57 | | Crete. | | |
| 29 30 31 | 18 19 19 | 4 4 21 | | 12.3 | 800 1.0 | 001 001 | .5 | 21 | | | | |
| 32 33 34 | 20 21 21 | 1 12 20 | 45 38 | 51 51 | 15 | | . 16 58 | 32 | 42 | Not very distant. | | |
| 35 36 37 38 | 22 27 27 28 | 8 12 21 5 | 7 56 | 15 20 | .4 | | 27 59 | 32 | 53 | Forerunners disturbed. | | |
| 39 40 41 | 28 29 30 | 19 18 19 | | | 11 | | .5 | 46 41 | | | | |
| | Men | | | 155 155 601 | 8.0 | | | | 4 | | | |
| 42 43 44* | May 1 1 1* | 6 8 15 | 44 26 | 50 1 | 3.1 45.9 | ow. dgargo | .6 .5 | ostron r | 36 | Persia. | | |
| 45 46 | 1 1 | 21 22 | N 05 = | 12 | efinalettoo | stantiboodq | \$61.690 | .2 | mo 2/3 | bne Missingsrgumalas variesmili | | |

No. 10.

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1929.

| | Købennavn. | | | | | | | | | | | |
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| | | | | Forer | unners | | | 1 | lega (T | | | |
| No. | Date | Hour | - | | | | L | Un- defined | Δ | Remarks | | |
| | | | Р | S | | | | | | | | |
| | 1929 May | | m s | m s | h m s | m s | h m | h m | 0 | | | |
| 47 | 2 | 14 | 37 30 | 46 58 | | 0. | 61 | | 71 | Kurile Islands. | | |
| 48 | . 3 | 8 | | | | | .9 | 100 | | Faint forerunners. | | |
| 49 | 3 | 16 | | 32 30 | | | 38 | | | Persia. | | |
| 50 | 4 | 4 | esiesto | 28 | | | .3 | | 16 5 | 100 1 30 100 | | |
| 51 52 | 5 | 6 5 | | | 47.7 | | 54 | | | | | |
| 53 | 5 | 17 | | 19.4 | | C I | .8 | | | Indian Ocean. | | |
| 54 | 6 | 5 | 1920 Olive | 13.4 | 28 11 | 37.6 | .9 | | | New Guinea. | | |
| 55 | 7 | 9 | | | | | .6 | | | Trew Gamea. | | |
| 56* | 7* | 16 | | | 54 42 | | 86 | | | New Guinea. | | |
| 57 | 8 | 12 | | | | | .7 | | | STATE OF THE | | |
| 58 59 | 8 | 14 11 | | | | Ø | .4 | 1.3 | | 8, 6 1 601 | | |
| 60 | 11 | 19 | | | | | 46 | 28 | | Italy | | |
| 61 | 12 | 10 | | | | | .3 | 20 | | Italy. | | |
| 62 | 12 | 17 | | | | | .2 | | | | | |
| 63 | 13 | 6 | | | | | | 52 | 00 0 | 10 0 1 55 101 180 | | |
| 64* | 13* | 13 | 34 9 | 39 33 | | | SV 1 | | 34 | Persia. | | |
| 65 66 | 15 16 | 9 | | | 32.5 | | .4 | | | | | |
| 67 | 16 | 10 | | | 32.3 | | 31 | .2 | | | | |
| 68 | 16 | 21 | | | | | .4 | .2 | | Faint. | | |
| 69 | 17 | 0 | | | | | .8 | | | Faint. | | |
| 70 | 18 | 1 | 11 7* | 18 14 | | | .4 | Auto de | 50 | Abessinia. | | |
| 71* | 18* 19 | 5 | 42 59 | i 47 6 | 20 | | 49 | | 24 | Asia Minor. | | |
| 73* | 20* | 5 | 4 25 | 13 51 | 28 14 38 | 18 58 | 1.0 | 6.00 | 71 | Aleutic Islands. | | |
| 74 | 20 | 12 | 20 55 | 23 39 | 14 30 | 10 00 | 26 | | 11 | Faint. | | |
| 75 | 20 | 18 | | | | | .8 | | | | | |
| 76 | 21 | 2. | ing distant | | | | .9 | 0.0 | | Edition of the last | | |
| 77 | 21 | 5 | 47 20 | F. 7. 4 | | 22.4 | .5 | CHE | | | | |
| 78* 79 | 21* | 16 | 47 30 | 57.4 | 50.4 | 62.4 48 58 | 73 | | . 77 | Japan. | | |
| 80 | 22 | 20 | | | 26.6 | 70 38 | 1.4 | | | Very distant. L faint. | | |
| 81 | 22 | 23 | | | | | .5 | | | | | |
| 82* | 23* | 18 | 37 18 | 9 . | | | | 8,48 | | Felt in Norway and Denmark. | | |
| 83 | 24 | 19 | 10 50 | 1 | | 02 50 | 12 | | | | | |
| 84 85 | 25 26 | 12 9 | 12 50 | | 23 13 | 23 52 | .7 | | | Peru. | | |
| 86 | 26 | 19 | | | 57.2 | | 1.4 | | | The beginning disturbed. | | |
| 87* | 26* | 22 | 51 2 | 60 23 | | 8. | 67 | | 71 | Pacific Ocean near Alaska. | | |
| 88 | 27 | 5 | | | 47 24 | | .9 | | | | | |
| 89 | 28 | 0 | | | 19 31 | | .6 | | | | | |
| 90 91 | 28 28 | 5 7 | | | | | .9 | 19 | | 00 00 00 | | |
| 92 | 28 | 18 | Section V | | | | | .3 | | | | |
| 93* | 29* | 23 | and the State | | | | 0 8 | | | Felt in Norway and Denmark. | | |
| 94* | 30* | 10 | | | 1 54 | 2 45 | 34 | | | Argentine. | | |
| 95 | 30 | 13 | 01 11 | 21.4 | | | .1 | 5 | | In preceding movement. | | |
| 96 | 31 | 0 | 21 44 | 31.4 | | | 46 | | 74 | Japan. | | |

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No. 10.

