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1937 AND 1938

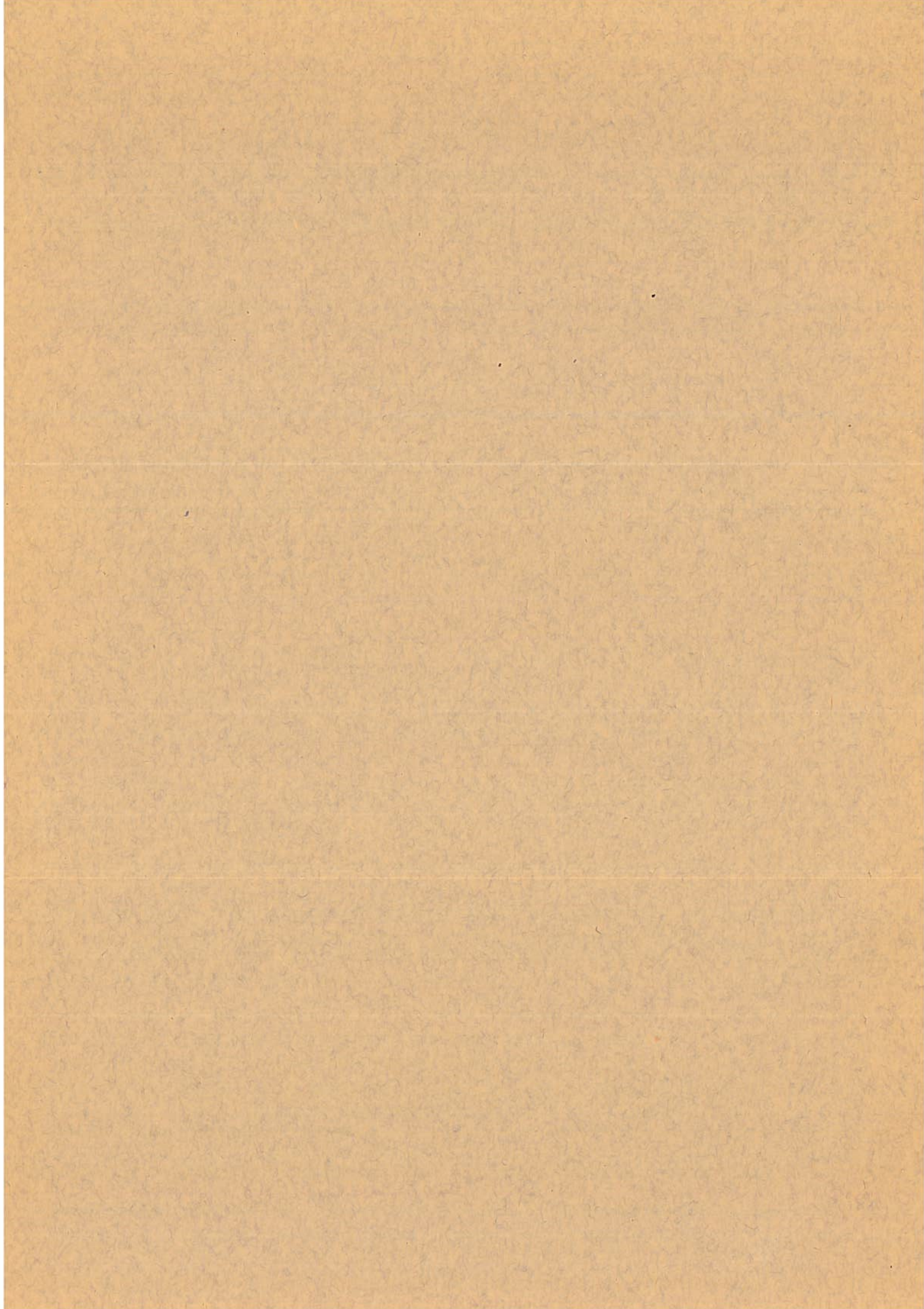
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RESULTS FROM THE MAGNETIC STATION AT DOMBÅS 1937—38

($\varphi = 62^{\circ} 04'.7$ N, $\lambda = 9^{\circ} 05'.8$ E)

BY

B. TRUMPY and K. F. WASSERFALL.

INTRODUCTION

The magnetic station at Dombås was started 1916 and the material collected between the years 1916—36 has been worked up at *Det Magnetiske Byrå* in Bergen. Results for the interval 1916—33 were published in No. 9, and those for 1934—36 in No. 13 of the present series of publications. The most characteristic features in the variation have been discussed in No. 10 and in No. 16 of the same series.

Before *Det Magnetiske Byrå* published the results from Dombås the manner in which to represent the tables was discussed and — owing to the large extension of the tables prepared, it seemed out of the question to print hour values. It was, therefore, decided only to print monthly hour means for storminess, 7-day normals for quiet diurnal variation and daily data for positive and negative storminess, besides the sum of these two quantities. Regarding the leading principles for representing the results and the methods employed we refer to the first publication, No. 9. The Astronomer SIGURD EINBU is still in charge of the station, where the conditions are the same as before. WASSERFALL has, now, as before, worked up the material.

The present paper contains resultant tables and graphs for the two years 1937 and 1938, arranged in more or less the same way as in the previous papers. The tables are arranged in chronological order and placed at the back of the paper in accordance with the list on page 2. On the same page there is a corresponding list for the graphs. In addition to this we shall for the interval July—December, 1938, give a more detailed representation of the results.

For said interval of 1938 we have thus, for D and H given two additional series of tables stating hourly mean values. The first series contains direct hourly values, while the second series gives corresponding hourly values for storminess. These tables will be found on p. p. 14—23, and »*Explanations to the tables*« on page 7* will supply the necessary remarks regarding the various headings of the tables.

