

Kodaikanal Observatory

BULLETIN No. CXXIX

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE YEAR 1948

PART I

Summary of Prominence Observations for the first half of 1948.

This summary is based on the observations made at Kodaikanal supplemented by the data from the photographs obtained from the co-operating observatories of Mt. Wilson and Meudon. During this half year K. Prominence photographs were taken at this observatory on 148 days and photographs for 32 days were supplied by Mt. Wilson. On the whole data were available for 180 days which were counted as 167 effective days after giving due weightage to photographs. The mean daily areas (in sq. minutes of arc) and the mean daily numbers of prominences computed from the above photographs are given below. The figures based on Kodaikanal photographs only are also given for comparison with bulletins prior to 1923 i.e. before the co-operation of other observatories came into force.

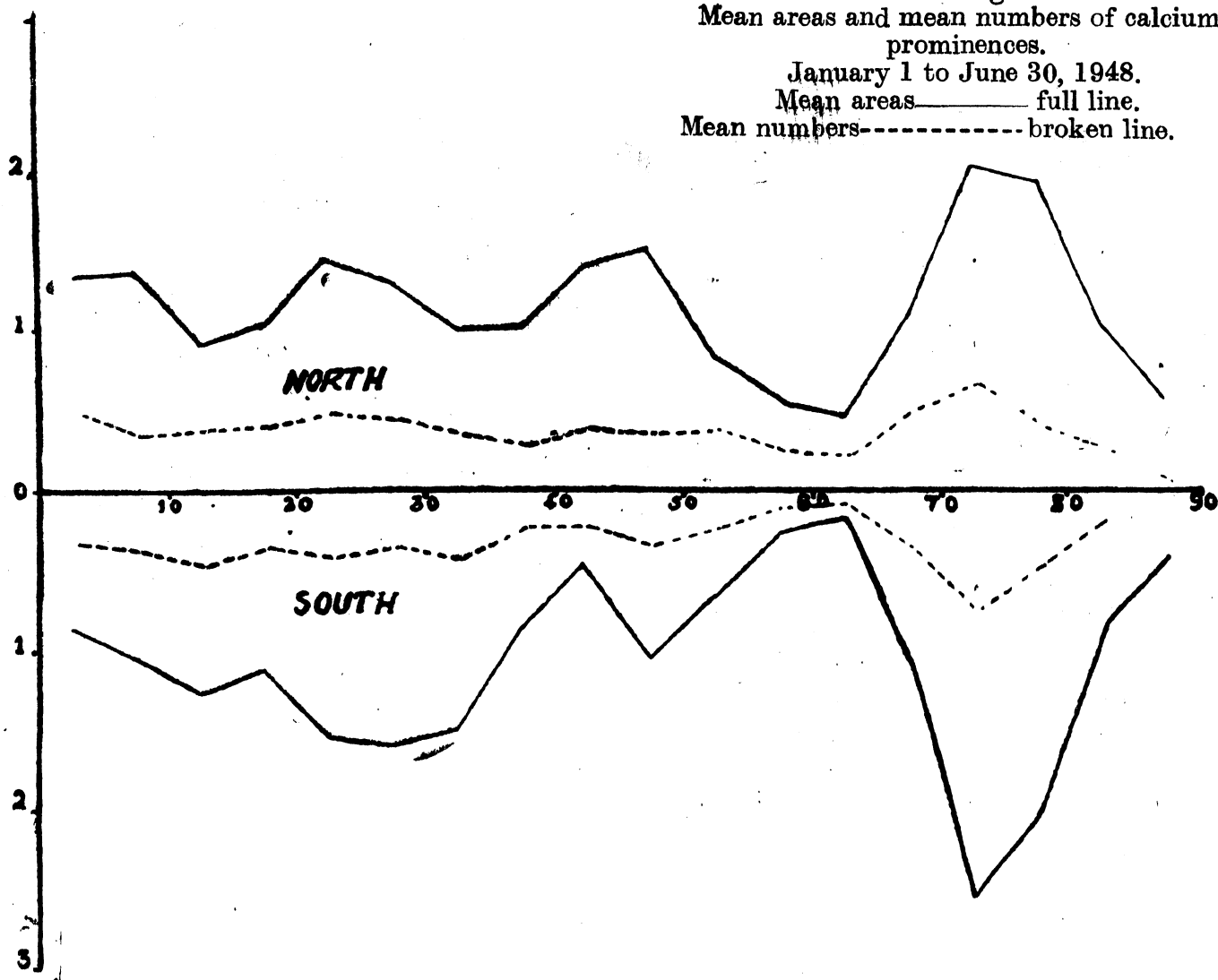
		Combined data		Kodaikanal data only	
		Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	.	2.10	6.55	2.07	6.46
South	.	1.93	5.80	1.75	5.80
Total	.	4.03	12.35	3.82	12.26

Compared with the corresponding figures of the previous half year, the areas show a decrease of about 34 per cent. while numbers remain practically the same.

