

Publikasjoner fra
DET NORSKE INSTITUTT FOR KOSMISK FYSIKK
Nr. 30

THE AURORAL OBSERVATORY AT TROMSØ

($\varphi = 69^{\circ} 39'.8$ N, $\lambda = 18^{\circ} 56'.9$ E. Gr.)

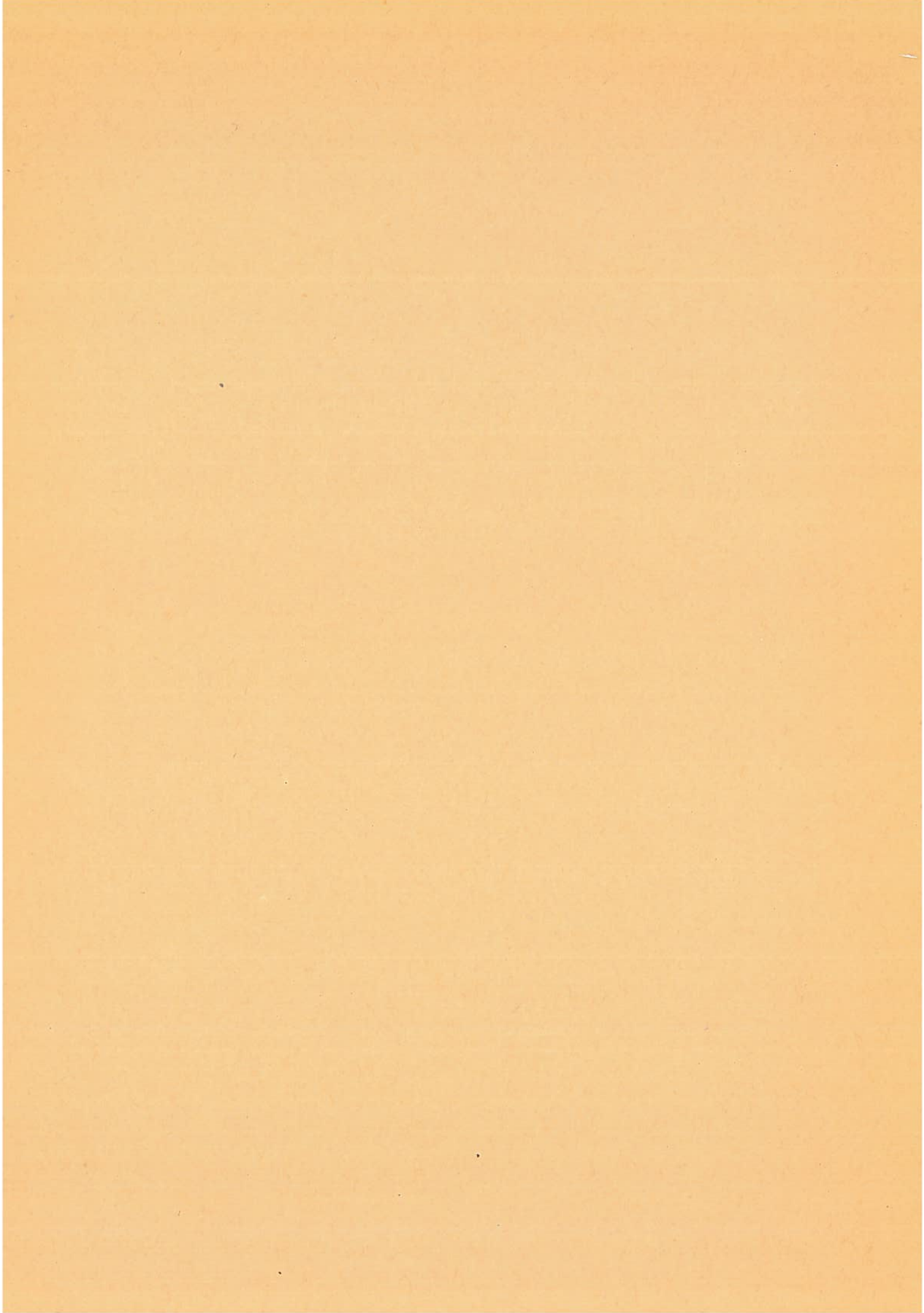
**RESULTS OF MAGNETIC OBSERVATIONS
FOR THE YEAR 1947**

BY

EINAR TØNSBERG and Mr. STEINAR BERGER

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A.S JOHN GRIEGS BOKTRYKKERI, BERGEN



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GENERAL REMARKS.

The instrumental equipment used for the magnetic measurements is the same as that previously used, a description of which is given in No. 1 of the present series of publications.

The observations have been made by E. TØNSBERG. The reading of the hourly values and the calculation work have been performed by STEINAR BERGER, JOHN PRØSHAUG and JON VALEN.

SCALE VALUES.

The following scale-values have been determined:

D-curves:	1'.45	4.73 γ per mm
H-curves		5.13 γ per mm
V-curves		6.80 γ per mm

BASE-LINE VALUES.

The absolute measurements of Declination and Horizontal Intensity resulted in the table given, below of observed and adopted base-line values. An error of about 3 in the Declination observations — caused by torsion in a new thread — was fortunately discovered by the Swedish colleagues *Ambolt* and *Ålesund* who paid the observatory a visit last august to make comparative measurements.

