

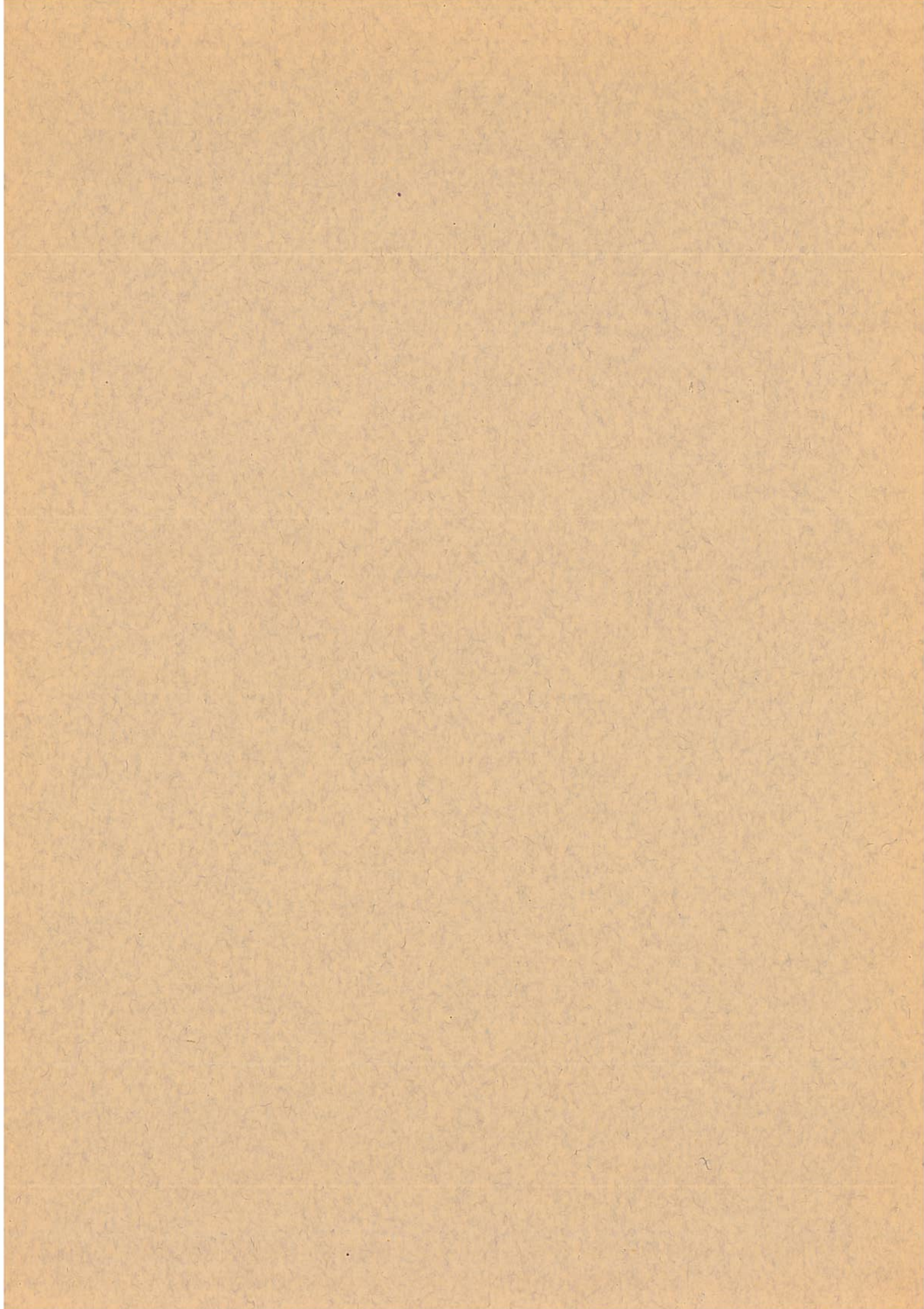
Publikasjoner fra  
DET NORSKE INSTITUTT FOR KOSMISK FYSIKK  
Nr. 21

THE AURORAL OBSERVATORY AT TROMSØ  
( $\varphi = 69^{\circ} 39'.8 \text{ N}$ ,  $\lambda = 18^{\circ} 56'.6 \text{ E Gr.}$ )  
RESULTS OF MAGNETIC OBSERVATIONS  
FOR THE YEAR 1940

BY  
LEIV HARANG and E. TÖNSBERG

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1941  
A.S JOHN GRIEGS BOKTRYKKERI, BERGEN



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

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**RESULTS OF MAGNETIC OBSERVATIONS  
FOR THE YEAR 1940**

BY

**LEIF HARANG and E. TÖNSBERG**

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**GENERAL REMARKS**

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

The observations were made by E. TÖNSBERG. The reading of the hourly values and the calculation work have been performed by Mrs. ANNA JAKLIN.