The latitudinal distribution of the areas and numbers for each zone of 5° of latitude is shown in the following diagram in which the full lines indicate areas and broken lines the numbers. The ordinates represent tenths of sq. minutes of arc for the full lines and numbers for the broken lines.

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Part I—Diagram I.
 Mean areas and mean numbers of calcium
 prominences.
 January 1 to June 30, 1948.
 Mean areas——— full line.
 Mean numbers----- broken line.



Prominent peaks of activity at zones 20° — 25° , 45° — 50° and 70° — 75° are seen in both the hemispheres. A marked minimum of activity is also seen at 60° — 65° in both the hemispheres. The numbers also show peaks of activity at 70° — 75° in both the hemispheres.

The monthly, quarterly and half-yearly areas and numbers and the mean height and the mean extent of the prominences are given in table I.

TABLE I

Months	Number of days (effective)	Areas Sq. mts.	Numbers	Daily Means		Mean height	Mean extent
				Areas	Numbers		
1948							
January	29	128.85	371	4.44	12.79	41.54	4.21
February	24	104.75	399	4.36	12.46	42.78	5.61
March	29½	106.65	341	3.62	11.56	43.37	4.86
April	26½	86.10	333	3.25	12.56	42.91	4.34
May	28½	102.55	326	3.63	11.54	43.67	5.76
June	29½	145.40	392	4.89	13.18	46.02	4.25
1st quarter	82½	340.25	1011	4.12	12.25	42.52	4.84
2nd quarter	84½	334.10	1051	3.81	12.44	44.31	4.75
1st Half-year	167	674.35	2062	4.04	12.35	43.43	4.79

The distribution of areas and numbers east and west of the sun's axis is given below :—

	East	West	Percentage East
Total area (sq. minutes)	361	323	52.1%
Total numbers	1057	1005	51.26

Both the areas and numbers show an eastern preponderance.

Observations with Prominence Spectroscope :—Details of metallic prominences observed during this half year are given in table II.

TABLE II

Date 1948	Time I. S. T.*	Base	Latitude		Limb	Height in Hs	Line
			North	South			
January 7	H. M. 08 20	1	17.5		W	Not known	4 and 10 only
March 14	07 50	4	14		E	22.4	— do —
April 29	07 43	2	19		E	Very short	— do —
May 24	09 15	3		32.5	W	15.2	— do —
May 5	09 00		24		E	Very short	— do —
May 10	08 28			19	W	Close to limb	1 to 12
May 14	09 15	1	7		W	Close to limb	4 and 10 only
May 26	08 45	1	11		E	Close to limb	1 to 12
June 30	08 40	1	11.5		W	23	1 to 12
June 9	09 11	4	11		W	15.2	4 and 10 only

*G. M. T. + 05^h 30^m

The key to the wave-lengths of the metallic lines is given below :—

No.	γA°	Element	No.	γA°	Element
1	4924.1	Fe+	7	5276.2	Fe+
2	5016.0	He	8	5316.8	Fe+
3	5018.6	Fe	9	5363.0	Fe+
4	b_4, b_3, b_2, b_1	Mg. Fe+	10	D_2, D_1	Na
5	5234.8	Fe	11	6677	He
6	5276.0	Cr	12	7065	He

The distribution of metallic prominences was as follows :—

	1°—10°	11°—20°	21°—30°	31°—40°	Mean latitude	Extreme latitudes.
North..	1	6	1	..	14.4	7° and 24°
South	..	1	..	1	25.8	19° and 32.5°

Particulars of displacements observed in the chromosphere and prominences with the spectroscope are given in the following table :—

TABLE III

Date	Time I. S. T.	Latitude		Limb	Displacements		Remarks
					Red	Violet	
January	H.	M.	°	°	A°	A°	
2	07	50		33.5	E	1	
	07	55		73.5	E	1	Middle and top.
7	08	20	14.5		W	0.2	
	08	38		34	E	0.5	Middle.
8	08	05	27		E	0.5	
14	08	00	14		E	Slight	Metallic prominence.
20	08	15		41	W	0.5	At the top.
22	08	30		26.5	E	2	At the top.
25	08	00	27		E	1	At the top.
29	08	09		18	E	Slight	
February							
3	08	09	27		E	0.5	In the chromosphere.
6	09	15		7	W	1.5	At the middle.