Our vertical intensity instrument — *Lloyd's Balance* of the Eschenhagen construction — proves to be too unstable to allow reduction to absolute hour values and for the

present we shall, therefore, only give hour values for storminess, which data can be considered correct in spite of the instability of the instrument.

Before 1938 absolute observations were taken very seldom — such data were not strictly necessary for the computation of the material beyond an approximate value for H , to be used in the calculation of the scale values of the register curves. As — from July 1938 — we intended to publish hourly tables for D , H and V — expressed in absolute units — it was of course necessary to start regular absolute observations at the station, and the required outfit of absolute instruments was, therefore, provided. The instruments used will be found below.

THE SCALE VALUES AND THE TEMPERATURE COEFFICIENTS OF THE VARIOMETERS

Deflection experiments have — as before — been taken once a month. In Table I we give the results calculated by aid of the observed data.

Table I.

Year	Interval	ω'	ε_d	ε_h	ε_v	τ_h	τ_v
1937	Jan.—Dec.	1.73	7.1	5.8	6.0	5.38	— 5.96
1938	Jan.—Jun.	1.73	7.1	5.8	5.8	»	»
1938	Jun.—Dec.	1.67	7.0	5.8	5.8	»	»

ABSOLUTE OBSERVATIONS AND BASE LINE VALUES

Regular absolute observations of D , H and I were started in June 1938 and have since then been made about 5 times a month on an average. The general observer is S. EINBU, but occasionally his son P. EINBU and Prof. TRUMPY attended. The instruments employed on each occasion shall be mentioned below.

As station instruments for Dombås we have taken over some old ones, originally used at Oslo Observatory, and because of this their constants were fairly well known. However, to be on the safe side, observations of comparison were performed in July 1939. On this occasion the observer — E. BARLINDHAUG — made use of instruments which, some time beforehand, had been controlled at *Tromsø Observatory* and at *Rude Skov*, Copenhagen. As the observations of comparison were taken in July 1939, it will be necessary to extend the results for the base line values to embrace also data for that year.

Base line values for the d-curve: For measurement of declination we have a *Bamberg* declinometer, which has usually been employed, except for the interval November to December, 1933, when the old magnetometer *Elliott No. 38* was used. The observations were taken on the wooden pier in the absolute house (cp. No. 9, page 4). The cairn on Veslefjellet served as «*Mark*» at a distance of about 4 km. from the station, with the azimuth: 159° 08'.5.

Observations have been made 2 to 7 times a month, but here we shall limit ourselves to state only monthly mean data, referring to a corresponding mean date. Observed mean D_w will be found in Table II, expressed in degrees and minutes, as well as in γ . In the following two columns we give the mean ordinate and the resulting base line value under the headings d and B_d , respectively. The number of observations, actually taken

during the month, has been added in the next column, then we have the instrument, where *B* stands for BAMBERG, *E* for ELLIOTT and *T*, for TESSDORFF. Finally we state the initials for the observer, where *S. E.* stand for EINBU and *E. B.* for BARLINDHOUG, the latter being responsible for the control observations on 8th and 9th of August, 1939.

Table II.

Year	Date	Observed		d	B_d	numb. of obs.	Instr.	Observer	
		D_w	D_w						
1938	Jun. 12	7	34.9	1836	673	1163	4	B	S. E.
»	» 24		26.6	1805	638	1167	7	»	»
»	Jul. 19		25.7	1802	636	1166	3	»	»
»	Aug. 21		29.1	1815	648	1167	2	»	»
»	Sep. 24		29.2	1815	656	1159	2	»	»
»	Oct. 16		25.9	1803	637	1166	5	»	»
»	Nov. 17		21.8	1787	617	1170	5	E	»
»	Dec. 14		21.9	1787	617	1170	5	»	»
1939	Jan. 25		20.8	1783	616	1167	4	B	»
»	Feb. 17		19.7	1779	608	1171	7	»	»
»	Mar. 16		14.4	1759	588	1171	4	»	»
»	Apr. 17		14.3	1758	593	1165	3	»	»
»	May 14		10.7	1745	578	1167	5	»	»
»	Jun. 17		14.1	1758	592	1166	4	»	»
Mean					<u>1167</u>			
1939	Jul. 14	7	11.2	1747	665	1085	4	B	S. E.
»	Aug. 13		15.6	1763	677	1086	6	»	»
»	Sep. 17		11.0	1746	659	1087	5	»	»
»	Oct. 16		10.8	1745	659	1086	3	»	»
Mean					<u>1085</u>			
1939	Aug. 8	7	20.4	1782	690	1092	2	T	E. B.
»	» 8		17.6	1771	684	1087	2	»	»
»	» 9		20.2	1781	696	1085	2	»	»
»	» 9		21.4	1785	701	1084	2	»	»
Mean					<u>1087</u>			

The table has been divided into three parts, where we see that $B_d = 1167$ represents the mean for the interval June 1938 to June 1939. After the break in the base line we get $B_d = 1085$, which value agrees fairly well with the control observation with the TESSDORFF in August 1939: $B_d = 1087$.

Base line values for the h-curve: To start with, we used *Elliott No. 38* as station instrument for observation of horizontal intensity. However, as the observations with this instrument did not seem to give base line values with satisfactory high degree of exactness, we have now purchased a torsion-instrument of LA COUR's construction, designation *Q. H. M. No. 15*. The first observation taken with this instrument will be seen to be 1st of November 1939.

In Table III we will find mean monthly data for observed H , the corresponding ordinate h_o — corrected corresponding to a base line value referred to 0° C. — and resulting baseline values Bh_o . In the three last columns we find: number of observations during the month, the indication of the instrument used and the initials of the observer: $S. E.$ $P. E.$ standing for EINBU — father and son, T for Prof. TRUMPY and finally $E. B.$ for BARLINDHAUG, who made control observations on 8th and 9th of August with $Q. H. M.$ *No. 63*.