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1929.

No. 10

København.

| | | | | Fore | runners | | | | Un- | Great | |
|-------------|--------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|------|----|----------|---------|-------|--------------------------------|
| No. | Date | Hour | P | S | E DE L | | | L | defined | Δ | Remarks |
| | 1929 June | | m s | m s | h m s | m | s | h m | h m | 0 | 1 A m = 1 1914 |
| 97 | 1 | 18 | 10 54 | 21.1 | | | | .6 | | 80 | Riou-Kiou Islands. |
| 98* | 2* 2* | 21 | <i>i</i> 50 1 <i>i</i> 51 19* | i 59 28 | 64.7 | 9. | | | | 72 | |
| 100* | 3* | 20 | 36 57 | 42 43 | 38.3 | 43 | 2 | | | 38 | Turkestan. |
| 101 | 4 | 7 | 48. 5 | | 17 59 | | | | 17.70 | | Turkestan. |
| 102 | 4 5 | 15 | 28 50 | | i 32 55 | 38 | 45 | 25 | | | Philippine Islands. Disturbed, |
| 104 | 6 | 11 | 0.4* | 8 41 | | | | 23 | 28 | 62 | Atlantic Ocean. |
| 105 | 6 | 14 | | | 43.0 | | | | | | |
| 106 | 6 | 16 | asifu0 w | | | | | .6 .2 | 46 | | 1 1 1 W |
| 108 | 9 | 8 | | | 27.7 | | | .6 | | | |
| 109* | 9* | 9 | 19 24* | 28 51 | 33.8 | | | .7 | | 72 | Kurile Islands. |
| 110 111 | 9 | 19 23 | iri | | 92 | | | 50 | 56 | | el |
| 112 | 10 | 0 | | | | | | .9 50 | | | |
| 113* | 10* | 23 | i 6 28 | 9 56 | 7.4 | | | 11 | | 19 | 6 6 |
| 114 | 12 | 11 | 57.8 | | 62 31 | 72 | 12 | | | 63. 6 | Pacific Ocean. |
| 115 116* | 12 13* | 15 | i 23 46 | 33 12 | 34 8 | | | .1 | | 72 | Kurile Islands. |
| 117* | 13* | 9 | 38 4 | 00 12 | 49 9 | 49 5 | 50 | 1.1 | | 12 | Mindanao region. |
| 118 | 13 | 20 | (0) | | .1 | | | .6 | | | 15 21 20- |
| 119 | 13 13 | 22 23 | 14.0 | | 24.7 | | | .6 | | | |
| 121 | 14 | 6 | 14.0 | | 21.7 | | | .8 | | | 1 10 CF 0 1 481 1 417 |
| 122 | 14 | 23 | | | 46.5 | | | 65 | 88 | | 342 4 4 5 |
| 123 124 | 15 15 | 2 9 | maint office | | | | | .8 | 14 | 18 8 | Faint preceding movement. |
| 125 | 15 | 16 | | | | | | .9 | | | |
| 126 | 15 | 20 | | | 0.0 | | | .4 | | | Mindanao region. |
| 127 128 | 15 16 | 21 | | | 31.9 | | | .9 | | | Mindanao region. |
| 129* | 16* | 23 | 31100041000 | | 7 19 | 8 1 | 7 | ., | | | New Zealand. |
| 130 | 17 | 10 | 29.9 | | 41 11 | E.I. | | 1.1 | B ess | | Mindanao region. |
| 131 | 18 | 1 | | | 24.0 | | | .9 | | | B |
| 132 | 18 18 | 14 | | | 24.8 | | | .9 | | | Persia. |
| 134 | 19 | 4 | * 1100 | g ja | | | 93 | .9 | 65 | | 18 81 18 50 |
| 135 | 19 | 7 | 44 19 | 70 | 54 53 | 55.6 | | 80 | | | Pacific Ocean. |
| 136 | 19 | 10 | 100000 000 | 9 10 | | | | .7 | 212 | | |
| 138 | 19 | 19 | | | | | | 58 | 76 | | 8 VC 84 |
| 139 | 20 | 18 | | | 47 6 | | | 1.2 | 61 | | 0 15 8 |
| 140 | 20 21 | 20 5 | | | 35 3 | | | .9 | | | |
| 142* | 22* | 15 | | | 50 8 | 50 5 | 1 | .0 | | | New Zealand. |
| 143* | 22* | 18 | stold act | N I | 59 6 | 59 5 | | | | | New Zealand. |
| 144 145 | 23 23 | 4 22 | Section 1 | | .2 | | | .6 | | | 01 100 100 |
| 146 | 24 | 2 | State of the state | 1 18 1 | .2 | | | .8 | | | to is to the late |
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No. 10.