TABLE III—*contd.*

Date	Time I.S.T.		Latitude		Limb	Displacements		Remarks
			North	South		Red	Violet	
February	H.	M.	°	°		°A	°A	
9	90	10	38		W	1	1	
11	09	50	63.5		W	Slight		
21	07	45		24	W		0.5	
23	08	08	27.5		W		0.5	
	08	30	19		W		4	At the base.
26	08	14		8	E	0.5	0.5	Middle to R and top to V.
	08	35		26.5	W	1	1	Very bright.
29	08	01		38	E		Slight	
March								
8	09	30	28		E		3	Speck.
9	09	11	23		W	1		At middle
10	08	40	2		W	1		Middle.
	07	45		28	W	Slight	Slight	At the ends.
11	08	15	8		E	0.5		At the base.
12	08	04	74.5		E	Slight		At the top.
13	07	58		16	W	0.5	Slight	At the base.
14	08	15		33	E	1	1	At the top.
19	08	00		13.5	W	1	0.5	At base.
21	08	15	77		E	0.5		At the top.
	08	30	46		E	Slight		At a number of points.
22	09	18	44.5		E	2.0	2.0	At the top to R and middle to V
25	08	38	48.5		E	Slight	Slight	At a number of points.
29	07	42	19		E	0.5	1	At the base.
	07	52		31	E	Slight	Slight	At the base.
April								
5	08	25		1.5	E	2.5	2.5	
7	08	20		70	E	Slight		
9	08	30	22.5		W	Slight		
	08	10		26.5	W		4.5	
10	08	45	24.5		W	2.5	2.5	
	09	15		9.0	E		1.0	
11	08	58	10.5		E	0.5	0.5	
15	08	10	13.5		W	0.5		

TABLE III—*contd.*

Date	Time I. S. T.	Latitude		Limb	Displacements		Remarks
		North	South		Red	Violet	
	H. M.	°	°		° A	° A	
17	08 00		23	W	0.2		
22	08 15		21	W		1.5	
May	5	09 00	24	E	3		Metallic.
		09 00	15	E		3	
		08 48		E			Close to limb.
	6	10 00	26	E	1	1	Displacement observed at a number of places.
	10	08 28		W		2	Metallic close to limb.
		09 15	46	W	1	1	
		09 30	17	E	2		
	14	09 15	7	W		1	Metallic.
	16	08 15	4	E	1.5	3.5	At the top.
	17	09 05	28	W	0.5		
		08 08	10.5	E	1	1	At the top.
23	09 07	14		E		7	Eruptive prominence.
	10 00		1	E	1.5		
23	08 45	11		E	2		Metallic.
27	08 30	18		E	2.5		
30	08 20	7		E		2	
	08 40	11.5		W	0.5	1	Metallic.
31	10 30	31		E	2	1	
		16		E	2.5	0.5	
June	2	07 45	15	W	0.5		Bright.
	3	07 55	35	E	1.5	Slight	At the middle.
	4	08 18	16.5	E	3	1.5	
	5	08 00	77.5	E	0.5		
	7	08 30	77.5	E		1	
		08 30	87	W	1		
	8	08 46	78.5	E	0.5	0.5	At the top.
	9	07 56	11	W	0.7	0.5	Metallic.
		08 12		E	1	Slight	
			14	E			

The total number of displacements was 73 as against 64 in the previous half year. Their distribution is given below :—

Latitude	North	South
0°–30°	29	22
31°–60°	5	9
61°–90°	3	5
Total	37	36
East limb		45
West limb		28
Total		73

Of these 25 were towards red, 17 towards violet and 31 towards both-ways simultaneously.

41 bright reversals of the H α line, 41 dark reversals of the D $_3$ line and 16 displacements of the H α line (8 towards red and 8 towards violet) were observed with the spectroscope on the sun's disc. Their distribution was as follows :—

	North	South	East	West	Total
Bright reversals of H α	31	10	23	18	41
Dark reversals of D $_3$	31	10	23	18	41
Displacements of H α	11	5	9	7	16

Observations with the Spectrohelioscope :—Doppler displacements of the H α line over prominences, dark markings and bright flocculi observed with the Hale Spectrohelioscope during this half year were as follows :—

	North	South	East	West	Total	Displacements towards			
						Red	Violet	Bothways	Total
Prominences	18	17	11	24	35	7	15	13	35
H α dark markings.	4	5	8	1	9	3	3	3	9
Bright flocculi	2	4	4	2	6	2	1	3	6

The largest displacement observed during this half year was 7°A to violet in an eruptive prominence on May 23.