**SCALE VALUES**

The following scale-values have been determined:

D-curves: 1'.45 or 4.77  $\gamma$  per mm  
H-curves: .....5.10  $\gamma$  per mm  
V-curves: .....6.80  $\gamma$  per mm

**BASE-LINE VALUES**

The absolute measurements of Declination and Horizontal Intensity result in the table given below of observed and adopted base-line values. The Vertical Intensity base-line value — 50 220  $\gamma$  — from the preceding years is still employed, as we are trusting more to the stability of the V-variometer than to the accuracy of the Inclination measurements. The mean Inclination value throughout the year is  $77^{\circ} 22'.0$ .

The temperature coefficient for the H-variometer is 8.0  $\gamma$  per degree Celcius and for the V-variometer  $\div$  1.3  $\gamma$  per degree Celcius.

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

Date	$D$ observed	$D$ adopted	$H$ observed	$H$ adopted
I 23	2° 34'.1 W	2° 34'.0 W	11 186 $\gamma$	11 184 $\gamma$
II 17	33.9	.0	84	84
III 15	33.8	.0	86	84
V. 23	34.1	.0	84	84
VI. 18	34.1	.0	83	84
VII. 18	33.7	.0	83	84
VIII. 13	33.9	.0	82	84
IX. 12	34.0	.0	82	84
IX. 24	34.1	.0	83	84
X. 31	34.2	.0	86	84
XII. 28	34.2	.0	84	84

## EXPLANATION OF THE 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 *quiet* hourly values.

The second series of the 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 No. 2 and No. 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 for the magnetic activity during a day, and we will use the 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 the absolute storminess ( $AS$ ) up to 400  $\gamma$ , character number 1 from 400  $\gamma$  to 1200  $\gamma$  and character number 2 greater than 1200  $\gamma$ . 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 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.

Table 1. The effect of various factors on the rate of growth of the rat. (Continued from p. 10)

Factor	Rate of growth (g/day)
1. Food	1.5
2. Water	1.5
3. Temperature	1.5
4. Humidity	1.5
5. Light	1.5
6. Noise	1.5
7. Social contact	1.5
8. Genetic factors	1.5
9. Age	1.5
10. Sex	1.5
11. Breed	1.5
12. Nutrition	1.5
13. Disease	1.5
14. Parasites	1.5
15. Stress	1.5
16. Handling	1.5
17. Transportation	1.5
18. Acclimatization	1.5
19. Season	1.5
20. Time of day	1.5
21. Time of year	1.5
22. Time of birth	1.5
23. Time of weaning	1.5
24. Time of mating	1.5
25. Time of pregnancy	1.5
26. Time of lactation	1.5
27. Time of weaning of offspring	1.5
28. Time of death	1.5
29. Time of necropsy	1.5
30. Time of fixation	1.5
31. Time of staining	1.5
32. Time of sectioning	1.5
33. Time of mounting	1.5
34. Time of display	1.5
35. Time of storage	1.5
36. Time of retrieval	1.5
37. Time of examination	1.5
38. Time of interpretation	1.5
39. Time of publication	1.5
40. Time of citation	1.5

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Tromsø. Declination.  $D = 2^\circ W +$  Tabular Quantities expressed in Tenths of Minutes. Gr. M. T.

JANUARY 1940.

HOURLY MEAN VALUES

Table for January 1940 showing hourly mean values for declination. Columns include Day (1-31) and values for hours 1-24, plus M and R columns.

FEBRUARY.

Table for February showing hourly mean values for declination. Columns include Day (1-29) and values for hours 1-24, plus M and R columns.

MARCH.

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



Tromsø.

Declination. Storminess (+ W). Unit Gamma.

Gr. M. T.

JANUARY 1940.

HOURLY MEAN VALUES

Table for January 1940 showing magnetic observations. Columns include Day (1-31), 24 hours of declination/storminess values, and summary statistics (M, PS, NS, AS).

FEBRUARY.

Table for February 1940 showing magnetic observations. Columns include Day (1-28), 24 hours of declination/storminess values, and summary statistics (M, PS, NS, AS).

MARCH.

Table for March 1940 showing magnetic observations. Columns include Day (1-31), 24 hours of declination/storminess values, and summary statistics (M, PS, NS, AS).

Tromsø. Declination. D = 2° W + Tabular Quantities expressed in Tenths of Minutes.

Gr. M. T.