- 5 **-**

1929.

| | Købennavn. | | | | | | | | | | | |
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| No. | Date | Hour | | | runners | 2870 | L | Un- | | Remarks | | |
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| 149 150 151* | 26 26 27* | 6 17 | 40 52 | 50 19 | 12 72 | i telivanto | .4 68 31 | i kas a | 72 | Aleutic Islands. Japan. | | |
| 152 153 | 27 28 | 13 22 1 | 2 8 43 9 | 46 30 | 12 52 | 14 3 | 34 48 .6 | one tem one tem | 18 | to 71. May 18. 67. Asia Minor. villa. 78. May 20. 47. Asia Minor. (S.P. SF) an A. Very requir | | |
| 154 155 156 | 28 28 29 | 2 22 2 | er er evy famt. | s min s | | M inspiral | .5 | 33 | ine se ion th Promi | No. 16 May 21, 14% Jamm. Stad distinctly; abortly alterward so. 82 May 24, 15°, 3) sparsks: 80 | | |
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| dt ,416 for tot | 3 3-1 59 389 | 70 Ha | real recerc | ery large: | upili S. S no distinctly | any strong rd). L bog | po tuode | estimites I-S N (nd econos | | wom ent year and of the to the to the to the to the to the total of th | | |
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| Turies 8 | 100 m | EG. 35 | as other t | emavem 8 | term and | seven gal. A ban N a | ollor ei besteur | Si lunge A cheerin | overel N boo | & nit not large: A much the largening uncertain. | | |
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No. 10. — 6 — 1929.

København.

NOTES

- No. 44. May 1. 15^h. Persia. Very strong record. A faint movement precedes *iP* 44^m 28^s; dilatation; the movement continues strong after *P. PP* most clearly marked on *E. S* and following movement large; the beginning of *L* not certain. *M* very large, largest on *N*.
- No. 56. May 7. 16^h. New Guinea. PP 54^m42^s. Other forerunners, not clearly marked. L has long periods. L' 18^h7.
- No. 64. May 13, 13^h . Persia. P faint. In the first part of L somewhat irregular waves of long period and large amplitude; later regular M groups.
- No. 71. May 18. 6h. Asia Minor. P not strong, S very large. M not very regular.
- No. 73. May 20. 5^h. Aleutic Islands. Not very strong record but all phases clearly marked. S strongest on E, following phase $(S_c P_c S)$ on N. Very regular M in first part of L.
- No. 78. May 21. 16^h. Japan. S rather small, unsharp, followed by larger movement, but no clearly marked phase. L begins distinctly; shortly afterwards M waves of long period; largest M group about 8 min. later.
- No. 82. May 23. $18^{\rm h}$. Skagerak; felt in Norway and Denmark. $\triangle = c.4^{\circ}$. P on WZ only, very faint. P $37^{\rm m}34^{\rm s}$ more clearly marked, also visible on GZ. There seem to be two shocks; P_2 $38^{\rm m}8^{\rm s}$ on WZ. Strongest phases, clearly marked on N and E, $38^{\rm m}20^{\rm s}$ and $39^{\rm m}10^{\rm s}$.
- No. 87. May 26. 22^h. Very strong record. P begins faintly on Z; increases on Z and begins on N and E about 11 sec. later. P not very large; the movement continues about equally strong until S. S very large; well recorded on M-S E only, the light being too faint on GN and M-S N (no GE record). L begins distinctly, very early, with waves of long period and large amplitude; later, very large M groups.
- No. 93. May 29. 23^h . Skagerak, felt in Norway and Denmark. $\triangle = c. 4^\circ$. P very faint, perhaps $31^m 56^s$; \overline{P} stronger, but in timemark, $32^m 15^s$. Strongest phase on N and $E: i 33^m 10^s$.
- No. 94. May 30.10^h. Argentine. △ = c.110°. P'1^m54^s, faint; PP 2^m45^s, clearly marked. Before (S_n) 18^m36^s some increase of movement, but no clearly marked phase. SS 18^m36^s; SSS 22^m.5. Very regular, not large M.
- Nos. 98—99. June 2. 21^h . Japan Sea and Pacific Ocean respectively, according to the Russian stations. P_1 very clearly marked on Z, but not large; P_2 much larger. S_1 large; in following movement phases not very clearly marked. L small, irregular, the beginning uncertain.
- No. 100. June 3. 20^h. Turkestan. P and PP clearly marked on Z and E. The first S movement quite large on E; on N small, followed by larger movement (another phase?). The beginning of L uncertain. On N large M begin sharply 49^m.6; M smaller on E.
- No. 109. June 9. 9^h. Kurile Islands. Record disturbed by change of sheets; no GE. In the beginning of L, on E, a group of oscillations of long period and large amplitude.
- No. 113. June 10. 23^h . Arctic Sea W of Norway according to Pulkovo. iP_N ; the movement continues strong; S not very well defined. Large, quite regular M.
- No. 116. June 13. 0^h. Kurile Islands. Strong record. iP_Z . S small. i_Z 25^m44^s may be P of a succeeding shock, 35^m.2 and 36^m.2 the corresponding S and PS. e_Z 37^m18^s possibly P of a third, stronger shock; S 46^m44^s and PS 47^m46^s not quite certain phases since L of the first shock begins about this time. In the beginning of L a group of long period waves of large amplitude; followed by M of shorter period. About 14 min. after the beginning of L again a group of long-period waves of large amplitude, followed by M groups of shorter period, possibly L of the third shock.
- No. 117. June 13. 9^h. Mindanao region. Strong record. P not very strong, but clearly marked; PP 42^m.0, larger. Later phases quite large but not very well defined. Additional phases: 50^m.9; 55^m.0; 57^m.4; 59^m.1. L begins earliest on N with waves of long period; large M groups.
- No. 129. June 16. 23^h. New Zealand. $\triangle = 161^{\circ}$. Very strong record. P_1 7^m19^s ; P_2 8^m17^s ; PP 12^m4^s . The movement continues strong; several later phases, not all very well defined. S_eP_eSP 22^m20^s and PPS 25^m20^s large; SS 33^m30^s and SSS 38^m .0 very large. The beginning of L uncertain; in first part irregular waves of long period and very large amplitude; later very large, regular M groups.
- No. 142. June 22. 15^h . New Zealand. P_1 , P_2 and PP $54^m 38^s$ distinct on Z, P_2 and PP on N and E. Several later phases in forerunners, not clearly marked. The beginning of L faint, uncertain. L waves very regular, of long period.
- No. 143. June 22. 18^h . New Zealand. Fainter than preceding record. P'_1 and P'_2 distinct on Z.
- No. 151. June 27. 13^h. South Sandwich Islands; $\triangle = c. 115^{\circ}$. Very strong record; the first part slightly disturbed. P and P', 5^m56^s , small but clearly marked on Z. PP 6^m53^s , large; PPP $9^m.7$. Strong continued movement, but later phases quite clearly marked. S_cP_cS largest on N, following phase on E. Additional phases: $15^m.1$ on E; $15^m.7$ on N; (PS) 16^m52^s , large; SS $22^m.7$ very large; SS $27^m.2$ large. E begins early; in first part groups of waves of long period and very large amplitude; later very large E of shorter period; several large groups.