Details of solar flares observed are given in Table IV :—

TABLE IV

Date 1948	Time (I. S. T.)			Mean latitude	Mean longitude from C. M.	Intensity	Remarks
	Beginning	Maximum	End				
January	H. M.	H. M.	H. M.	.	.		
16 .	..	08 16	..	—25	55 E	1	From spectrohelioscope.
24 .	..	07 49	..	—12	35 E	2	From spectroheliogram.
February							
9 .	..	08 04	..	+10	25W	1	From spectrohelioscope.
				+17	47 W	1	Do.
10 .	..	08 20	..	+16	62 W	1	Do.]
12 .	..	08 16	..	—12	40 ₂ W ₁	1	Do.

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Table IV

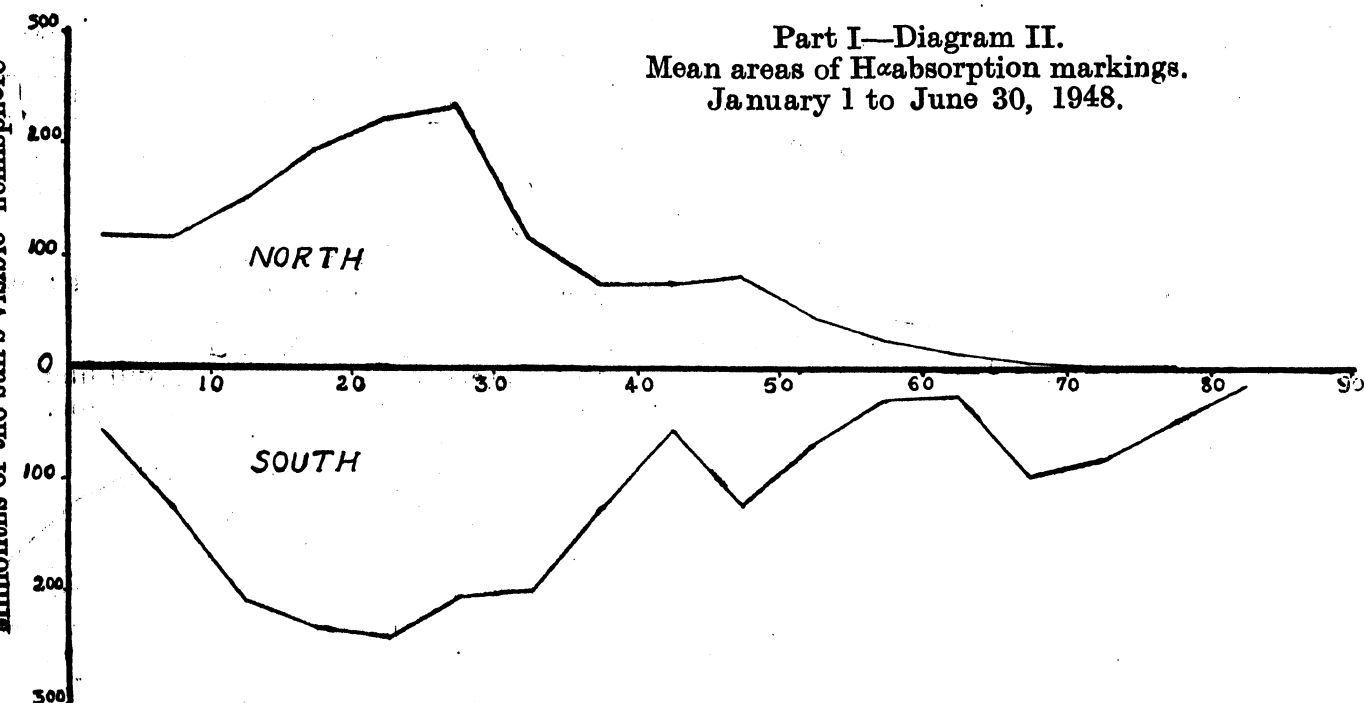
Date 1948	(Time (I. S. T.))			Mean latitude	Mean longitude from C. M.	Intensity	Remarks
	Beginning	Maximum	End				
19 .	..	08 35	..	+21	40 W	1	For spectrohelioscope.
20 .	..	08 02	..	+21	53 W	1	Do.
24 .	..	07 55	..	-15	75 W	1	Do.
March							
19 .	08 19	08 24	08 45	+23	53 W	3	Do.
April							
2 .	08 59	09 25	09 38	-17	17 W	1	Do.
5 .	07 58	08 02	08 25	-13	60 E	1	Do.
6 .	09 45	09 20	09 28	-15	50 E	1	Do.
7 .	08 33	08 37	08 52	-18	44 E	2	From spectrohelioscope and spectroheliogram.
9 .	..	07 07	..	-5	7E	1	From spectrohelio-gram.
11 .	..	08 36	..	-10	40 E	1	Do.
16 .	..	08 12	08 32	-21	15 W	1	From spectrohelioscope and spectroheliogram.
17 .	...	07 50	07 55	-10	70 W	1	From spectrohelioscope.
May							
10 .	08 25	08 37	08 45	-25	25 E	1	Do.
13 .	08 06	..	08 20	+13	80 E	1	Do.
25 .	08 40	08 45	09 25	+12	62 E	2	From spectrohelioscope and spectroheliogram.
27 .	08 27	08 40	08 53	-16	11 E	1	Do.
31 .	08 05	..	08 25	+9	28 E	1	From spectrohelioscope.
June							
8 .	09 55	..	10 05	+10	80 W	1	Do.