Table III.

Year	Date	H	h_o	Bh_o	numb. of obs.	Instr.	Observer
1938	Jun. 9	0.13940	381	0.13559	2	E. 38	T.
»	Aug. 7	999	430	569	2	»	S. E.
»	Sep. 9	967	392	575	2	»	»
»	Oct. 21	947	372	575	2	»	»
»	Nov. 18	922	352	570	6	»	»
»	Dec. 10	944	383	561	3	»	»
1939	Jan. 31	922	350	572	2	»	»
»	Feb. 23	916	350	566	6	»	»
»	Mar. 13	930	363	567	7	»	»
»	Apr. 23	905	336	569	4	»	»
»	May 24	990	410	580	6	»	»
»	Jun. 20	934	375	559	5	»	»
»	Jul. 19	968	391	577	8	»	»
»	Aug. 19	923	358	565	10	»	»
»	Sep. 22	897	317	580	4	»	»
»	Oct. 10	885	306	579	2	»	»
»	Nov. 2	894	330	564	1	»	P. E.
Mean.....				0.13570			
1939	Aug. 8	0.13918	350	0.13568	5	Q. H. M.	E. B.
»	» 9	904	338	566	6	No. 63.	»
Mean.....				0.13567			
1939	Nov. 1	0.13894	326	0.13568	3	Q. H. M.	P. E.
»	» 2	895	324	572	3	No. 15	»
Mean.....				0.13570			

Also in this case the table has been divided into three parts. As mean base line value for the entire interval: June 1938 — October 1939 we find: $Bh_o = 0.13570$ for the observations with *Elliott No. 38*. BARLINDHAUG's control observation gives: $Bh_o = 0.13567$, while the new station instrument *Q. H. M. No. 15* results in $Bh_o = 0.13570$ in agreement with the mean ELLIOTT observations.

Vertical intensity: As mentioned above, absolute hour values for V must be left out, until a new v -instrument be installed. However, to get a hint regarding the absolute value of V we shall below state the result of BARLINDHAUG's control observation.

Table IV.

Year	Date	Obs. I	H	v_0	V	B_{v_0}	Instrum	Observer
1933	Aug. 9	73 32.2	0.13937	68	0.47160	0.47092	T 2179	E. B.
»	» 9	32.7	936	70	181	111	»	»

Tesdorff Circle No. 2179 was used — needle 27 in the first set of observation and needle 26 in the last set. Control observations at *Tromsø Observatory* indicated a correction of $-2'$ and $-7'$ for the two needles, respectively, and these corrections have, accordingly, been applied.

EXPLANATION TO THE TABLES.

As the first set of tables (page 3—13) corresponds to those in the two previous publications — No. 9 and No. 13 — nothing need be said here, except that character numbers for Dombås have been added in the storminess tables for D — the last column to the right. According to what has been stated in No. 10 of the present series of publications the character numbers for Dombås have been derived from the AS -data for declination.

In the tables on p.p. 14—23 we have given usually hour values for D and H for the interval July to December, 1938, and corresponding hourly data for storminess — storminess tables are also given for V . The hour tables for declination have been expressed in $\gamma - D = 1000 \gamma +$ tabulated data. In the first two horizontal rows below, headed M , the monthly means are stated in γ and corresponding quantities: $D = 7^\circ +$ tabulated quantities, expressed in tenths of minutes.

The next two rows below give monthly means for the quiet days, QM — the first expressed in γ , the next expressed in tenths of minutes. The data for QM are corrected to noncyclic variation — this being also the case for the corresponding data for H .

To the right of the hour tables we find daily mean values for direct and quiet data — M and QM , respectively. Also here we have added values expressed in tenths of minutes. Finally we find in the last vertical column, to the right, data for range — the difference between the absolute highest and lowest value for the day, read on the photograph and expressed in γ .

The monthly mean data below and the daily means to the right of the hour tables for horizontal intensity are of course expressed in $\gamma - H = 0.13500 +$ tabulated quantities, expressed in γ . The meaning of the different headings M , QM and R will be understood from what has been explained above for the tables of declination.

Finally, on page 24 we have tabulated monthly mean data for D , H and V — direct and quiet values, besides range and storminess.

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Dombås. Declination. Quiet Values (+ W). Unit Gamma. Gr. M. T.

Table with 25 columns (1-25) and 13 rows (1937 JAN-DEC, MEAN). Data values range from -12 to 16. MEAN values range from -4.5 to 47.0.

Dombås. Horizontal Intensity. Quiet Values (+ N). Unit Gamma. Gr. M. T.

Table with 25 columns (1-25) and 13 rows (1937 JAN-DEC, MEAN). Data values range from -12 to 17. MEAN values range from 5.3 to 42.2.

Dombås. Vertical Intensity. Quiet Values (+ Down). Unit Gamma. Gr. M. T.

Table with 25 columns (1-25) and 13 rows (1937 JAN-DEC, MEAN). Data values range from -2 to 5. MEAN values range from -0.4 to 10.2.

Dombås. Declination. Quiet Values (+ W). Unit Gamma. Gr. M. T.

Table with 25 columns (1-25) and 13 rows (1938 JAN-DEC, MEAN). Data values range from -8 to 22. MEAN values range from -6.4 to 47.2.

Dombås. Horizontal Intensity. Quiet Values (+ N). Unit Gamma. Gr. M. T.

Table with 25 columns (1-25) and 13 rows (1938 JAN-DEC, MEAN). Data values range from -11 to 16. MEAN values range from 4.6 to 42.7.

Dombås. Vertical Intensity. Quiet Values (+ Down). Unit Gamma. Gr. M. T.