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No. 11.

1929.

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 m.

Lithologic foundation: chalk.

No. 11. July-September 1929.

Instruments:

Galitzin pendulums with galvanometric registration.

Constants:

| Component | l | T_1 | A_1 | μ^2 | T | k |
|-------------|----------------------------|--------------------------------|-------------------------|--------------------|------------------------|-------------------|
| N E Z | cm 12.5 12.5 14.4 | sec 12.63 12.69 11.55 | em 100 100 100 | 0.16 0.1 0.3 | sec 12.6 13 9 | 105 100 100 |

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

| Component | ., | T | ν | ę | V |
|-----------|------------------------|------|------|-----|-------|
| 7. 76 | | sec | | mm | 8 861 |
| N | 10/7—24/7 24/7—30/9 | 13.0 | 8.8 | 1.4 | 239 |
| | 24/7-80/9 | 13.2 | 9.3 | 0.8 | 230 |
| E | 10/7-24/7 | 12.7 | 11.3 | 0.5 | 204 |
| | 24/7-30/9 | 13.2 | 8.7 | 1.0 | 207 |
| Z | 9 | 5.7 | 4 | 0.2 | 165 |

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

No. 11.

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1929.

| , | København. | | | | | | | | | | |
|------------|--------------|----------|----------------------|----------------|-----------------|---------------|----------|----------------|----------|------------------------------------|--|
| No. | Date | Hour | | Forer | unners | | L | Un- defined | | Remarks | |
| | | | P | S | No. of the last | | | denned | | | |
| | 1929 July | | m s | m s | h m s | m s | h m | h m | 0 | | |
| 1 | 2 | 1 | | | 2.0 | | 29 | | | | |
| 2 3 | 2 2 | 2 16 | | | | 1221 | .8 | | | | |
| 4 | 3 | 1 | 3 18 | 11 37 | 13 3 | 13 91 | 1.5 | | 61 | L faint. | |
| 5 | 3 | 7 | | | toiteds | seigolo | dieloe | .5 | | Seismic? | |
| 6 7 | 3 | 8 | | | 32.8 | | .8 | | | | |
| 8 | 4 | 4 | 38 40 | | | | .0 | | | Other phases unsharp. | |
| 9 | . 4 | 7 | 20.1 | 24 42 | 777 5 | THE LAND | ास स | T KY | 27 | | |
| 10 11 | 4 | 8 | 37 1 2 22 | 41.5 6.9 | A W.Y. | 五王 尹 | LIL C | T ACK | 27 27 | | |
| 12 | 4 | 9 | | 0.0 | 52 | 12°22' S | 8 30 | 4°68 == | 21 | Disturbed. | |
| 13 | 4 | 12 | :20 22 | 40 0 | 22 | : moiling an | .6 | 6.1 | | | |
| 14* 15 | 5* 5 | 14 19 | i 30 33 | 40 0 | 33 17 | 45 11 | .8 .5 | | 72 | | |
| 16* | 5* | 22 | 47 46* | 57 15 | 57 40 | | .0 | | 72 | | |
| 17 | 5 | 23 | 21 17 | | | | | | | In preceding movement. | |
| 18* 19* | 6* 6* | 2 9 | 15 21 <i>i</i> 56 30 | i 64 50 | 66.4 | | 71 | | 61 | | |
| 20 | 7 | 6 | AY OV | 201 00 | 00.1 | | .8 | | 01 | | |
| 21 22* | 7 | 10 | :24 42 | | | | 6 | | | Forerunners disturbed. | |
| 23 | 7* 8 | 21 2 | <i>i</i> 34 42 16.4 | i 44 7 26.0 | 37 28 | i 45 0 | 40 | .goismis) | 71 | P and S faint. | |
| 24 | 8 | 19 | | -0.0 | 29.8 | | .8 | | | rand o faint. | |
| 25 26 | 9 | 6 | | | | | .5 | 7-7 | | | |
| 27 | 9 9 | 9 18 | - | | | | .4 | | | District Commence | |
| 28 | 10 | 15 | 801 | | 0.10 | 61017 | .1 | - ms | | | |
| 29 30 | 11 | 14 21 | 8 33 | 17 58 | 1.0 | . 00 <i>f</i> | 15 | 6.21 | 71 | C -C Al I l | |
| 31 | 12 | 16 | 8 33 | 13.0 | 8.0 | 001 | 32 26 | 3,21 | 71 | S. of Aleutian Islands. Alaska. | |
| 32 | 12 | 18 | 11 31 | 21.9 | | | 42 | | | | |
| 33 34 | 12 | 22 23 | | | | | .5 | | | | |
| 35 | 13 | 5 | | | | | .5 | .19 | Azgon | Faint forerunners. | |
| 36 | 13 | 7 | | 49 18 | | | | | despris | Disturbed. | |
| 37 38 | 13 | 12 | | | | | .8 | | | | |
| 39 | 14 | 6 | | | | | .9 | | | Forerunners disturbed. | |
| 40* | 14* | 9 | 48 7 | 57 19 | 52.6 | 65.6 | 71 | | 69 | | |
| 41* | 15* 15 | 7 10 | <i>i</i> 51 5 | i 56 35 | 1010 | | 5 | | 35 | | |
| 43 | 15 | 15 | | 088 | 8.0 | G d | .5 | | | | |
| 44 | 16 | 2 | • | 102 | 8.0 | | .2 | 3401 F | | | |
| 45 46 | 16 | 20 23 | | 705 | All . | | 32 | | | | |
| 47 | 17 | 8 | i 49 35 | | | | 32 | | | Disturbed. | |
| 48 | 17 | .21 | | | | | .3 | | | | |
| 49 50 | 18 | 7 21 | N 08 == | 922 == 12° | etunt ngo | wami sonde i | 30 | 8 | mes s | bas w sagargomeies wart?-ordin | |
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No. 11.