Table for APRIL 1940. Columns: DAY (1-30), 1-23, M, R. Rows: 1-30. Values range from 180 to 450.

Table for MAY. Columns: DAY (1-31), 1-23, M, R. Rows: 1-31. Values range from 125 to 450.

Table for JUNE. Columns: DAY (1-30), 1-23, M, R. Rows: 1-30. Values range from 135 to 450.

Tromsö.

Declination. Storminess (+ W). Unit Gamma.

Gr. M. T.

APRIL 1940.

HOURLY MEAN VALUES

Table for April 1940 showing magnetic observations. Columns include Day (1-30), M, PS, NS, AS, and summary rows for M, MPS, and MNS.

MAY.

Table for May 1940 showing magnetic observations. Columns include Day (1-31), M, PS, NS, AS, and summary rows for M, MPS, and MNS.

JUNE.

Table for June 1940 showing magnetic observations. Columns include Day (1-30), M, PS, NS, AS, and summary rows for M, MPS, and MNS.

Tromsø. Declination. D = 2° W + Tabular Quantities expressed in Tenths of Minutes.

Gr. M. T.

Table for July 1940 showing hourly mean values. Columns include Day (1-31), hours 1-24, and months M and R. Values range from -50 to 360.

Table for August showing hourly mean values. Columns include Day (1-31), hours 1-24, and months M and R. Values range from -50 to 420.

Table for September showing hourly mean values. Columns include Day (1-30), hours 1-24, and months M and R. Values range from -90 to 450.

Tromsø.

Declination. Storminess (+ W). Unit Gamma.

Gr. M. T.

JULY 1940.

HOURLY MEAN VALUES

Table for July 1940 showing hourly mean values for declination and storminess. Columns include Day (1-31), M, PS, NS, AS, and summary rows for M, MNS, and MMS.

AUGUST.

Table for August 1940 showing hourly mean values for declination and storminess. Columns include Day (1-31), M, PS, NS, AS, and summary rows for M, MNS, and MMS.

SEPTEMBER.

Table for September 1940 showing hourly mean values for declination and storminess. Columns include Day (1-30), M, PS, NS, AS, and summary rows for M, MNS, and MMS.

Tromsø. Declination. D = 2° W + Tabular Quantities expressed in Tenths of Minutes.

Gr. M. T.

Table for October 1940 showing hourly mean values for declination. Columns include Day (1-31), hours (1-24), and values (M, R).

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

Table for December 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.

OCTOBER 1940.

HOURLY MEAN VALUES

Table for October 1940 showing magnetic declination and storminess data for each hour of the month. Columns include Day, hours 1-24, M, PS, NS, AS, and summary rows for MFS and MNS.

NOVEMBER.

Table for November 1940 showing magnetic declination and storminess data for each hour of the month. Columns include Day, hours 1-24, M, PS, NS, AS, and summary rows for MFS and MNS.

DECEMBER.

Table for December 1940 showing magnetic declination and storminess data for each hour of the month. Columns include Day, hours 1-24, M, PS, NS, AS, and summary rows for MFS and MNS.

Tromsø. Horizontal Intensity. H = 11200 + Tabular Quantities expressed in Gamma.

Gr. M. T.

Table for January 1940. Columns: DAY (1-31), 1-23, M, R. Rows: Daily data and monthly totals (M, QM).

FEBRUARY.

Table for February. Columns: DAY (1-29), 1-23, M, R. Rows: Daily data and monthly totals (M, QM).

MARCH.

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



Tromsø.

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

Gr. M. T.

JANUARY 1940.

HOURLY MEAN VALUES

Table for January 1940 showing magnetic observations. Columns include DAY (1-31), hours (1-24), and various magnetic intensity and storminess measurements (M, PS, NS, AS, CH).

FEBRUARY.

Table for February 1940 showing magnetic observations. Columns include DAY (1-29), hours (1-24), and various magnetic intensity and storminess measurements (M, PS, NS, AS, CH).

MARCH.

Table for March 1940 showing magnetic observations. Columns include DAY (1-31), hours (1-24), and various magnetic intensity and storminess measurements (M, PS, NS, AS, CH).

Tromsø. Horizontal Intensity. H = 11200 + Tabular Quantities expressed in Gamma.

Gr. M. T.

Table for April 1940 showing hourly mean values (DAY, 1-25) and monthly totals (M, R). Values range from -120 to 300.

Table for May showing hourly mean values (DAY, 1-31) and monthly totals (M, R). Values range from -240 to 300.

Table for June showing hourly mean values (DAY, 1-30) and monthly totals (M, R). Values range from -340 to 300.

Tromsö.

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

Gr. M. T.