Prominences projected on the disc as H α dark markings :—During this half year H α focculus plates were taken at Kodaikanal on 153 days ; 30 plates were received from Mt. Wilson and 19 from Meudon Observatories. The photographs were available on the whole for 181 days which were taken as 166½ effective days. The mean daily areas uncorrected for foreshortening) in millionths of sun's visible hemisphere and the mean daily numbers computed from the above photographs are given below :—

	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	1505	14.88	1446	13.86
South	1944	17.92	1943	17.68
Total	3449	32.80	3389	31.54

Compared with the last half year's figures both areas and numbers show a decrease of about 36 per cent. and 23 per cent. respectively.

Both the areas and numbers show an eastern defect, the percentages being 46.10 and 45.77 respectively. The distribution in latitude of the areas is represented by the following diagram:—



The curves show prominent flat peaks of activity at 20°-30° in the northern hemisphere and at 15°-25° in the southern hemisphere.

PART II

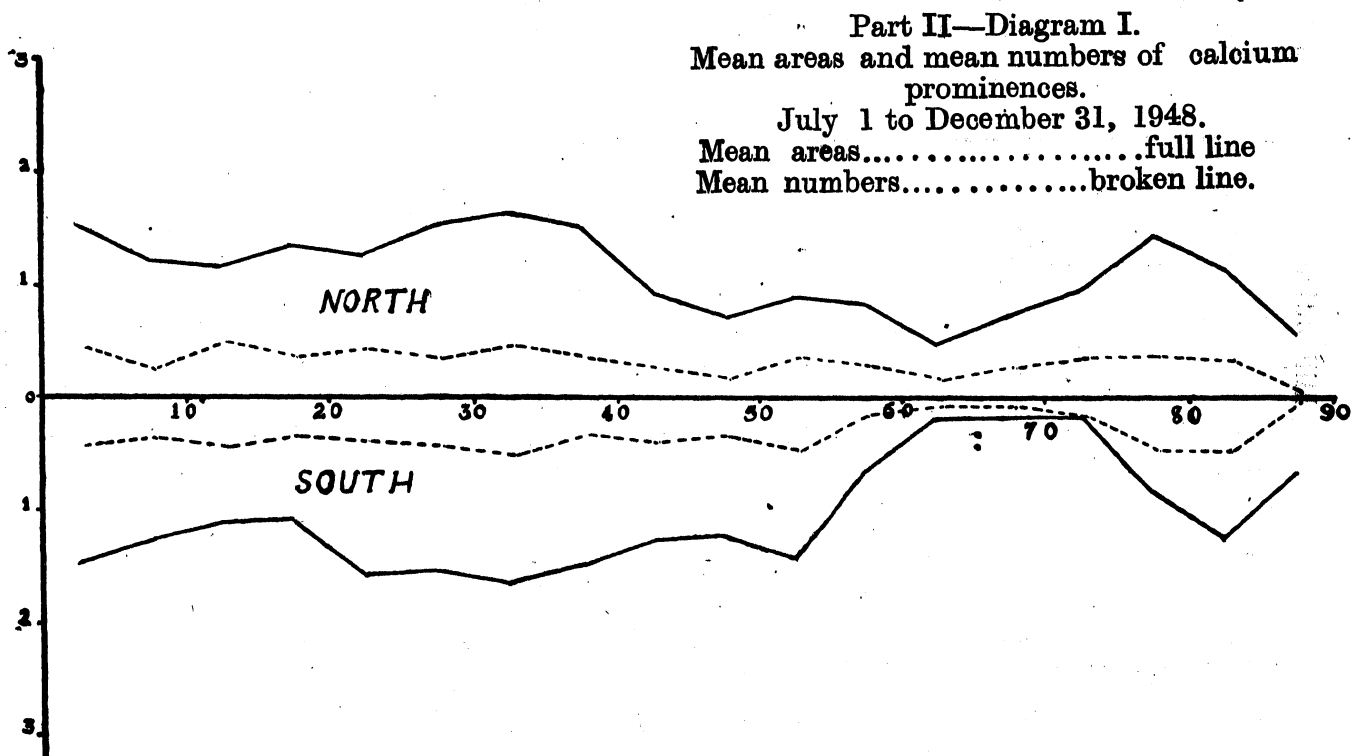
Summary of prominence observations for the second half of 1948