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| | | | | Forer | runners | | | Un- | layo'i | |
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| No. | Date | Hour | Р | S | benilet F | | L | defined | | Remarks 400 |
| 51 52 53 54 | 1929 July 19 21 21 23 | 8 11 13 15 | m s | m s | h m s | m s | h m .5 1.0 .7 | h m 39 | 3.0 | 1020 Aug 1030 Aug 103 |
| 55* 56 57 58 | 23* 23 24 25 | 18 20 3 0 | 47 28 8.8 | <i>i</i> 51 11 12.5 | 30.0 | 6.1 6.1 7 | 52 13 .5 | 88.8 | 21 21 | In foregoing; repetition. |
| 59 60 61 62 63 | 25 25 26 26 27 | 15 23 17 23 13 | 8.9 0 12 | 18 27 | 3.2 | 11.0 | .7 33 50 29 .3 | 54,2 56 61,0 61,0 | 73 77 | Japan. |
| 64 65 | 28 30 Aug. | 17 8 | 78.65 | | | 6.1 6.1 7. | .4 | 28 | | Disturbed. |
| 66* 67 68 69 70 71 | 1* 1 1 1 3 3 | 5 6 9 15 13 | 13 37 | 23 16 | 23 46 | 8 | .7 .5 .0 .9 | gi,ve | 74 | Preceding movement disturbed. |
| 72 73 74 75 76 | 3 4 4 4 5 | 19 9 15 23 15 | ao mini | 6 34 | 13 42 | 010 1 88 010 1 83 60 | .3 16 .5 .6 .4 | 8.06 | | Aleutian Islands. Faint preceding movement. |
| 77* 78 79 80* 81 | 6* 6 7 8* 10 | 1 13 20 13 5 | 8 31 | 37 48 17 44 | | 8 9. V. | 40 .1 .9 33 7 | OF. | 69 | Some preceding movement. |
| 83 84 85 86 87 | 11 11 14 14 14 | 18 19 2 3 6 | .usom | 01 | 33 | 8. 1.2 7. 0.1 | .5 46 50 | .7 | | One or two earthquakes? |
| 88 89 90 91* 92 | 14 14 15 15* 16 | 15 19 15 20 21 | i 9 20 | 20 7* | 15 40 19 47 55.7 | 0. S. | 49 .7 44 35 | | | 126 13 6 12 12 12 12 12 12 12 12 12 12 12 12 12 |
| 93 94 95* 96 97 | 16 17 17* 18 18 | 23 4 23 6 9 | 34 27 53 37 | 38 48 | 57 3 | 64 14 | 1.4 .9 .6 | . 27 | 25 | Forerunners disturbed. |

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1929.