APRIL 1940.

HOURLY MEAN VALUES

Table for April 1940 showing magnetic observations. Columns include Day (1-25), M, PS, NS, AS, CH. Rows contain hourly mean values for various parameters.

MAY.

Table for May 1940 showing magnetic observations. Columns include Day (1-31), M, PS, NS, AS, CH. Rows contain hourly mean values for various parameters.

JUNE.

Table for June 1940 showing magnetic observations. Columns include Day (1-30), M, PS, NS, AS, CH. Rows contain hourly mean values for various parameters.

Tromsø. Horizontal Intensity. H = 11200 + Tabular Quantities expressed in Gamma. HOURLY MEAN VALUES

Gr. M. T.

JULY 1940.

Table for July 1940 showing hourly mean values for horizontal intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R).

AUGUST.

Table for August showing hourly mean values for horizontal intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R).

SEPTEMBER.

Table for September showing hourly mean values for horizontal intensity. Columns include Day (1-30), hours (1-24), and monthly totals (M, R).

Tromsø.

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

Gr. M. T.

JULY 1940.

HOURLY MEAN VALUES

Table for July 1940 showing magnetic observations. Columns include Day (1-31), 25 hourly values (1-25), M, PS, NS, AS, CH. Includes summary rows for M, PS, NS, AS, CH and MNS.

AUGUST.

Table for August 1940 showing magnetic observations. Columns include Day (1-31), 25 hourly values (1-25), M, PS, NS, AS, CH. Includes summary rows for M, PS, NS, AS, CH and MNS.

SEPTEMBER.

Table for September 1940 showing magnetic observations. Columns include Day (1-30), 25 hourly values (1-25), M, PS, NS, AS, CH. Includes summary rows for M, PS, NS, AS, CH and MNS.

Tromsø.

Horizontal Intensity. H = 11200 + Tabular Quantities expressed in Gamma.

Gr. M. T.

OCTOBER 1940.

HOURLY MEAN VALUES

Table for October 1940 showing hourly mean values for horizontal intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R).

NOVEMBER.

Table for November showing hourly mean values for horizontal intensity. Columns include Day (1-30), hours (1-24), and monthly totals (M, R).

DECEMBER.

Table for December showing hourly mean values for horizontal intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R).

Tromsø.

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

Gr. M. T.

OCTOBER 1940.

HOURLY MEAN VALUES

Table for October 1940 showing hourly mean values for magnetic intensity and storminess. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS, CR).

NOVEMBER.

Table for November 1940 showing hourly mean values for magnetic intensity and storminess. Columns include Day (1-30), hours (1-24), and summary statistics (M, PS, NS, AS, CR).

DECEMBER.

Table for December 1940 showing hourly mean values for magnetic intensity and storminess. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS, CR).

Tromsø. Vertical Intensity. V = 50300 + Tabular Quantities expressed in Gamma.

Gr. M. T.

JANUARY 1940. HOURLY MEAN VALUES

Table for January 1940 showing hourly mean values for vertical intensity. Columns include Day (1-31), hours (1-24), and monthly totals (M, R).

FEBRUARY.

Table for February showing hourly mean values for vertical intensity. Columns include Day (1-28/30), hours (1-24), and monthly totals (M, R).

MARCH.

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



Tromsø.

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

Gr. M. T.

JANUARY 1940.

HOURLY MEAN VALUES

Table for January 1940 showing magnetic observations. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS). Values range from -16 to 32 for hours and -17 to 3 for summary statistics.

FEBRUARY.

Table for February 1940 showing magnetic observations. Columns include Day (1-29), hours (1-24), and summary statistics (M, PS, NS, AS). Values range from -105 to 112 for hours and -10 to 13 for summary statistics.

MARCH.

Table for March 1940 showing magnetic observations. Columns include Day (1-31), hours (1-24), and summary statistics (M, PS, NS, AS). Values range from 0 to 105 for hours and -13 to 8 for summary statistics.







Tromsø.

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

Gr. M. T.

JULY 1940.

HOURLY MEAN VALUES

Table with columns: DAY, 1-23, M, PS, NS, AS. Rows for July 1-31 and monthly averages.

AUGUST.

Table with columns: DAY, 1-23, M, PS, NS, AS. Rows for August 1-31 and monthly averages.

SEPTEMBER.

Table with columns: DAY, 1-23, M, PS, NS, AS. Rows for September 1-30 and monthly averages.



Tromsø.

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

Gr. M. T.

OCTOBER 1940.

HOURLY MEAN VALUES

Table for October 1940 showing magnetic observations for Tromsø. Columns include Day (1-31), 25 numbered columns of values, and summary columns M, PS, NS, AS. Includes sub-rows for M, MPS, and MNS.