During this half year K. prominence photographs were taken at Kodaikanal on 110 days only; 63 photographs were obtained from Mt. Wilson Observatory making the records available for 171 days which were counted as 157½ effective days. The mean daily areas (in sq. minutes of arc) and the mean daily numbers derived from the above photographs are given below :—

	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	1.98	6.05	2.08	6.30
South	1.89	5.77	2.09	6.04
Total	3.87	11.82	4.17	12.34

Both the areas and numbers show a decrease of about 4% compared with the figures for the last half year.

The distribution in latitude of areas and numbers in 5° ranges of latitude is shown in the following diagram:—



Activity is almost uniform over the zone 20°-40° in both the hemispheres with peaks at 75°-80° in the northern hemisphere and at 80°-85° in the southern. The minima between 60° and 65° noticed in the first half year still persist. The numbers show almost uniform activity in both the hemispheres.

The monthly, quarterly and half yearly means of areas, numbers, heights and extents calculated as usual are shown in table I.

TABLE I

Months	Number of days (effective)	Areas sq. mts.	Numbers	Daily Means		Mean height	Mean extent
				Areas	Numbers		
1948							
July	24½	120.95	324	4.94	13.22	44.00	4.23
August	28	109.50	352	3.91	12.57	45.80	4.33
September	28½	110.15	375	3.90	13.23	43.03	4.56
October	26½	104.25	289	3.90	10.80	42.61	4.32
November	24½	75.00	264	3.06	10.78	38.79	3.91
December	25½	88.35	255	3.50	10.10	44.92	4.38
3rd quarter	80½	340.60	1051	4.22	13.92	44.30	4.38
4th quarter	76½	267.60	808	3.50	10.56	42.23	4.20
2nd half year	157½	608.20	1859	3.87	11.82	43.34	4.31

The distribution of areas and numbers east and west of the sun's axis is given below :—

	East	West	Percentage East
Total areas	275	333	45.19
Total numbers	917	942	49.33

Both the areas and the numbers show an eastern defect.

Observations with prominence spectroscope :—Details of the metallic prominences observed during this half year are given in table II.

TABLE II

Date 1948	Time I. S. T.	Base	Latitude		Limb	Height in Hec	Line
			North	South			
September .	H. M.	°	°	°			
11 .	09 25	2		3	E	6.4	4 only.
13 .	08 45	1		12.5	E	..	4, 10 and 11.
16 .	09 20	1		6	E	10	Do.
25 .	07 56	3		18.5	W	14	Do.
October							
6 .	09 15	1		14	E	14	Do.
25 .	09 10	1		32	W	Short	Do.
November							
21 .	08 15	3	27.5		W	21.6	Do.
25 .	08 15	1		10.5	W	10.4	Do.
	08 00	2	28		W	7.2	Do.

The distribution of metallic prominences was as follows :—

	1°-10°	11°-20°	21°-30°	31°-40°	Mean latitude	Extreme latitudes
North . . . . .	..	..	2	..	27.8	27.5° and 28°
South	2	4	..	1	13.8	3° and 32°

The details of displacements observed in the chromosphere and the prominences with the spectroscope are given in table III.

TABLE III

Date	Time I. S. T.	Latitude		Limb	Displacements		Remarks
		North	South		Red	Violet	
July	H. M.	°	°		°A	°A	
5	09 45		22	E		Slight	At the top.
13	08 45	15.5		W	Slight	Slight	
19	10 07	20.5		E		2.5	Seen in 6677 also.
August							
4	08 50	7.5		W	7	7	
15	08 10		54.5	W	2	2	
	08 15	10		W	Slight		
16	09 30		13	W	2.5	2.5	Top right.
18	08 40	19		E		1	
22	09 50	24		E	Slight		At the top.
29	09 12	11.5		E		2	At the base.
	09 15		21.5	E	1		At the base.
	09 10	28		W		0.5	At the top.
September							
1	08 15		32.5	W		0.5	
3	09 00		7	E		Slight	
	09 10		10	W	0.5	0.5	To R at bottom and V at top.
5	08 20		36.5	E		0.5	
8	08 40	14.5		W		0.5	
9	08 40	40		E		1	
10	08 40	15		W	1	1	Top to R and base to V.
11	09 25		3	E	0.5		Metallic.
13	08 45		12.5	E	2		Metallic.
16	09 20		10	E	2		