The Vertical Intensity base-line value from the perceding years is still employed. Some measurements, however, undertaken in March 1947 with BMZ 16 and BMZ 27 — the instruments kindly lent out by professor TRUMPY, Magnetic Bureau — indicated that our Vertical Intensity base-line value was several γ too low. But as the results with the two instruments failed to be mutually in good agreement, we have decided not to change the base-line value till the question could be finally settled in the course of 1948.

The quiet mean Inclination value for the year was calculated to $77^{\circ} 32'.2$.

The temperature coefficient for the H-variometer is 7.3 γ per degree Celsius, and for the V-variometer — 1.3 γ per degree Celsius.

OBSERVED AND ADOPTED BASE-LINE VALUES FOR H AND D .

Date	D observed	D adopted	Date	H observed	H adopted
I 11	$1^{\circ} 47'.1$ W	$1^{\circ} 47'.2$ W	VII 2	11205 γ	11208 γ
V 23	47.4	.2	5	11	08
VII 2	46.5	46.5	10	10	08
5	46.2	.5	16	05	08
10	46.8	.5	VIII 26	10	08
16	46.4	.5	X 11	17	08
VIII 26	46.6	.5	XI 5	08	08
IX 24	46.5	.5			
27	46.4	.5			
29	46.8	.5			
X 11	46.2	.5			
XI 5	46.1	.5			
XII 30	46.6	.5			

EXPLANATION OF TABLES.

For each of the components D , H , and V two series of tables are given. One series gives, in the usual way, the hourly mean values centered at half hours Gr. M. T. In these tables the column headed M gives the ordinary diurnal means. R designates the range, i. e. the difference between the maximum and minimum value measured on the magnetogram. The horizontal line marked M gives the monthly means of the hourly values, and the line marked OM gives the monthly means of the *quiet* hourly values. The second series of tables gives the hourly values of the Storminess («average perturbing force» or «activity»). As to the definition of the storminess and the method for separating it, we refer to Nos. 2 and 4 in the present series of publications. In the storminess tables the column headed M gives the diurnal means. The columns headed PS , NS and AS give the diurnal sum of the positive, negative and absolute storminess, respectively. The column headed CH gives the magnetic character numbers. We consider the diurnal sum of the absolute storminess as the best expression of the magnetic activity during a day, and we will use that quantity for defining the character numbers. Only the strongest perturbed component, the Horizontal Intensity, is used in characterisation. Character number 0 comprises diurnal sum of absolute storminess (AS) up to 400, character number 1 from 400 to 1200, and character number 2 figures higher than 1200. The horizontal line marked M contains the monthly means of the hourly values, and the two lines marked MPS and MNS give the monthly means of the positive and the negative storminess, respectively.

In D the storminess is reckoned positive towards magnetic west, in H positive towards magnetic north, and in V positive downwards.

In addition to the main tables resuming tables, figures, and vector diagrams are given at the end of the year-book.

TABLES

Tromsø. Declination. D = 1° W + Tabular Quantities expressed in Tenths of Minutes.

Gr. M. T.

JANUARY 1947.

HOURLY MEAN VALUES

Table for January 1947 showing hourly mean values for declination. Columns include Day (1-31), hours (1-24), and values (M, R).

FEBRUARY.

Table for February showing hourly mean values for declination. Columns include Day (1-28), hours (1-24), and values (M, R).

MARCH.

Table for March showing hourly mean values for declination. Columns include Day (1-31), hours (1-24), and values (M, R).

Tromsø.

Declination. Storminess. (+ W) Unit Gamma.

Gr. M. T.

JANUARY 1947.

HOURLY MEAN VALUES

Table for January 1947 showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-31), M, PS, NS, AS.

FEBRUARY.

Table for February showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-28), M, PS, NS, AS.

MARCH.

Table for March showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-31), M, PS, NS, AS.

EINAR TØNSBERG and STEINAR BERGER

Tromsø. Declination. D = 1° W + Tabular Quantities expressed in Tenths of Minutes.

Gr. M. T.

APRIL 1947.

HOURLY MEAN VALUES

Table for April 1947 showing hourly mean values for declination. Columns include Day (1-30), hours (1-24), and values for M and R.

MAY.

Table for May showing hourly mean values for declination. Columns include Day (1-31), hours (1-24), and values for M and R.

JUNE.

Table for June showing hourly mean values for declination. Columns include Day (1-30), hours (1-24), and values for M and R.

Tromsø.

Declination. Storminess. (+ W) Unit Gamma.

Gr. M. T.

APRIL 1947.

HOURLY MEAN VALUES

Table for April 1947 showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-30), M, PS, NS, AS, and summary rows for M, PS, NS, AS, MPS, and MNS.

MAY.

Table for May showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-31), M, PS, NS, AS, and summary rows for M, PS, NS, AS, MPS, and MNS.

JUNE.

Table for June showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-30), M, PS, NS, AS, and summary rows for M, PS, NS, AS, MPS, and MNS.

Tromsø. Declination. D = 1° W + Tabular Quantities expressed in Tenths of Minutes. Gr. M. T.

Table for July 1947. Columns: DAY, 1-23, M, R. Rows: 1-31, M, QM. Values range from 126 to 580.

Table for August. Columns: DAY, 1-23, M, R. Rows: 1-31, M, QM. Values range from 126 to 580.

Table for September. Columns: DAY, 1-23, M, R. Rows: 1-30, M, QM. Values range from 126 to 580.

Tromsø.

Declination. Storminess. (+ W) Unit Gamma.