Table with 25 columns (1-25) and 13 rows (1938 JAN-DEC, MEAN). Data values range from -2 to 5. MEAN values range from -1.0 to 9.4.

Dombás. Declination. Storminess (+ W). Unit Gamma. Gr. M. T.

Table with columns for months (1937), days (1-23), and mean values for Declination Storminess (+ W). Rows include monthly data (MPS) and mean values for each month.

Dombás. Horizontal Intensity. Storminess (+ N). Unit Gamma. Gr. M. T.

Table with columns for months (1937), days (1-23), and mean values for Horizontal Intensity Storminess (+ N). Rows include monthly data (MPS) and mean values for each month.

Dombás. Horizontal Intensity. Storminess A.S. Unit Gamma.

Table with 6 columns for months (JULY to DECEMBER) and 3 columns for stations (PS, NS, AS). Rows list days 1-31 for each month and a MEAN row at the bottom.

Dombás. Vertical Intensity. Storminess A.S. Unit Gamma.

Table with 6 columns for months (JANUARY to JUNE) and 3 columns for stations (PS, NS, AS). Rows list days 1-31 for each month and a MEAN row at the bottom.

Dombás. Vertical Intensity. Storminess A.S. Unit Gamma.

Table with 6 columns for months (JULY to DECEMBER) and 3 columns for stations (PS, NS, AS). Rows list days 1-31 for each month and a MEAN row at the bottom.

Dombás.

Horizontal Intensity. Storminess A.S.

Unit Gamma.

Table with columns for months (JULY to DECEMBER) and sub-columns for PS, NS, AS. Rows represent days from 1 to 31. Includes a MEAN row at the bottom.

Dombás.

Vertical Intensity. Storminess A.S.

Unit Gamma.

Table with columns for months (JANUARY to JUNE) and sub-columns for PS, NS, AS. Rows represent days from 1 to 31. Includes a MEAN row at the bottom.

Dombás.

Vertical Intensity. Storminess A.S.

Unit Gamma.

Table with columns for months (JULY to DECEMBER) and sub-columns for PS, NS, AS. Rows represent days from 1 to 31. Includes a MEAN row at the bottom.

Dombds. Declination. (+ W).

Gr. M. T.

Table for July 1938 showing Dombds. Declination. (+ W) with columns for Day (1-31) and values for 1000 + tabulated values in tenths of minutes.

Table for August showing Dombds. Declination. (+ W) with columns for Day (1-31) and values for 1000 + tabulated values in tenths of minutes.

Table for September showing Dombds. Declination. (+ W) with columns for Day (1-30) and values for 1000 + tabulated values in tenths of minutes.

Dombås, Declination. (- W).

D- 1000 + TABULATED 7. (7th + TABULAR QUANTITIES EXPRESSED IN TENTHS OF MINUTES).

Gr. M. T.

Table for October 1938 showing declination data for days 1 through 31. Columns include DAY, 1-23, M, U, QM, QM, R.

Table for November showing declination data for days 1 through 31. Columns include DAY, 1-23, M, U, QM, QM, R.

Table for December showing declination data for days 1 through 31. Columns include DAY, 1-23, M, U, QM, QM, R.

Declination. Storminess (+ W). Unit Gamma.

Dombás.

Gr. M. T.

Table for October 1938 showing magnetic data for days 1-31. Columns include day, declination values (1-23), and storminess indices (M, PS, NS, AS, CH).

Table for November showing magnetic data for days 1-31. Columns include day, declination values (1-23), and storminess indices (M, PS, NS, AS, CH).

Table for December showing magnetic data for days 1-31. Columns include day, declination values (1-23), and storminess indices (M, PS, NS, AS, CH).

Dombds. Horizontal Intensity. (+ N).

N = 0.13500 + TABULAR QUANTITIES EXPRESSED IN GAMMA

Gr. M. T.

Table for July 1938 showing horizontal intensity data for days 1 through 31. Columns include Day, 24 hourly measurements (1-24), and summary columns M, QM, and R.

Table for August 1938 showing horizontal intensity data for days 1 through 31. Columns include Day, 24 hourly measurements (1-24), and summary columns M, QM, and R.

Table for September 1938 showing horizontal intensity data for days 1 through 30. Columns include Day, 24 hourly measurements (1-24), and summary columns M, QM, and R.

Dombås. Horizontal Intensity. (- N).
H = 0,15000 + TABULAR QUANTITIES EXPRESSED IN GAMMA

Gr. M. T.

OCTOBER 1938

Table for October 1938 showing horizontal intensity data. Columns include DAY (1-31), M, QM, and R. Rows contain numerical values for each day.

NOVEMBER

Table for November showing horizontal intensity data. Columns include DAY (1-31), M, QM, and R. Rows contain numerical values for each day.

DECEMBER

Table for December showing horizontal intensity data. Columns include DAY (1-31), M, QM, and R. Rows contain numerical values for each day.

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

Dombås. Gr. M. T.

Table with columns for DAY, 1-23, M, P8, N8, AS and rows for October 1938. Data includes magnetic intensity measurements and storminess values.

NOVEMBER

Table with columns for DAY, 1-23, M, P8, N8, AS and rows for November. Data includes magnetic intensity measurements and storminess values.

DECEMBER

Table with columns for DAY, 1-23, M, P8, N8, AS and rows for December. Data includes magnetic intensity measurements and storminess values.

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

Dombås.

Gr. M. T.

Table for July 1938 showing vertical intensity, storminess, and unit gamma data for Dombås. Columns include Day (1-31), M, PS, NS, AS, and MNS.

AUGUST

Table for August showing vertical intensity, storminess, and unit gamma data for Dombås. Columns include Day (1-31), M, PS, NS, AS, and MNS.