NOVEMBER.

Table for November 1940 showing magnetic observations for Tromsø. Columns include Day (1-30), 25 numbered columns of values, and summary columns M, PS, NS, AS. Includes sub-rows for M, MPS, and MNS.

DECEMBER.

Table for December 1940 showing magnetic observations for Tromsø. Columns include Day (1-31), 25 numbered columns of values, and summary columns M, PS, NS, AS. Includes sub-rows for M, MPS, and MNS.





Resuming Tables.

Storminess.

Tromsø.

Declination. Unit Gamma. + West.

Table with 21 columns and 12 rows (JAN to DEC) showing magnetic declination data for Tromsø. Each row contains 21 numerical values representing observations for that month.

MEAN row for declination data, showing the average of the 21 columns for each month.

Table with 21 columns and 12 rows (JAN to DEC) showing magnetic intensity (MNS) data for Tromsø. Each row contains 21 numerical values representing observations for that month.

MEAN row for intensity data, showing the average of the 21 columns for each month.

Table with 21 columns and 12 rows (JAN to DEC) showing magnetic storminess (MPS) data for Tromsø. Each row contains 21 numerical values representing observations for that month.

MEAN row for storminess data, showing the average of the 21 columns for each month.

Horizontal Intensity. Unit Gamma.

Table with 21 columns and 12 rows (JAN to DEC) showing horizontal magnetic intensity data for Tromsø. Each row contains 21 numerical values representing observations for that month.

MEAN row for horizontal intensity data, showing the average of the 21 columns for each month.

Table with 21 columns and 6 rows (JAN to JUN) showing magnetic intensity (MNS) data for Tromsø. Each row contains 21 numerical values representing observations for that month.

Tromsø.

Vertical Intensity. Storminess (+ Down). Unit Gamma.  
HOURLY MEAN VALUES

Gr. M. T.

APRIL 1940.

Table for April 1940 showing vertical intensity, storminess, and unit gamma values for each hour of the month. Includes columns for Day, Hour (1-24), M, PS, NS, AS.

MAY.

Table for May 1940 showing vertical intensity, storminess, and unit gamma values for each hour of the month. Includes columns for Day, Hour (1-24), M, PS, NS, AS.

JUNE.

Table for June 1940 showing vertical intensity, storminess, and unit gamma values for each hour of the month. Includes columns for Day, Hour (1-24), M, PS, NS, AS.