No. 11.

| | København. | | | | | | | | | | |
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| | | | | Forer | unners | | | Un- | 191091 | | |
| No. | Date | Hour | P | S | defined | | L | defined | Δ | Remarks | |
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| 98 | 18 | 15 | | 27 22 | 50 5 | 00 5 | .7 | | | 10 10 10 | |
| 99* | 19* 19 | 20 | <i>i</i> 55 18 56 43 | 65 22 66 51 | 58 7 | 66 7 | 1.5 | 10.08 | 78 79 | China Sea. | |
| 101 | 19 | 23 | 70 01 | 00 30 | 26.8 | | 30 | | 70 | | |
| 102 | 20 20 | 16 17 | 50 31 49 52 | 60 38 60 19 | Agrical B | | 1.3 | | 79 83 | Riou Kiou Islands. In foregoing. | |
| 104 | 21 | .1 10 | | | 33.3 | | .2 | | | Faint forerunners. | |
| 105 106 | 21 22 | 7 | 30 1 | 4 0 | 54.2 | | .2 | 2.00 | | Disturbed. | |
| 107 108 | 22 22 | 16 19 | 51.6 | | 56 61.9 | | 1.5 | | 150 | 9.8 62 65 65 | |
| 109 | 23 | 16 | 31.0 | ela T | | | | 2 | | oskesteno Ex Es En | |
| 110 111* | 24 28* | 3 | 3 25 | 13 3 | 13.4 | 18 0 | 1.6 | | 74 | Japan. | |
| 112 | 29 | 1 | hadrate | 10 0 | | 10 0 | .4 | | | Jupan. | |
| 113 | 29 29 | 10 20 | | | 28 52 | | 1.5 .5 | | | | |
| 115 | 29 | 23 | | | | | .7 | | | 30/1 | |
| 116 | 30 31 | 5 19 | | T ew | 37.0 | | .8 | | E.R. | | |
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| 7709 | Sept. | rement | eceding and | ela 3 | | | | | | | |
| 118 119 | 1 1 | 10 16 | iolal maitre | | 14 1 | 17 58 | .3 1.2 | , V1 | 40 | | |
| 120 | 2 | 5 | int precedi | 4 | 0 | | 5 | 56 | | | |
| 121 122 | 2 3 | 11 | | | 36.8 | 37 24 | 1.0 | 44 | | P faint, ca. 11 ^h 26 ^m . No records from 8—17 ^h . | |
| 123 | 3 | 21 | | | | 4. | .8 | | | | |
| 124 125 | 4 5 | 22 14 | | | 36 | | 37 | | | Superintendent in 1987 | |
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| 127 128 | 6 8 | 12 17 | | | | | 55 | | | | |
| 129 130 | 8 9 | 23 | | | | 4. | .1 .4 | | | 88 11 1 100 100 100 100 100 100 100 100 | |
| 131 | 9 | 19 | | | | d. | .5 | | | 0 1 1 3 | |
| 132 133 | 10 10 | 20 22 | 0W1 10 0A | 2 | 40.4 | 47.1 | 1.2 | | | | |
| 134 | 11 | 22 | | 41 1 | | | 1.0 | _ | | Formosa. | |
| 135 136 | 12 13 | 5 | | | | 4. | .0 | .5 | | | |
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| 139 | 14 14 | 3 | | | | | .2 | .0 | | | |
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| 142 | 17 | 6 | | | | 4.5 41. | .3 | Ve. | | 10 10 10 10 10 10 10 10 10 10 10 10 10 1 | |
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No. 11.

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| | No. | Date | Hour | | , | runners | erro | L. | Un- defined | Δ. | Remarks |
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| | 145 | 1929 June 21 | 19 | m s | m s | h m s | m s | h m | h m .8 | | No was the 4-30 principle |
| | 146 147 | 24 24 | 2 14 | n teganotis | | | do skliziv | 37 | 6 | S au | de. 16. July 8, 22%. The guine rece and 6. is regular. |
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No. 11.

- 6 -

1929.

København.

NOTES

- No. 14. July 5. $14^{\rm h}$. Aleutian Islands. Strong record. PP and SS well defined phases on N, hardly visible on E. PP < P. The beginning of E not very certain, earliest on E, where irregular, long-period waves precede regular E0 groups. E1 of long duration. Short-period movement E3 conspicuous on E4, possibly E7 of a second shock.
- No. 16. July 5. 22^h . The pulse read as S distinct but small, visible on E only; 57^m40^s much stronger movement begins on N and E. L regular.
- No. 18. July 6. 2^h . S not clearly marked, e_E 24^m .8, e_N 25^m .2. L regular, of long duration.
- No. 19. July 6. 9h. Atlantic Ocean. L begins earliest on N with waves of long period and rather large amplitude. Later M small.
- No. 22. July 7. 21^h. Aleutian Islands. Very strong record. iP on N and Z. On N forerunners strongest with clearly marked reflections. PP < P. S followed by large movement. On E, L begins immediately after SSS with irregular waves of long period. M very large.</p>
- No. 40. July 14. 9h. Sea of Okhotsk. First part of record disturbed by change of sheets. PPP and SSS clearly marked on E. L earliest on E, in first part long period waves of large amplitude; later L not large, not very regular.
- No. 41. July 15. 7^h. Persia. P and S very clearly marked. S followed by irregular movement. L irregular, not large, the beginning uncertain.
- No. 55. July 23. Iceland. P and S very clearly marked phases, but beginnings unsharp. L begins distinctly; a large, regular M group.
- No. 66. Aug. 1. 5h. Not strong record, but S and PS very clearly marked on N.
- No. 77. Aug. 6. 1h. Jan Mayen. P faint, the reading not quite certain. L has rather long periods.
- No. 80. Aug. 8. 13^h. Burma. S not very well defined. L earliest on N; in first part some long period waves of large amplitude; later L irregular, not large.
- No. 91. Aug. 15. $20^{\rm h}$. Central America. Faint record, but P, $\overline{S_cP_cS}$ and S_n very clearly marked, $\overline{S_cP_cS}$ on E only. L begins distinctly with waves of long period.
- No. 95. Aug. 17. 23h. Central America. P and PP clearly marked. S phases not very well defined. L very regular.
- No. 99. Aug. 19. 2^h. Riou Kiou Islands region. Phases clearly marked. PP < P. In first part of L, on N, long period waves of rather large amplitude; later M group on all.
- No.111. Aug. 28. 19^h. Japan. Forerunners small but clearly marked. L begins earliest on N with waves of long period. M waves continue for some time about equally large.
- No. 140. September 15. 13h. Asia Minor. P and S very clearly marked. L irregular.
- No. 143. September 17. 19^h. Pacific Ocean. P faint on N and E. S rather large, followed by much movement; RS have long periods. The beginning of L uncertain; one rather large M group; later L somewhat irregular. C of long duration.