SEPTEMBER

Table for September showing vertical intensity, storminess, and unit gamma data for Dombås. Columns include Day (1-30), M, PS, NS, AS, and MNS.

OCTOBER 1938

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

Dombás.

L. M. T.

Table for October 1938 showing magnetic data for days 1-31. Columns include day, 24-hour intensity values, and summary statistics (M, PS, NS, AS).

NOVEMBER

Table for November 1938 showing magnetic data for days 1-31. Columns include day, 24-hour intensity values, and summary statistics (M, PS, NS, AS).

DECEMBER

Table for December 1938 showing magnetic data for days 1-31. Columns include day, 24-hour intensity values, and summary statistics (M, PS, NS, AS).

Summary.

DECLINATION (+W) 1938.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
DIRECT VALUES. D = 10007 +							789	783	777	769	764	759	-
QUIET VALUES. D = 10007 +							786	782	780	773	765	758	-
DIRECT VALUES. D = 7°+							22.7	21.3	19.8	18.0	16.7	15.5	-
QUIET VALUES. D = 7°+							21.5	20.5	19.9	18.1	16.0	14.1	-
RANGE	195	106	121	100	131	89	111	113	132	132	97	110	111
QUIET RANGE	22	31	44	64	62	62	67	68	55	43	27	21	47
STORMINESS, MEAN (UNIT γ)	-5.1	-1.5	-2.4	-0.4	-0.5	-0.2	3.0	1.0	-3.3	-4.1	-1.0	1.0	-1.0
STORMINESS, DIURNAL SUM OF PS	109	86	86	99	105	90	161	123	77	87	86	117	102
" " " NS	233	121	141	106	118	95	90	99	158	188	112	95	130
" " " AS	342	207	227	205	223	185	251	124	235	275	198	212	232
CHARACTER NUMBERS	1.09	0.77	0.78	0.74	0.84	0.72	0.96	0.86	0.77	0.98	0.71	0.67	0.82
HORIZONTAL INTENSITY													
DIRECT VALUES. H = 0.13500 +							445	443	431	432	434	437	-
QUIET VALUES. H = 0.13500 +							449	444	446	438	434	437	-
RANGE	326	157	190	206	328	117	226	212	302	221	151	171	217
QUIET RANGE	16	25	38	58	50	57	61	53	49	40	25	16	43
STORMINESS, MEAN (UNIT γ)	-4.2	0.1	-3.6	-2.5	-4.8	2.0	-3.9	0.0	-12.9	-5.2	0.6	-0.1	-2.8
STORMINESS, DIURNAL SUM OF PS	343	185	172	212	279	172	239	136	123	186	103	175	194
" " " NS	444	182	257	273	400	123	299	262	218	416	193	114	265
" " " AS	787	367	329	485	679	295	538	398	341	602	296	289	459
VERTICAL INTENSITY													
DIRECT VALUES. V = 0.47000 +													
QUIET VALUES. V = 0.47000 +													
RANGE	218	124	111	124	136	62	98	93	135	132	80	80	116
QUIET RANGE	5	5	7	9	11	16	17	14	12	8	5	4	9
STORMINESS, MEAN (UNIT γ)	-1.3	-6.0	-3.5	-1.1	1.0	-2.8	-0.3	-3.4	-4.6	-6.2	1.2	2.1	-2.1
STORMINESS, DIURNAL SUM OF PS	245	118	141	213	214	102	155	146	196	162	168	167	169
" " " NS	231	259	231	239	198	170	161	230	310	300	142	115	216
" " " AS	476	377	372	452	412	272	316	376	506	462	310	282	385