Gr. M. T.

JULY 1947.

HOURLY MEAN VALUES

Table for July 1947 showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-31), M, PS, NS, AS, and summary statistics (MPS, MNS).

AUGUST.

Table for August showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-31), M, PS, NS, AS, and summary statistics (MPS, MNS).

SEPTEMBER.

Table for September showing hourly mean values for Declination, Storminess, and Unit Gamma. Columns include Day (1-30), M, PS, NS, AS, and summary statistics (MPS, MNS).

Tromsø. Declination. D = 1° W + Tabular Quantities expressed in Tenths of Minutes. Gr. M. T.

Table for October 1947 showing hourly mean values for declination. Columns include Day (1-31), M, and R. Values range from approximately -37 to 346.

NOVEMBER.

Table for November showing hourly mean values for declination. Columns include Day (1-30), M, and R. Values range from approximately -552 to 346.

DECEMBER.

Table for December showing hourly mean values for declination. Columns include Day (1-31), M, and R. Values range from approximately -174 to 346.

Tromsø.

Declination. Storminess. (+ W) Unit Gamma.

Gr. M. T.

OCTOBER 1947.

HOURLY MEAN VALUES

Table for October 1947 showing hourly mean values for declination, storminess, and unit gamma. Columns include Day (1-31), 24 hours (1-24), M, PS, NS, AS, MPS, and MNS.

NOVEMBER 1947.

Table for November 1947 showing hourly mean values for declination, storminess, and unit gamma. Columns include Day (1-30), 24 hours (1-24), M, PS, NS, AS, MPS, and MNS.

DECEMBER.

Table for December showing hourly mean values for declination, storminess, and unit gamma. Columns include Day (1-31), 24 hours (1-24), M, PS, NS, AS, MPS, and MNS.

Tromsø. Horizontal Intensity. H = 11100 + Tabular Quantities expressed in Gamma. Gr. M. T.

Table for January 1947. Columns: DAY, 1-23, M, R. Rows: 1-31. Includes monthly totals (M, R) and a QM row.

Table for February. Columns: DAY, 1-23, M, R. Rows: 1-28. Includes monthly totals (M, R) and a QM row.

Table for March. Columns: DAY, 1-23, M, R. Rows: 1-31. Includes monthly totals (M, R) and a QM row.

Tromsø.

Horizontal Intensity, Storminess (+ N). Unit Gamma.

Gr. M. T.

JANUARY 1947.

HOURLY MEAN VALUES

Table for January 1947 showing hourly mean values for magnetic intensity, storminess, and other parameters (M, PS, NS, AS, CH) across 31 days.

FEBRUARY.

Table for February showing hourly mean values for magnetic intensity, storminess, and other parameters (M, PS, NS, AS, CH) across 28 days.

MARCH.

Table for March showing hourly mean values for magnetic intensity, storminess, and other parameters (M, PS, NS, AS, CH) across 31 days.

Tromsø. Horizontal Intensity. H = 11100 + Tabular Quantities expressed in Gamma. Gr. M. T.

Table for APRIL 1947. HOURLY MEAN VALUES. Columns: DAY, 1-23, M, R. Rows: 1-30, M, QM.

Table for MAY. HOURLY MEAN VALUES. Columns: DAY, 1-23, M, R. Rows: 1-30, M, QM.

Table for JUNE. HOURLY MEAN VALUES. Columns: DAY, 1-23, M, R. Rows: 1-30, M, QM.

Tromsø.

Horizontal Intensity. Storminess (+ N). Unit Gamma.

Gr. M. T.

APRIL 1947.

HOURLY MEAN VALUES

Table for April 1947 showing hourly mean values for days 1-30. Columns include Day, 24 hours of intensity/storminess, and summary statistics (M, PS, NS, AS, CH).

MAY.

Table for May showing hourly mean values for days 1-31. Columns include Day, 24 hours of intensity/storminess, and summary statistics (M, PS, NS, AS, CH).

JUNE.

Table for June showing hourly mean values for days 1-30. Columns include Day, 24 hours of intensity/storminess, and summary statistics (M, PS, NS, AS, CH).

Tromsø. Horizontal Intensity. H = 11100 + Tabular Quantities expressed in Gamma.

Gr. M. T.

JULY 1947.

HOURLY MEAN VALUES

Table for July 1947 showing hourly mean values for horizontal intensity. Columns include Day (1-31), hours (1-23), and monthly totals (M, R). Values range from -55 to 354.

AUGUST.

Table for August showing hourly mean values for horizontal intensity. Columns include Day (1-31), hours (1-23), and monthly totals (M, R). Values range from -43 to 664.

SEPTEMBER.

Table for September showing hourly mean values for horizontal intensity. Columns include Day (1-30), hours (1-23), and monthly totals (M, R). Values range from -38 to 77.

Tromsø.

Horizontal Intensity. Storminess (+ N). Unit Gamma.

Gr. M. T.

JULY 1947.

HOURLY MEAN VALUES

Table for July 1947 showing hourly mean values for magnetic intensity and storminess. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS, CH).

AUGUST.

Table for August 1947 showing hourly mean values for magnetic intensity and storminess. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS, CH).

SEPTEMBER.

Table for September 1947 showing hourly mean values for magnetic intensity and storminess. Columns include Day (1-30), hours (1-24), and summary statistics (M, PS, NS, AS, CH).

Tromsø.

Horizontal Intensity. Storminess (+ N). Unit Gamma.