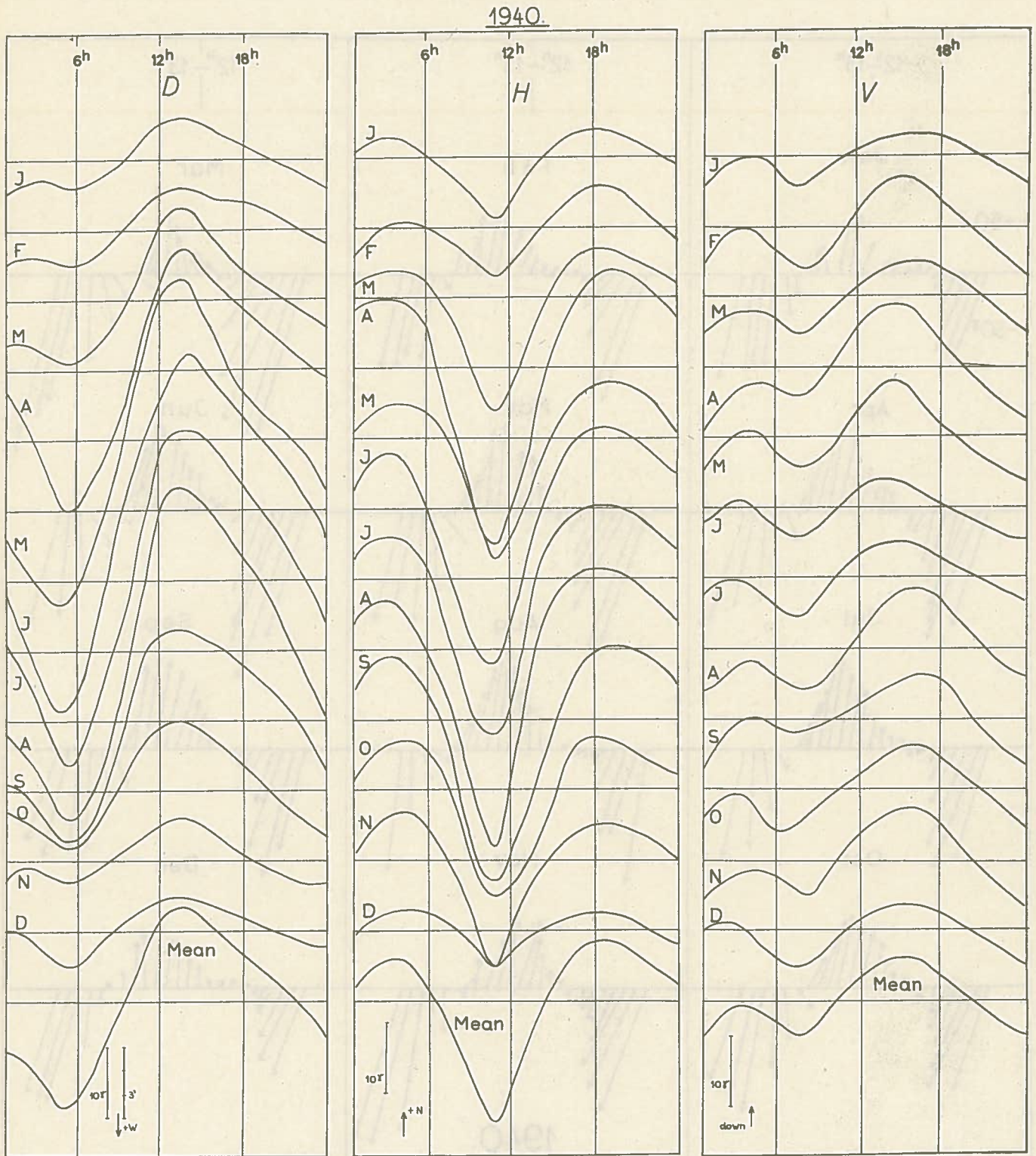


Fig. 1. The Quiet Diurnal Variation, smoothed Values.