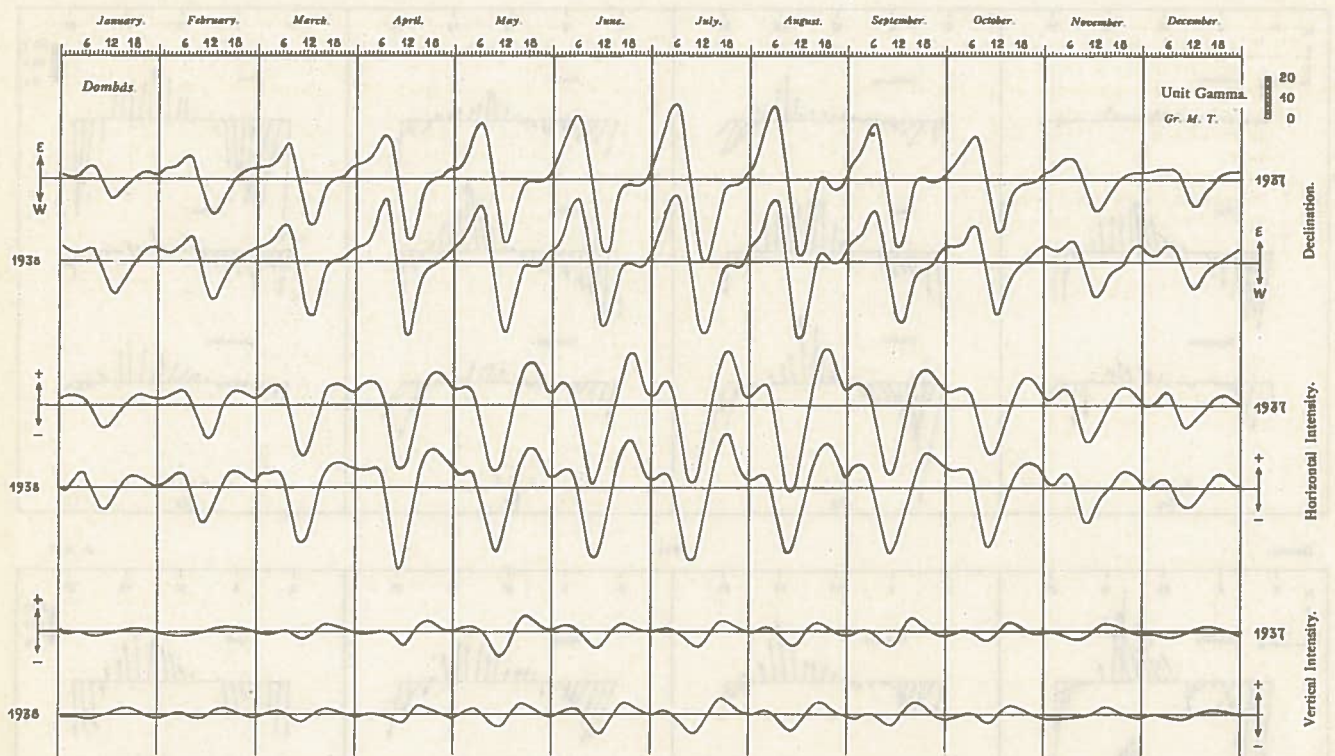


Fig. 1. Monthly values for quiet diurnal variation for *D*, *H* and *V* for Dombás. 1937 and 1938.

Fig. 1. Monthly mean values for quiet diurnal variation of declination and vector diagram for *D* and *H*, 1937 and 1938.

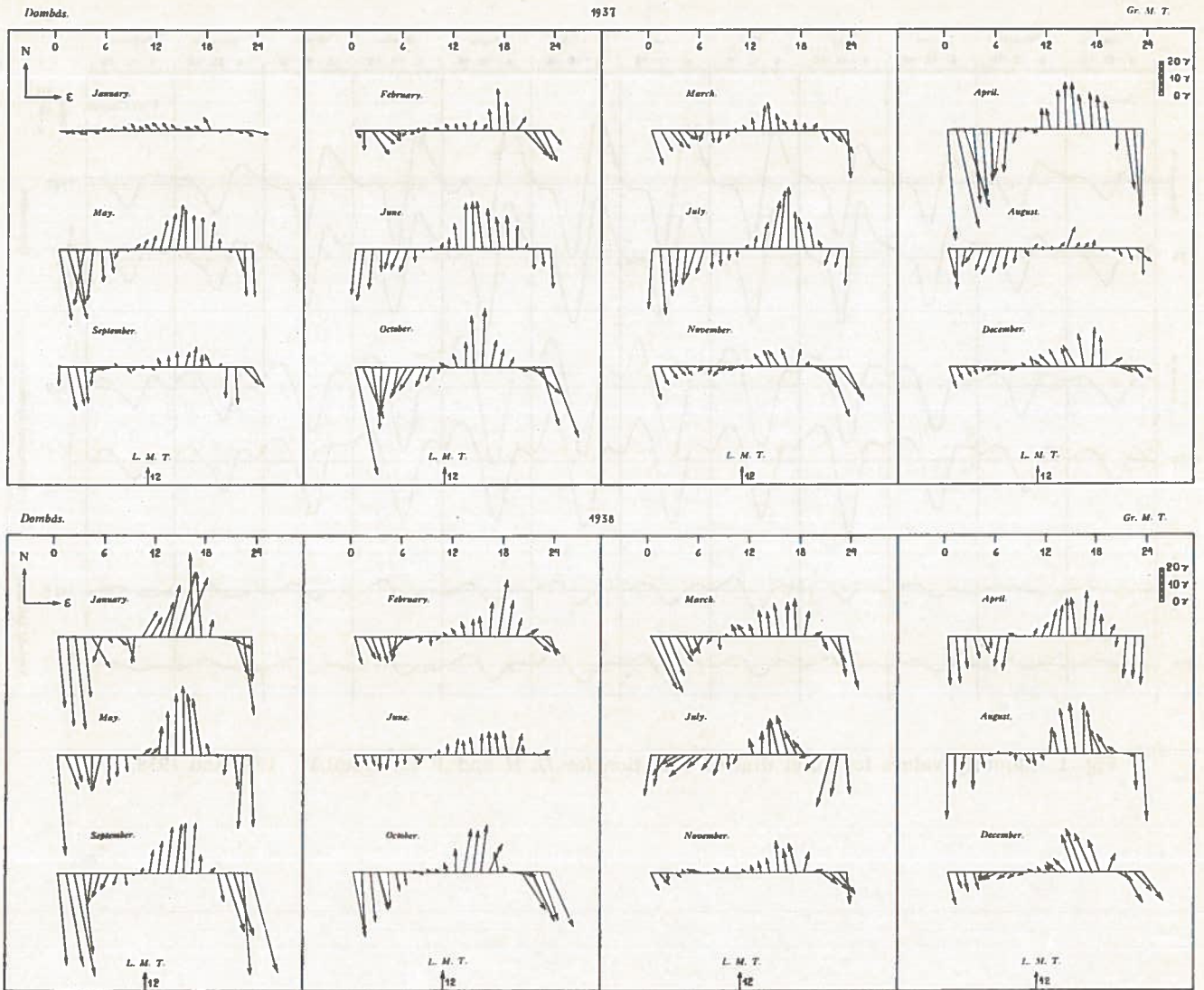


Fig. 2. Monthly mean values for diurnal variation of Storminess as vector diagram for *D* and *H*, 1937 and 1938.