Gr. M. T.

OCTOBER 1947.

HOURLY MEAN VALUES

Table for October 1947 showing hourly mean values for magnetic intensity and storminess. Columns include Day, hours 1-24, M, PS, NS, AS, CH, and summary rows for M, MPS, and MNS.

NOVEMBER 1947.

Table for November 1947 showing hourly mean values for magnetic intensity and storminess. Columns include Day, hours 1-24, M, PS, NS, AS, CH, and summary rows for M, MPS, and MNS.

DECEMBER.

Table for December showing hourly mean values for magnetic intensity and storminess. Columns include Day, hours 1-24, M, PS, NS, AS, CH, and summary rows for M, MPS, and MNS.

Tromsø. Vertical Intensity. V = 50500 + Tabular Quantities expressed in Gamma.

Gr. M. T.

JANUARY 1947.

HOURLY MEAN VALUES

Table for January 1947 showing hourly mean values for vertical intensity. Columns include Day, hours 1-24, M, and R. Data points range from approximately 35 to 129.

FEBRUARY.

Table for February showing hourly mean values for vertical intensity. Columns include Day, hours 1-24, M, and R. Data points range from approximately 40 to 265.

MARCH.

Table for March showing hourly mean values for vertical intensity. Columns include Day, hours 1-24, M, and R. Data points range from approximately 40 to 445.

Tromsø.

Vertical Intensity. Storminess (+ Down). Unit Gamma.

Gr. M. T.

JANUARY 1947.

HOURLY MEAN VALUES

Table for January 1947 showing magnetic observations. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS).

FEBRUARY.

Table for February 1947 showing magnetic observations. Columns include Day (1-28), hours (1-24), and summary statistics (M, PS, NS, AS).

MARCH.

Table for March 1947 showing magnetic observations. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS).

Tromsø. Vertical Intensity. V = 50500 + Tabular Quantities expressed in Gamma.

Gr. M. T.

APRIL 1947.

HOURLY MEAN VALUES

Table for April 1947 showing hourly mean values for vertical intensity. Columns include Day (1-30), hours (1-24), and monthly totals (M, R). Values range from approximately 47 to 117.

MAY.

Table for May showing hourly mean values for vertical intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R). Values range from approximately 50 to 175.

JUNE.

Table for June showing hourly mean values for vertical intensity. Columns include Day (1-30), hours (1-24), and monthly totals (M, R). Values range from approximately 40 to 240.

Tromsø.

Vertical Intensity. Storminess (+ Down). Unit Gamma.

Gr. M. I.

APRIL 1947.

HOURLY MEAN VALUES

Table for April 1947 showing hourly mean values for vertical intensity, storminess, and unit gamma. Columns include Day (1-30), 24 hours (1-24), M, PS, NS, AS, MPS, and MNS.

MAY.

Table for May showing hourly mean values for vertical intensity, storminess, and unit gamma. Columns include Day (1-31), 24 hours (1-24), M, PS, NS, AS, MPS, and MNS.

JUNE.

Table for June showing hourly mean values for vertical intensity, storminess, and unit gamma. Columns include Day (1-30), 24 hours (1-24), M, PS, NS, AS, MPS, and MNS.

Tromsø. Vertical Intensity. V = 50500 + Tabular Quantities expressed in Gamma.

Gr. M. T.

JULY 1947.

HOURLY MEAN VALUES

Table for July 1947 showing hourly mean values for vertical intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R). Values range from approximately 40 to 350 Gamma.

AUGUST.

Table for August showing hourly mean values for vertical intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R). Values range from approximately 40 to 350 Gamma.

SEPTEMBER.

Table for September showing hourly mean values for vertical intensity. Columns include Day (1-30), hours (1-24), and monthly totals (M, R). Values range from approximately 40 to 350 Gamma.

Tromsø.

Vertical Intensity. Storminess (+ Down). Unit Gamma.

Gr. M. I.

JULY 1947.

HOURLY MEAN VALUES

Table for July 1947 showing hourly mean values for vertical intensity and storminess. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS).

AUGUST.

Table for August showing hourly mean values for vertical intensity and storminess. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS).

SEPTEMBER.

Table for September showing hourly mean values for vertical intensity and storminess. Columns include Day (1-30), hours (1-24), and summary statistics (M, PS, NS, AS).

Tromsø. Vertical Intensity. V = 50500 + Tabular Quantities expressed in Gamma.

Gr. M. T.

Table for October 1947. Columns: DAY, 1-25, M, R. Rows: 1-31. Values range from approximately 85 to 330.

Table for November. Columns: DAY, 1-23, M, R. Rows: 1-30. Values range from approximately 58 to 188.

Table for December. Columns: DAY, 1-23, M, R. Rows: 1-31. Values range from approximately 62 to 142.

Tromsø.

Vertical Intensity. Storminess (+ Down). Unit Gamma.

Gr. M. T.

OCTOBER.

HOURLY MEAN VALUES

Table for October showing hourly mean values for vertical intensity and storminess. Columns include Day (1-31), 24 hours (1-24), M, PS, NS, AS. Summary rows for M, PS, NS, AS are provided at the bottom of the table.

NOVEMBER.

Table for November showing hourly mean values for vertical intensity and storminess. Columns include Day (1-30), 24 hours (1-24), M, PS, NS, AS. Summary rows for M, PS, NS, AS are provided at the bottom of the table.

DECEMBER.