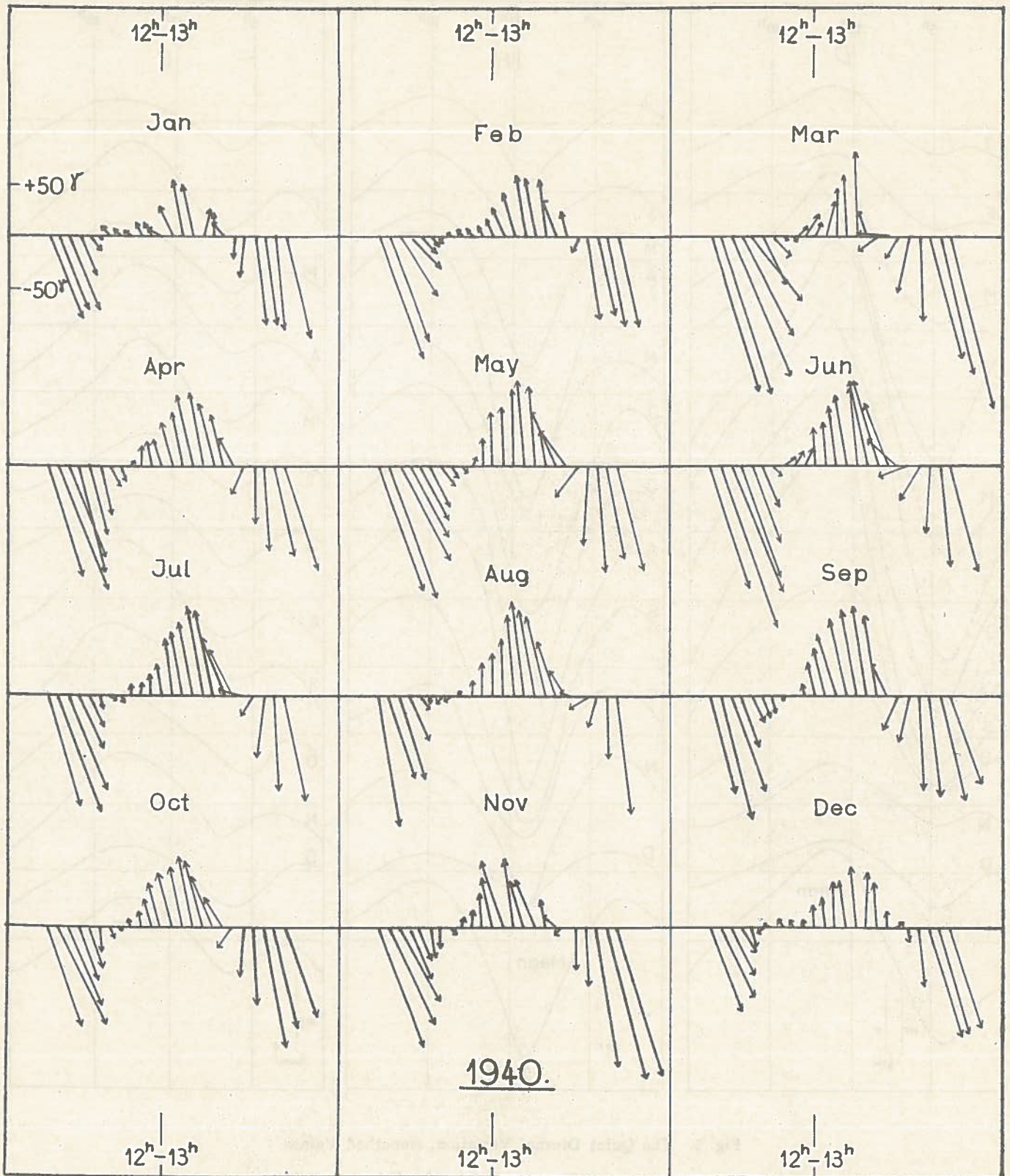


Fig. 3. Diagrams of the Monthly Mean Values ( $M$ ) of the Storminess in the Horizontal Plane.

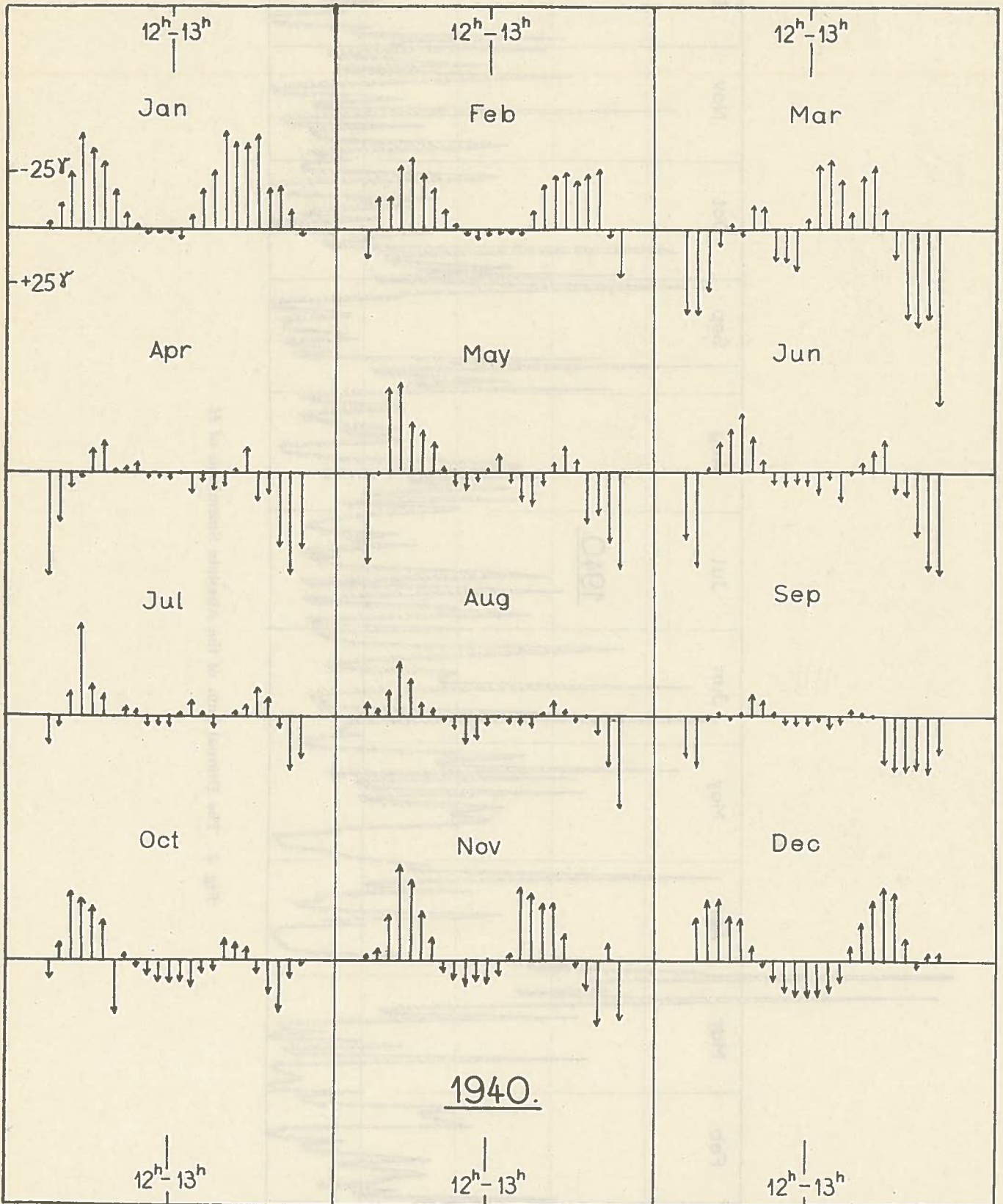


Fig. 4. Diagrams of the Monthly Mean Values ( $M$ ) of the Storminess of the Vertical Intensity.