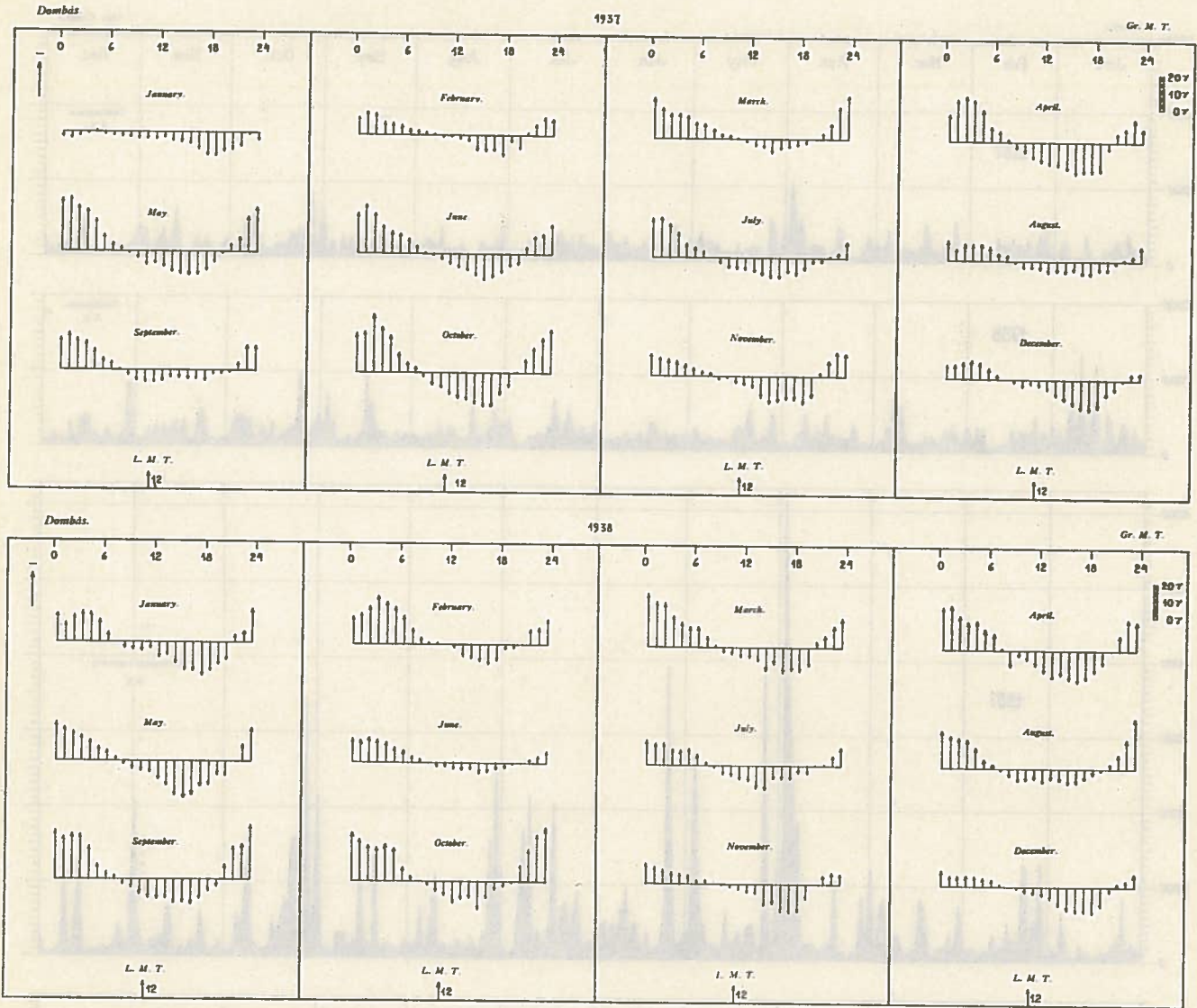


Fig. 3. Monthly mean diurnal variation for Storminess in the vertical intensity. 1937 and 1938.