Table for December showing hourly mean values for vertical intensity and storminess. Columns include Day (1-31), 24 hours (1-24), M, PS, NS, AS. Summary rows for M, PS, NS, AS are provided at the bottom of the table.

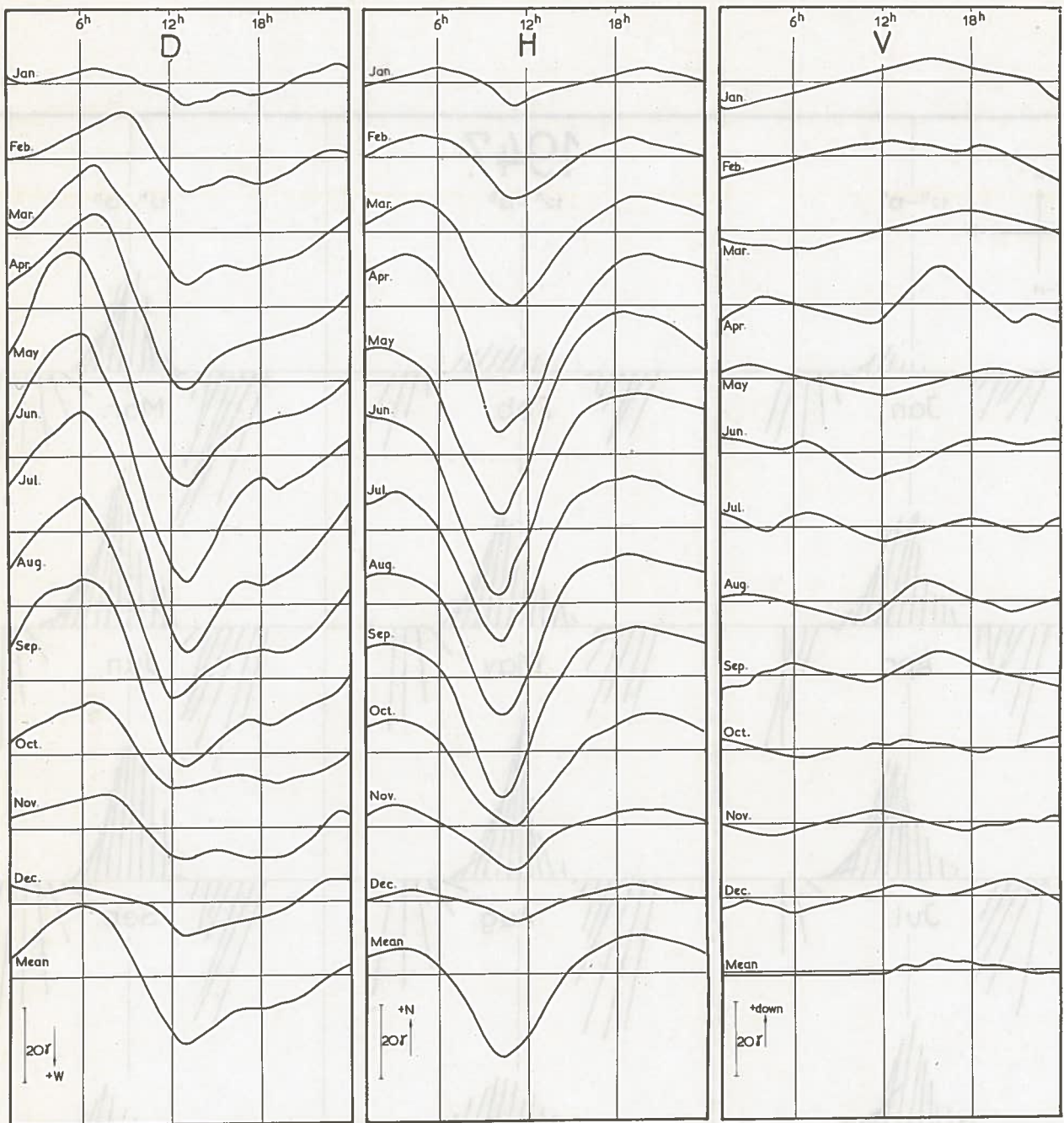


Fig. 1. The Quiet Diurnal Variation, smoothed Values.