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No. 12.

1929.

Geodætisk Institut

Proviantgaarden, Copenhagen, Denmark.

Bulletin

of the seismological station

KØBENHAVN

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

No. 12. Oct.—Dec. 1929.

Instruments:

Galitzin pendulums with galvanometric registration.

Constants:

| Component | l | T_1 | A_1 | | μ^2 | T | k |
|-----------|------|-------|-------|------------|---------|------|-----|
| | em | sec | cm | | | sec | |
| N | 12.5 | 12.63 | 100 | | 0.10 | 12.6 | 105 |
| E | 12.5 | 12.69 | 100 | | 0:0 | 13.0 | 99 |
| | | | | from 16/11 | 0.1 | 12.8 | 98 |
| Z | 14.4 | 11.55 | 100 | | 0.3 | 9 | 100 |

E was dismounted on Dec. 15.

Wiechert 1000 kg. horizontal seismograph.

Wiechert 1300 kg. vertical seismograph.

Constants:

| Component | T | υ | ę | V |
|-----------|-----|-----|-----|-----|
| | sec | | mm | |
| N | 9.8 | 4.6 | 0.8 | 225 |
| E | 9.6 | 4.4 | 0.6 | 195 |
| Z | 5.8 | 4 | 0.2 | 160 |

Milne-Shaw seismographs, N and E components, with the approximate constants $T=12^{\rm s}$ $\nu=20$ V=300. Wood-Anderson torsion seismometer, N component, $T={\rm c.~11^{\rm s}}$.

No. 12.

- 2 -

1929

| | København. | | | | | | | | | | |
|-----------------------|-----------------------|----------------------|------------------------------|---------------|----------------------|--------------------|-----------------------|--------------------|-----------------|----------------------------------|--|
| No. | Date | Hour | P | Forer | unners | si k ir | L LS | Un- defined | | Remarks | |
| 1 | 1929 Oct. 2 | 10 | m s | m s | h m s | m s | h m | h m | 0 | Strong microseisms. | |
| 2 3* 4 | 5 5* 5 | 3 17 19 | <i>i</i> 10 54 <i>i</i> 12 3 | 19 52 21.3 | 20 39 | 24.5 | .4 .5 .6 | | 67 | ,, Kamtchatka, S faint. | |
| 5 6* 7* | 6 6* 6* | 6 8 13 | 5 39 | | 9 59 32 25* | 16 21 | .7 | orla te | | Pacific Ocean. | |
| 8* 9* 10 | 7* 8* . 9 | 15 17 3 | | И | 27 23 35 44 | 39.3 | 1.3 1.4 .9 | 0 | M | Pacific Ocean. | |
| 11 12 13 14* | 10 14 16 16* | 23 10 16 20 | 21.2 | 30.7 47 19 | 48 26* | 51 37 | .7 1.0 | 52 | 9 | Readings uncertain. | |
| 15 16 17* | 18 18 19* | 0 11 10 | 26 51 | • 19 | 37 21 | 38 5 | .6 18 55 | | | Chile. | |
| 18 19 20 21 | 19 20 21 21 | 20 16 11 12 | | | 45 3 19 30 3.7 | 53.6 | 1.2 .7 .4 .7 | .noltanei | on 2014 | Disturbed. | |
| 22 23 24 | 22 23 24 | 19 20 6 | N. | | 56.9 | | 23 .3 1.2 | T. | | Disturbed by microseisms. | |
| 25 26 27 28 | 26 27 27 27 | 13 3 16 20 | 801 • 00 | 0.8)1 0.61 | 47 57 | 0 | .3 | .9 | 8.S) 8.S) | Felt in Halland, Sweden. | |
| 29 30 31 | 28 29 29 | 10 6 12 | 001 | 7 40 | 6.0 | .0 | .2 | .1 .2 | 1 21 | Persia. | |
| 32* 33 34 | Nov. 1* 2 4 | 7 2 16 | i 0 24 | 2.7 | | | .7 | .2 | argore Aross | Rumania. Faint. | |
| 35 36 37 | 5 8 9 | 12 4 2 | | - | 2.5 | | .4 | .3 | | 2000 2000 | |
| 38 39* 40* | 13 15* 17* | 1 19 3 | 4.6 56.8 | 858 | 8 53 67 50 | 18 8 68 33 | .5 .6 1.4 | 1 mono | (1306) | Caroline Islands. | |
| 41 42* 43* | 18 18* 23* | 6 20 0 | 40 3 | 46 29* | 41.8 21.2 | 49 42 28.8 | .5 | | 44 | New Foundland. New Guinea. | |
| 44 45 | Dec. 3 6 | 8 12 | V 00 =- | 191 = | -emeternoo | ipproximat | .7 .5 | alganos Mograni | neer 3 | han W selgangardalos warisaan is | |
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No. 12.