TABLE III—*contd.*

Date	Time I. S. T.	Latitude		Limb	Displacements		Remarks
		North	South		Red	Violet	
September	H. M.	°	°		°A	°A	
23	08 55	60		W	0.5		
25	07 45	42		W	0.5		Speck.
	07 52		15	W	1.5	1.0	
26	08 50		15	W	0.5		
27	09 00		31	W	2		
	09 15	13		W		2	Top displaced.
28	08 45	19.5		W	1	0.5	Top displaced to V and middle to R.
	09 15		36	W		1	
October							
3	07 50		17	W		2	Top displaced.
	07 50		35	W		1.5	Do.
	07 40	37		E	1	1	
5	08 35	23		E	1 to 2	6	
6	09 15	14		E	1	1	Metallic.
8	11 20	44		E	1		Middle portion displaced.
10	08 02	12		E	0.5	2.0	
	07 42		44	W	0.5		At top.
	08 00		24	W	1		Faint Speck.
11	08 30	25		E	0.5		Floating.
23	10 18		8	W	1	1	Displaced to R at bottom and V at top.
24	08 30	17.5		W		1.5	At top.
25	09 10	40		E	1	1	
31	10 00		5.5	W	1.5	2.5	Displaced to R at top and to V at base.
	10 10		15	W	3	2.5	Do.
November							
3	09 00	4		E		2.0	
21	08 05		26.5	W	Slight		
25	08 15		10.4	W		0.5	
	08 00	28		W		1	
27	08 40		17	E		0.5	Very bright at the base.
	08 00		12	W		0.5	At the base.

TABLE III—*contd.*

Date	Time I. S. T.	Latitude		Limb	Displacements		Remarks
		North	South		Red	Violet	
December	H. M.	°	°		°A	°A	
1		6		E	1		At the bottom.
2	08 20	3		E	1		At the top.
11	09 15	18.5		W		0.5	At the top.
	09 20		26	E		0.7	The entire prominence is displaced.
12	07 40	88		E		Slight	
14	09 00		3	E		1	
15	08 30	1		E		1	At the top.
	08 40	28		W	Slight		At the top.
16	09 20	1		W	0.7	1	To R at top and V at bottom.
	09 55		27.5	E	1	0.5	To R at the middle and to V at the base.
23	08 15	58		W		2.5	At the middle.
	08 25	27		W	1		At the base.

The total number of displacements was 63 as against 73 in the previous half year. The distribution of these displacements was as follows:—

Latitude										North	South
0°-30°	.	.	.	.	.	.	.	.	.	26	22
31°-60°	.	.	.	.	.	.	.	.	.	7	7
61°-90°	.	.	.	.	.	.	.	.	.	1	..
Total										34	29
East limb	.	.	.	.	.	.	.	.	.	28	
West limb	.	.	.	.	.	.	.	.	.	35	
Total										63	

Of these 19 were towards red, 26 towards violet and 18 both ways simultaneously.

62 bright reversals of the H α line, 49 dark reversals of D $_2$ line and 13 displacements of H α line (7 towards red, 2 towards violet and 4 both ways) were observed with the spectroscope on the sun's disc during this half year. This distribution was as follows:—

	North	South	East	West	Total
Bright reversals of H α	30	32	30	32	62
Dark reversals of D $_2$	24	25	23	26	49
Displacements of H α	4	9	5	8	13

Observations with the spectrohelioscope :—The displacements of H α line over prominences, dark markings and bright flocculi observed with the Hale Spectrohelioscope during the period are summarised below :—

	North	South	East	West	Total
Displacements in prominences	15	20	17	18	35
Displacements in dark markings	5	15	12	8	20
Bright flocculi	2	2	3	1	4

	Displacements towards		
	Red	Violet	Bothways
Prominences	9	11	15
H α dark markings	4	7	9
Bright flocculi	2	2	..

The details of chromospheric eruptions observed during this half year are given below in table IV :—