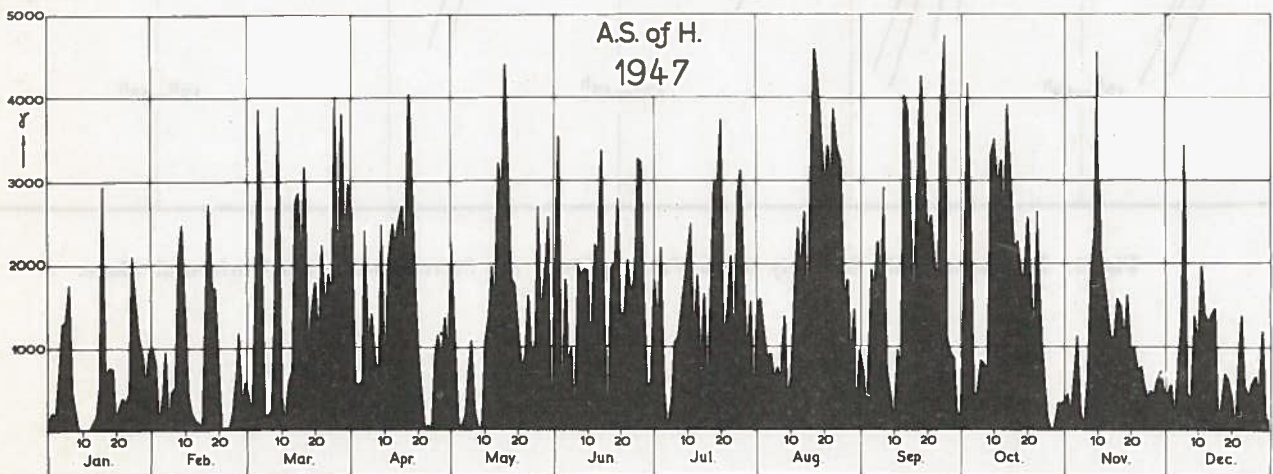


Fig. 2. The Diurnal Sum of the Absolute Storminess of H.

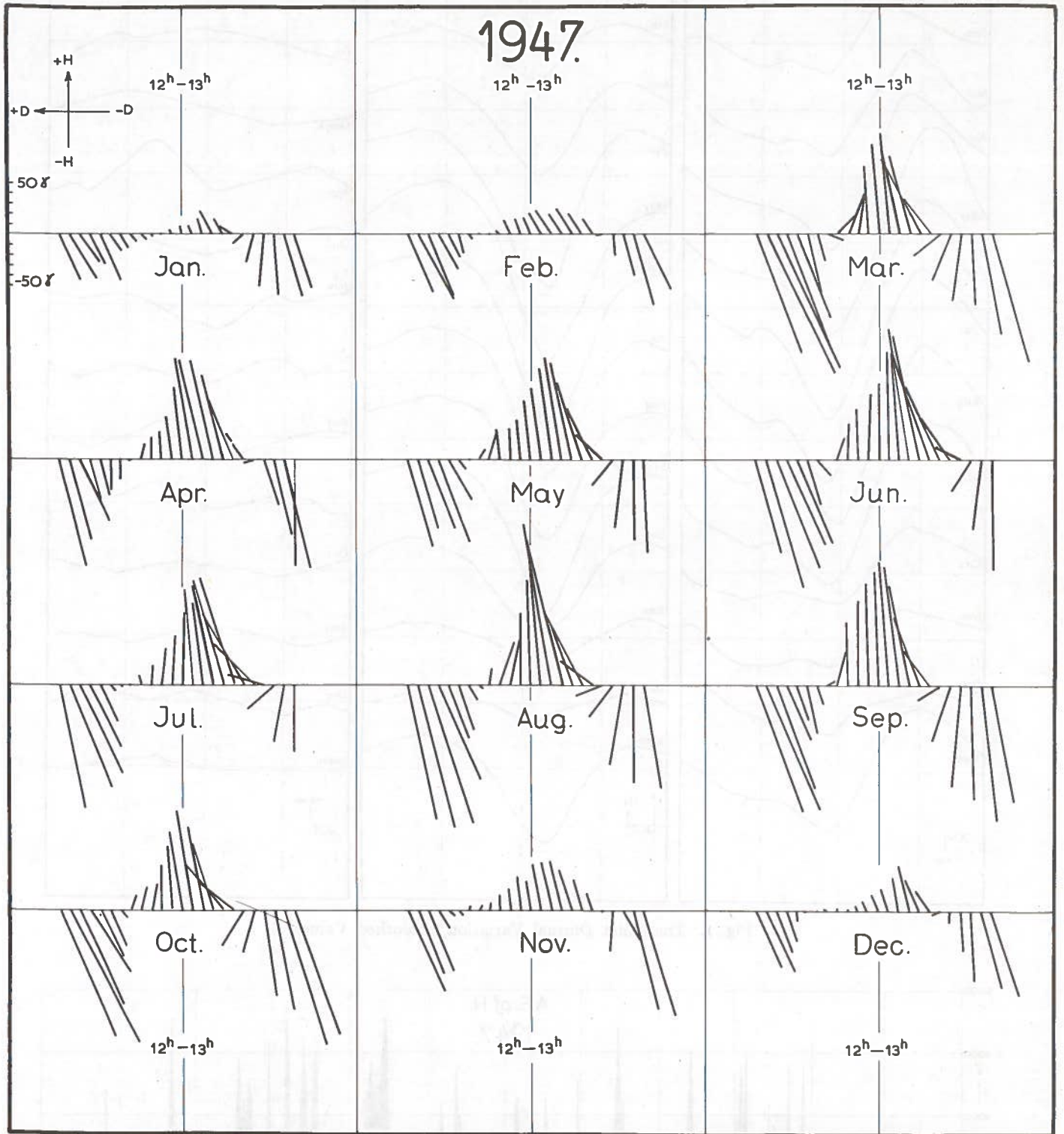


Fig. 3. Diagrams of the Monthly Mean Values (M) of the Storminess in the Horizontal Plane.