_ 3 _

1929.

| N. | | | | Forer | unners | 2979 | usig | Un- | | Danasalas |
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| No. | Date | Hour | Р | S | | | L | defined | | Remarks |
| No. 47* 48 49 50 51 52 53 54* 55 66 57 58 59 60 61 62 63 64 | Date 1929 Dec. 6* 9 13 13 15 16 17* 17 18 18 20 24 31 31 31 | Hour 20 7 4 9 10 1 12 11 18 22 7 13 16 20 5 .1 5 22 | P m s 2 16 | | nners h m s 50 41 12.5 53.5 12.2 .1 21.2 28.6 .3 47 | m s 57.0 | L h m 1.3 .5 .5 .5 .4 .7 .4 .4 .5 .6 .7 .9 .8 .9 .6 1.1 | Undefined h m 26 | 69 | Remarks Sandwich Group. Sumatra. |
| | | | | | | | | | | |

 $N_0. 12.$ — 4 — 1929.

København.

NOTES

- No. 3. Oct. 5. 17^h. Kamtchatka. iP_Z . P faint on E. PP, 13^{m.4}, weak; PPP just visible. S large; 20^{m.39s} another phase $(\overline{S_cP_cS_c})$, on E clearly separated from S. SS_N has long periods. L not regular; the first part most regular on E with long periods and large amplitudes.
- No. 6. Oct. 6. 8h. Pacific Ocean; $\triangle = c. 110^\circ$. P faint, visible on Z only; PP much stronger. The following phases clearly marked on N, but hardly to be distinguished on E: $S_c P_c S$ $16^m 21^s$; $(S_c P_c P_c S)$ $17^m 2^s$; PS $19^m 7^s$; PPS $20^m .1$; $21^m .4$; SS $24^m .7$. A movement of long period on E at 35^m possibly an early beginning of L, but followed by irregular, smaller movement. M about 45^m .
- No. 7. Oct. 6. 13h. On Z a clearly marked phase 32m25s; no other forerunners. L small. Strong microseismic movement.
- No. 8. Oct. 7. 15h. On Z a clearly marked phase 27m33s; no other forerunners. L small. Strong microseismic movement.
- No. 9. Oct. 8. 17^h. Pacific Ocean; △ = c. 155°. P', 35^m44^s, and the following phase, 39^m.3, quite strong on Z; the movement increases 40^m10^s. Later phases not clearly marked. On N: 42^m.4; 49^m.7; 54^m.7. On N and E: SS 58^m.9. Several M groups.
- No. 14. Oct. 16. $20^{\rm h}$. Burma; $\triangle = {\rm c.~65^{\circ}}$. Strong microseismic movement. Forerunners most clearly marked on E. L irregular, earliest on N; large M group of short duration.
- No. 17. Oct. 19. $10^{\rm h}$. Pacific Ocean off Northern Chile; $\triangle={\rm c.~100^{\circ}}$. Strong record. No Galitzin records, the other records except Wood-Anderson disturbed by work at the station. P begins faintly; the movement increases at $27^{\rm m.4}$. PP, $31^{\rm m.38}$, stronger. $\overline{S_cP_cS}$ $37^{\rm m.21^{\rm s}}$ and $(\overline{S_cP_cP_cS})$ $38^{\rm m.58}$ strong and clearly marked on E; S_n $38^{\rm m.5}$, on N, stronger. SS $44^{\rm m.6}$. M regular.
- No. 32. Nov. 1. 7h. Rumania. P followed by strong movement, S not well defined. After S, strong movement continues; the beginning of L uncertain. M irregular.
- No. 39. Nov. 15. 19h. Caroline Islands; $\triangle = c. 105^\circ$. In forerunners continued oscillatory movement; many phases, but not very clearly marked. Some of the best marked can be interpreted as follows: $P_Z' 7^m 51^s$; $PP 8^m 53^s$; $S_c P_c S 15^m 17^s$; $S_c P_c P_c S 16^m .0$; $S_n 16^m 35^s$; $PS 18^m 8^s$; $SS 23^m 46^s$. M irregular.
- No. 40. Nov. 17. 3^{h} . Mindanao region according to URSS; $\triangle = \text{c. }95^{\circ}$. PP, c. $60^{\text{m}}.9$, stronger than P, but the beginning not clearly marked. $67^{\text{m}}50^{\text{s}}$ (S_cP_cSP) very clearly marked, largest on E. c. 70^{m} a distinct phase, but beginning uncertain. SS $75^{\text{m}}.3$. L earliest on N; the first waves have periods of more than 1 min.
- No. 42. Nov. 18. 20h. New Foundland. The first impulse not strong, compression; sharp increase on Z 40m7s and 40m22s; followed by oscillatory movement. S large. One very large, regular M group.
- No. 43. Nov. 23. 0h. New Guinea; $\triangle = c$. 110°. Forerunners not large and not clearly marked. PP 21m.2; PS 33m.2; SS 36m.8. The first L waves have long periods; M not large, but of long duration.
- Nos. 46/47. Dec. 6. 17h and 20h. Sandwich Group; $\triangle = c$. 110°. Disturbed by strong microseismic movement. Faint forerunners precede PS, the first phase read, which is very clearly marked.
- No.54. Dec. 17. 11^h. Between Kamtchatka and Aleutian Islands according to Strasbourg. Very strong record. P increases $10^{\rm m}.1$. S large, followed by large oscillations. The beginning of L not certain; large M of long duration.

BIANCO LUNO A/S, KBHV