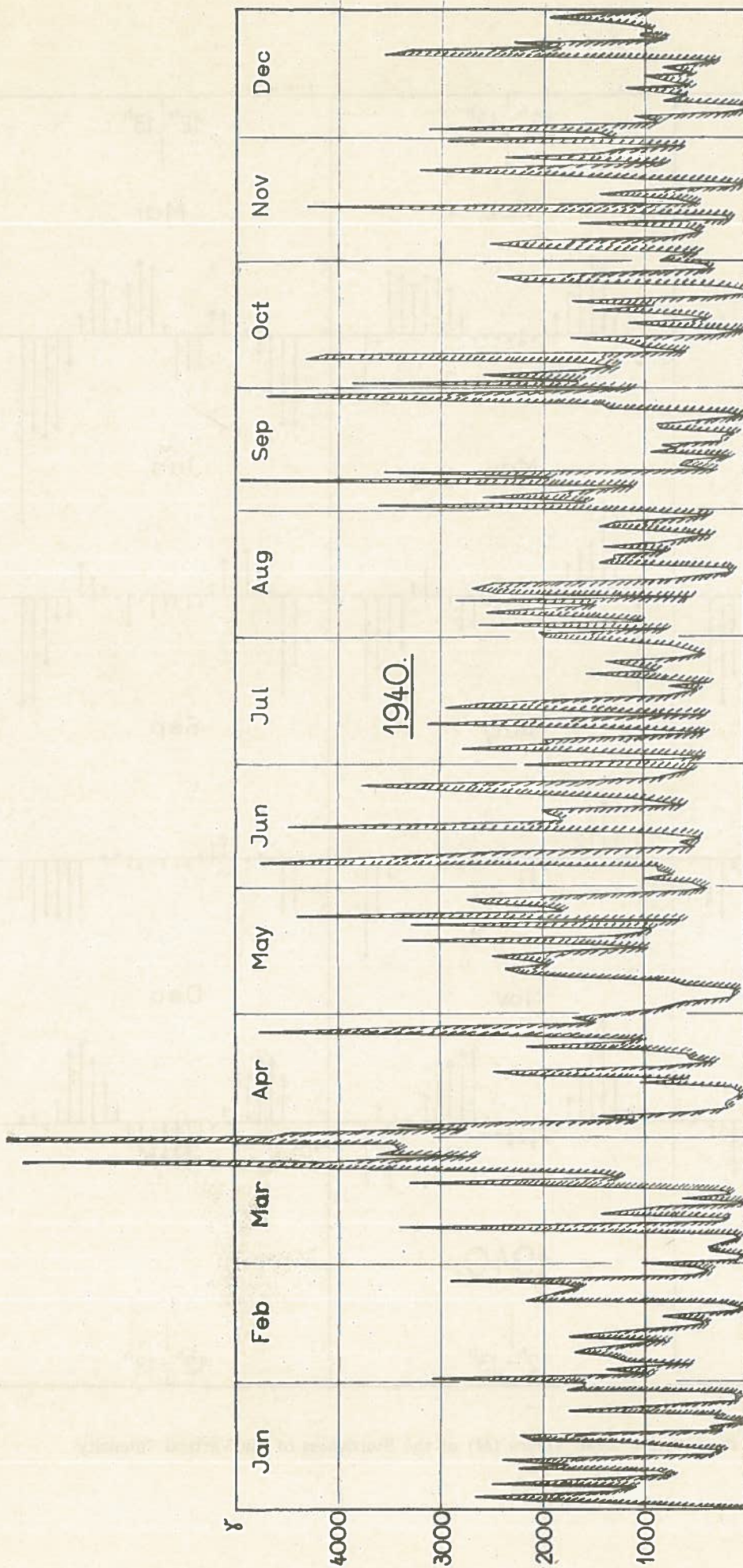


Fig. 2. The Diurnal Sum of the Absolute Storminess of H.



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4. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1932 by LEIV HARANG and E. TØNSBERG. 1934.
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