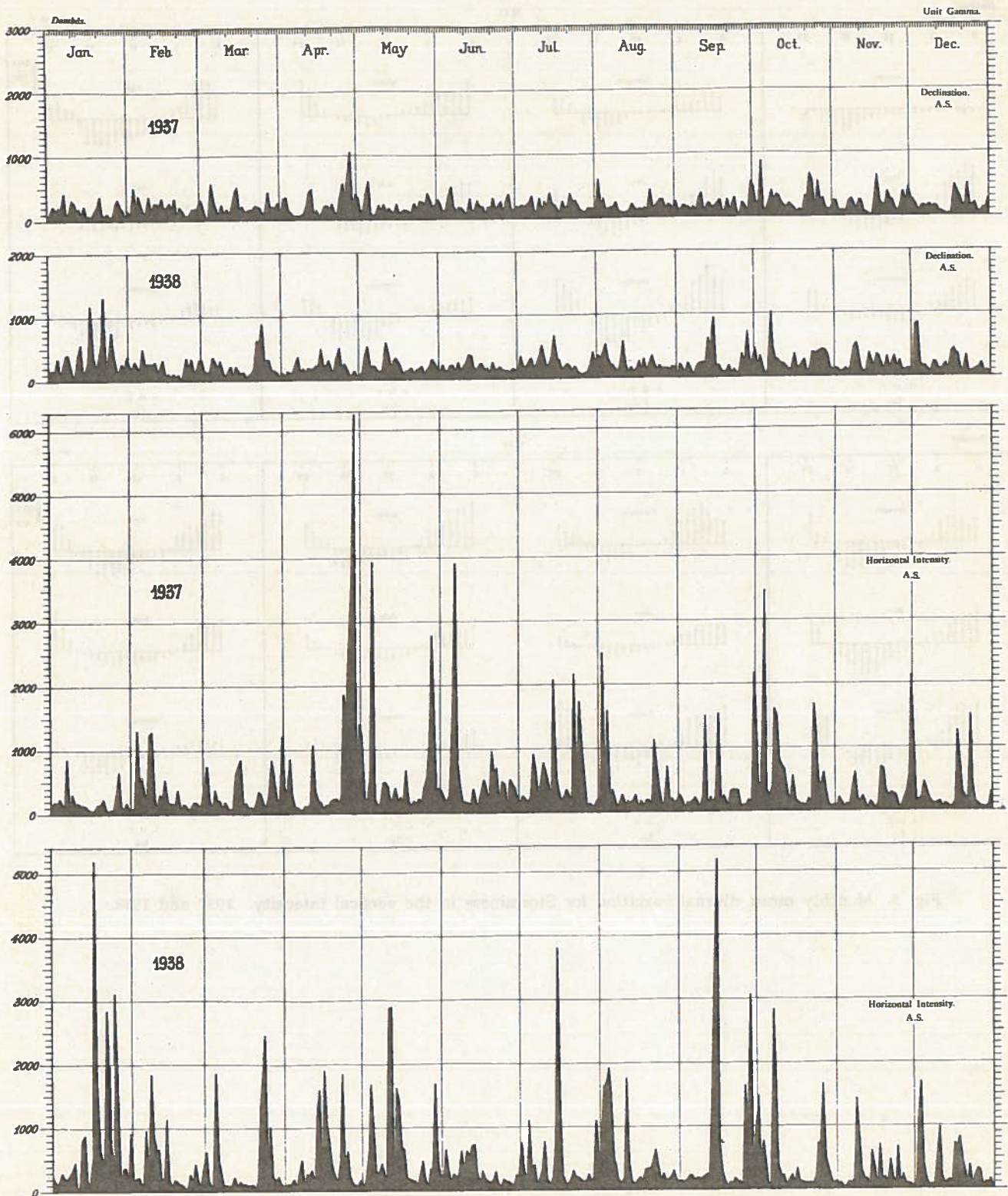
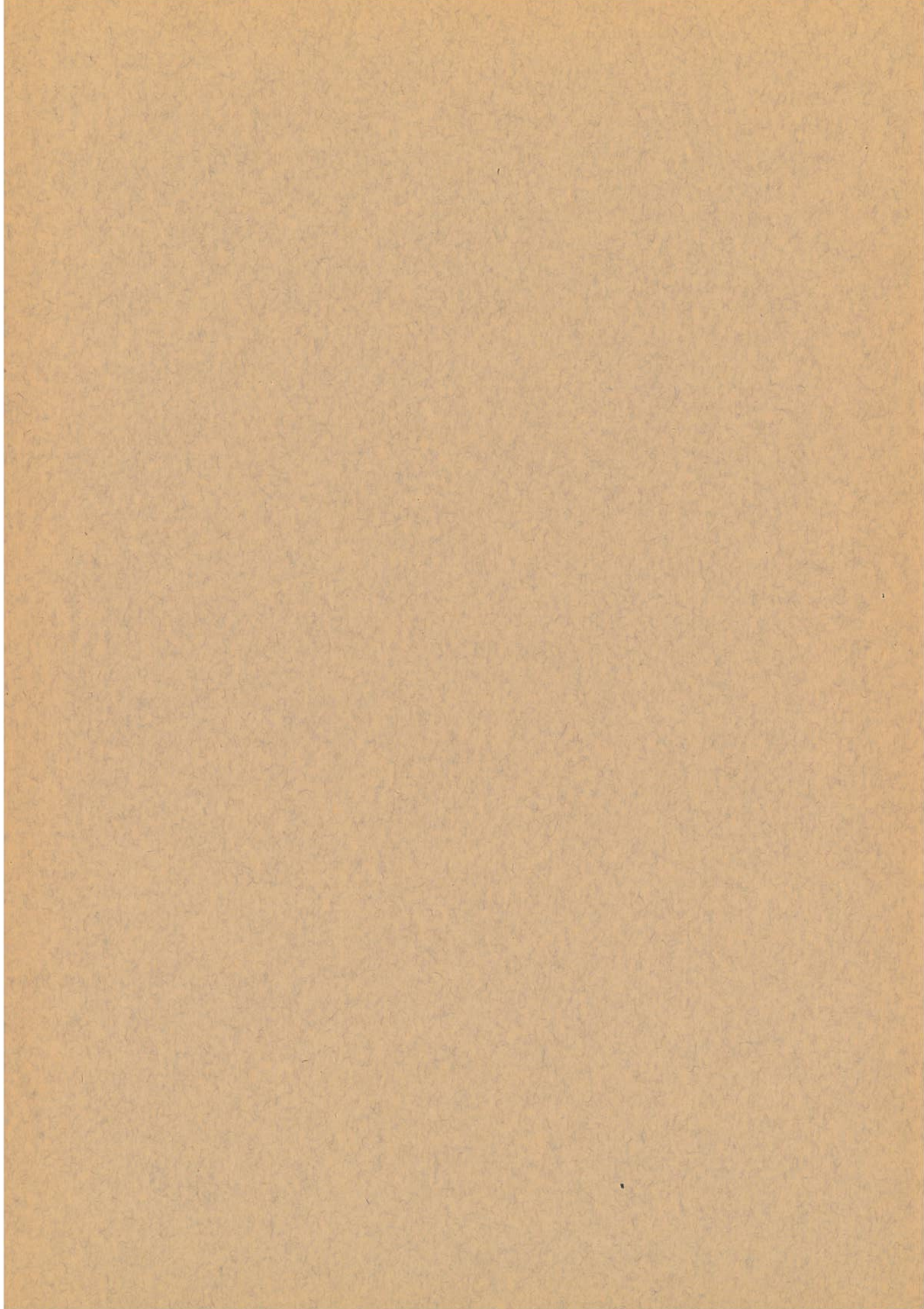


Fig. 4. Daily values for absolute Storminess for *D* and *H*. 1937 and 1938.



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3. The Auroral Observatory at Tromsø. Results of Magnetic Observations for the Year 1931 by LEIV HARANG and E. TØNSBERG. 1933.
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