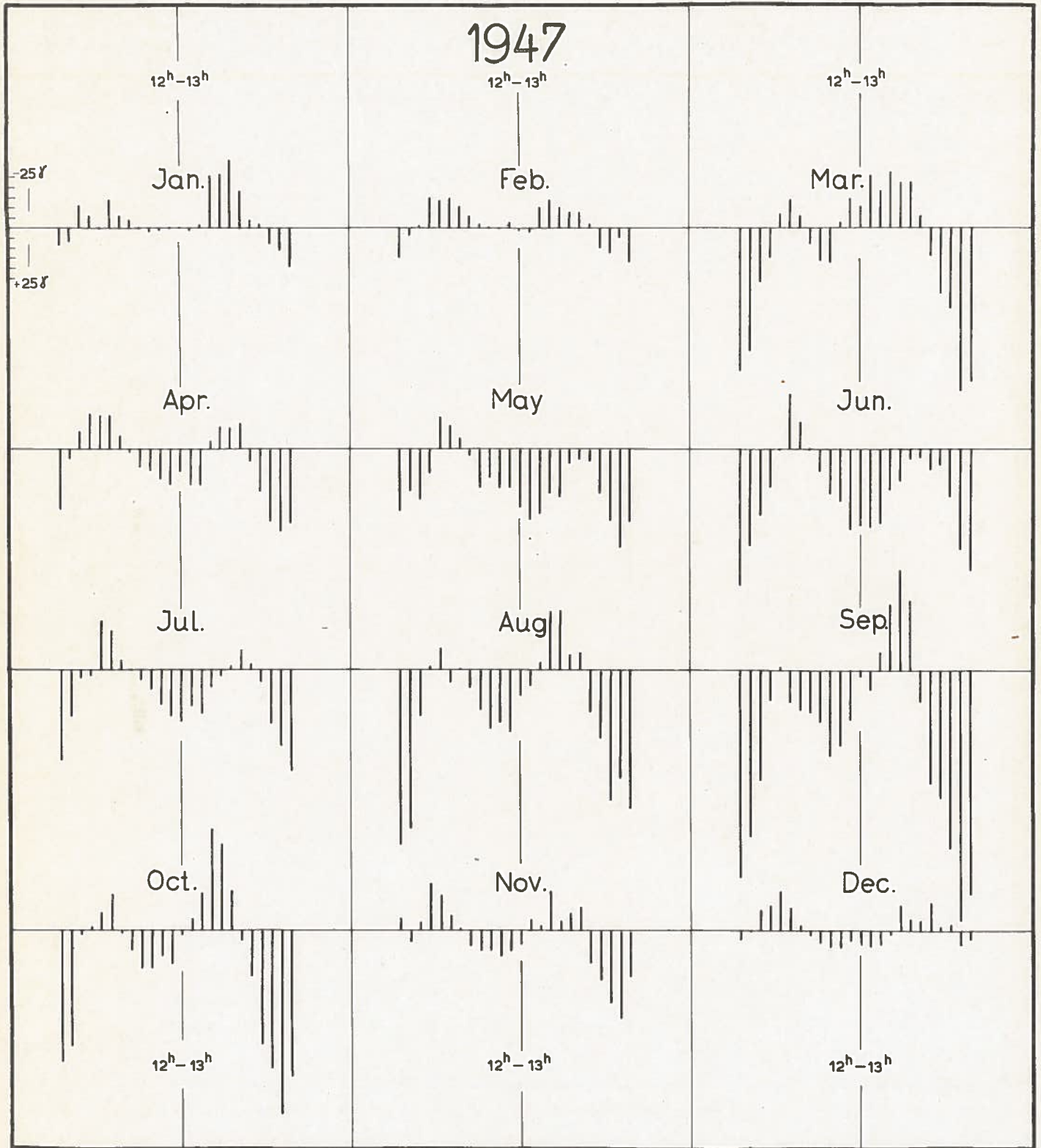
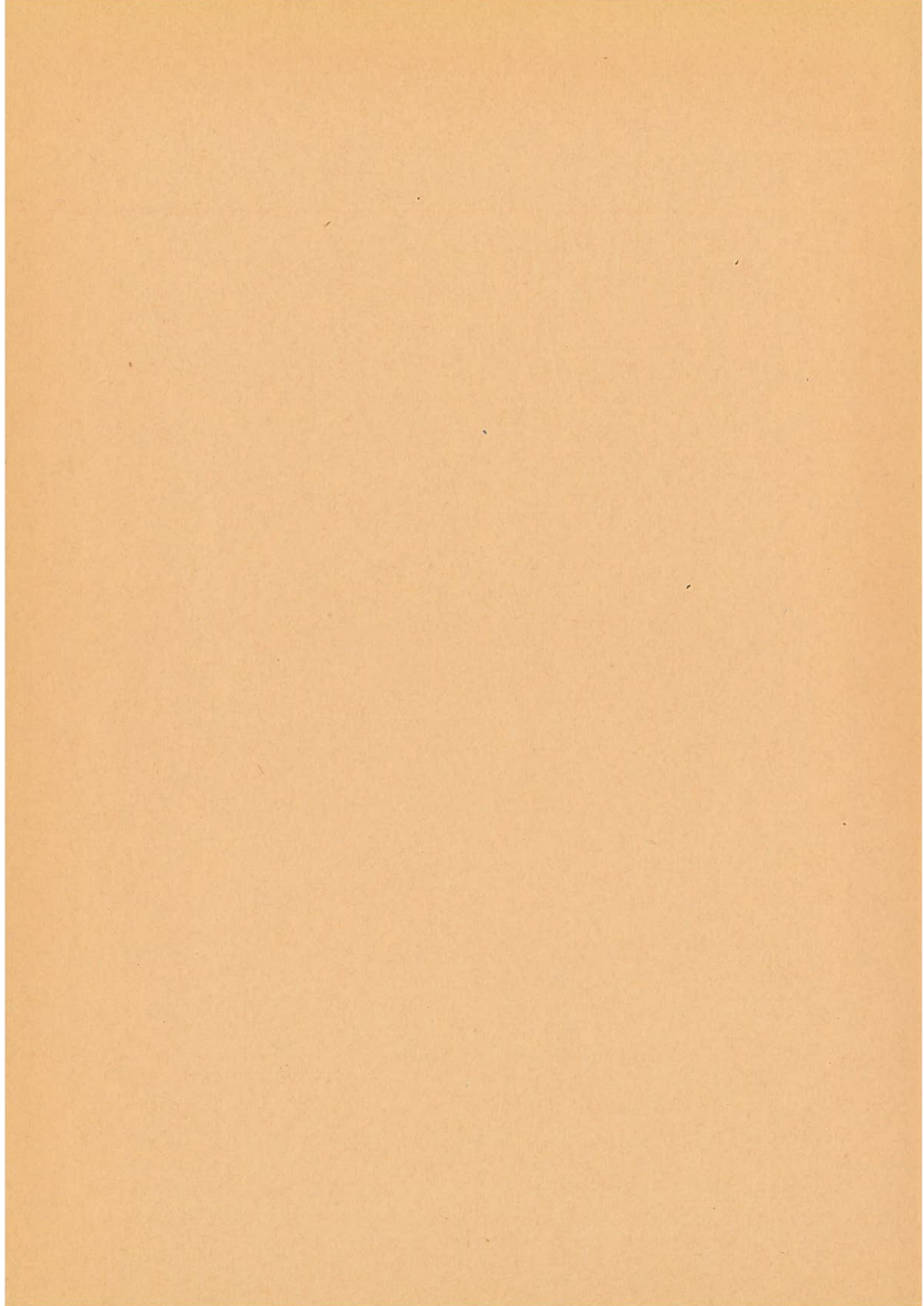