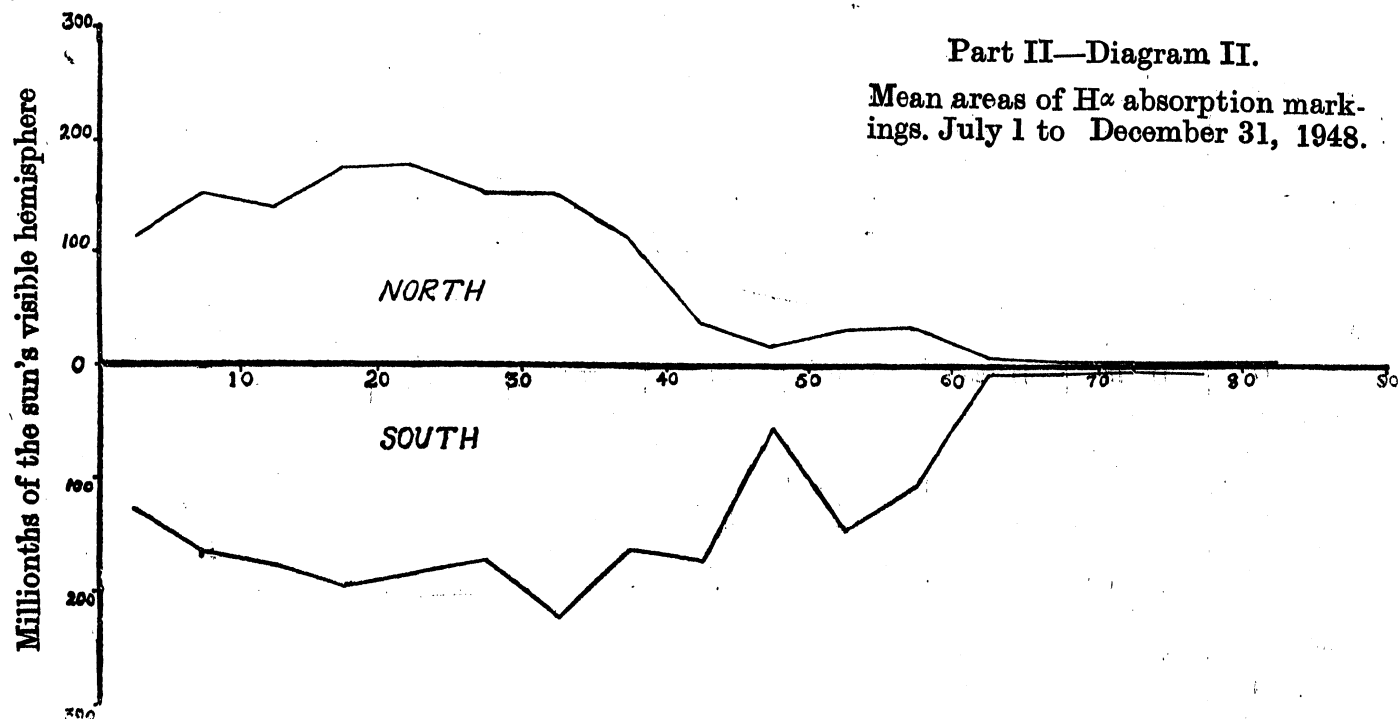
TABLE IV

Date 1948	Time (I. S. T.)			Mean latitude	Mean longitude from C. M.	Intensity	Remarks
	Beginning	Maximum	End				
July	H. M.	H. M.	H. M.	°	°		
22	08 24	..	08 35	+7	40 E	1	From spectrohelioscope.
31	..	11 15	..	+7	40 W	1	Do.
August							
17	11 15	11 20	11 40	—17.5	55 E	2	Do.
September							
1	..	08 08	..	+19	33 E	1	Do.
13	..	08 10	..	—22	35 E	1	Do.
17	..	08 14	08 25	—8	72 E	1	Do.
25	..	11 43	..	+15	70 W	1	Do.
October							
4	..	09 50	..	+7	40 W	1	Do.
5	..	08 00	..	+7	55 W	1	Do.
22	..	14 48	..	N	W	2	Observation incomplete.
November							
11	..	08 30	..	N	E	1	From spectrohelioscope.
December							
11	..	08 40	..	—10.5	50.5 E	1	Do.
16	..	09 05	09 35	—10.5	19 W	1	Do.
22	..	07 59	..	—15	25 E	1	Do.
27	..	07 45	08 05	—15	40 W	2	From spectrohelioscope and spectroheliogram.

On the whole photographs were available for 175 days, which were counted as 162½ effective days. The mean daily areas in millionths of the sun's visible hemisphere (without applying foreshortening correction) and the mean daily numbers derived from the above photographs are given below :—

												Combined data		Kodaikanal data only	
												Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	.	.	.	.	.	.	.	.	.	.	.	1321	13.99	1269.6	12.69
South	.	.	.	.	.	.	.	.	.	.	.	1937	16.46	2109.5	16.81
Total												3258	30.45	3379.1	29.50

The areas and numbers show a decrease of about 6 per cent and 7 per cent respectively compared with the figures of the previous half year. Both the areas and numbers show an eastern defect the percentage east being 48·97 and 48·66 respectively.



The distribution in latitude is shown in the following diagram :—

As in the case of prominences, the $H\alpha$ markings also indicate uniform activity over the zone 10° - 35° in both the hemispheres.

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