Fig. 4. Diagrams of the Monthly Mean Values (*M*) of the Storminess of the Vertical Intensity.



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1. The Auroral Observatory at Tromsø by The Executive Committee. 1932.
2. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1930 by LEIV HARANG, O. KROGNESS and E. TØNSBERG. Bergen 1933.
3. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1931 by LEIV HARANG and E. TØNSBERG. Bergen 1933.
4. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1932 by LEIV HARANG and E. TØNSBERG. Bergen 1934.
5. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1933 by LEIV HARANG and E. TØNSBERG. Bergen 1934.
6. Norwegian Publications from the International Polar Year 1932—33. No. 2. Work on Terrestrial Magnetism, Aurora and Allied Phenomena, under the auspices of Det Norske Institutt for Kosmisk Fysikk. Bergen 1935.
7. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1934 by LEIV HARANG and E. TØNSBERG. Bergen 1935.
8. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1935 by LEIV HARANG and E. TØNSBERG. Bergen 1936.
9. O. KROGNESS and K. F. WASSERFALL: Results from the Magnetic Station at Dombås. 1916—33. Det Magnetiske Byrå, 1936.
10. K. F. WASSERFALL: Some of the Most Characteristic Features of Magnetic Elements. Det Magnetiske Byrå. 1937.
11. The Auroral Observatory at Tromsø. Results of Radio Echo Observations for the Years 1935 and 1936 by LEIV HARANG. Bergen 1937.
12. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1936 by LEIV HARANG and E. TØNSBERG. Bergen 1937.
13. B. TRUMPY and K. F. WASSERFALL: Results from the Magnetic Station at Dombås 1934—36. Det Magnetiske Byrå. 1938.
14. The Auroral Observatory at Tromsø. Results of Radio Echo Observations for the Year 1937 by LEIV HARANG. Bergen 1938.
15. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1937 by LEIV HARANG and E. TØNSBERG. Bergen 1938.
16. K. F. WASSERFALL: Contribution to the Study of the Variation in Magnetic Elements. Det Magnetiske Byrå. 1939.
17. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1938 by LEIV HARANG and E. TØNSBERG. Bergen 1939.
18. B. TRUMPY and K. F. WASSERFALL: Results from the Magnetic Station at Dombås 1937 and 1938. Det Magnetiske Byrå 1940.
19. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1939 by LEIV HARANG and E. TØNSBERG. Bergen 1941.
20. B. TRUMPY and K. F. WASSERFALL: Results from the Magnetic Station at Dombås 1938. Det Magnetiske Byrå 1941.
21. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1940 by LEIV HARANG and E. TØNSBERG. Bergen 1943.
22. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1941 by LEIV HARANG and E. TØNSBERG. Bergen 1943.
23. B. TRUMPY and K. F. WASSERFALL: Results from the Magnetic Station at Dombås 1940 and 1941. Det Magnetiske Byrå 1944.
24. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1942 by LEIV HARANG and E. TØNSBERG. Bergen 1944.
25. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1943 by LEIV HARANG and E. TØNSBERG. Bergen 1946.
26. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1944 by LEIV HARANG and E. TØNSBERG. Bergen 1947.
27. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1945 by LEIV HARANG and E. TØNSBERG. Bergen 1948.
28. B. TRUMPY and K. F. WASSERFALL: Results from the Magnetic Station at Dombås 1942 and 1945. Det Magnetiske Byrå, Bergen 1949.
29. The Auroral Observatory at Tromsø: Results of Magnetic Observations for the Year 1946 by EINAR TØNSBERG and Mr. STEINAR BERGER. Bergen 1949.