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Kodaikanal Observatory

BULLETIN No. CXXX

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF THE YEAR 1949

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 150 days and photographs for 23 days were supplied by Mt. Wilson. On the whole, data were available for 172 days which were counted as 161½ effective days after giving due weightage to photographs. The mean daily areas (in sq. minutes of arc) and mean daily numbers of prominences computed from the above photographs are given below. The figures based on Kodaikanal photographs alone 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	2.76	6.39	2.70	6.48
South	1.64	4.55	1.68	4.68
Total . . .	4.40	10.94	4.38	11.16

Compared with the corresponding figures of the previous half year, the areas show an increase of about 14% and numbers a decrease of about 7%.

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 square minutes of arc for the full lines and numbers for the broken lines.

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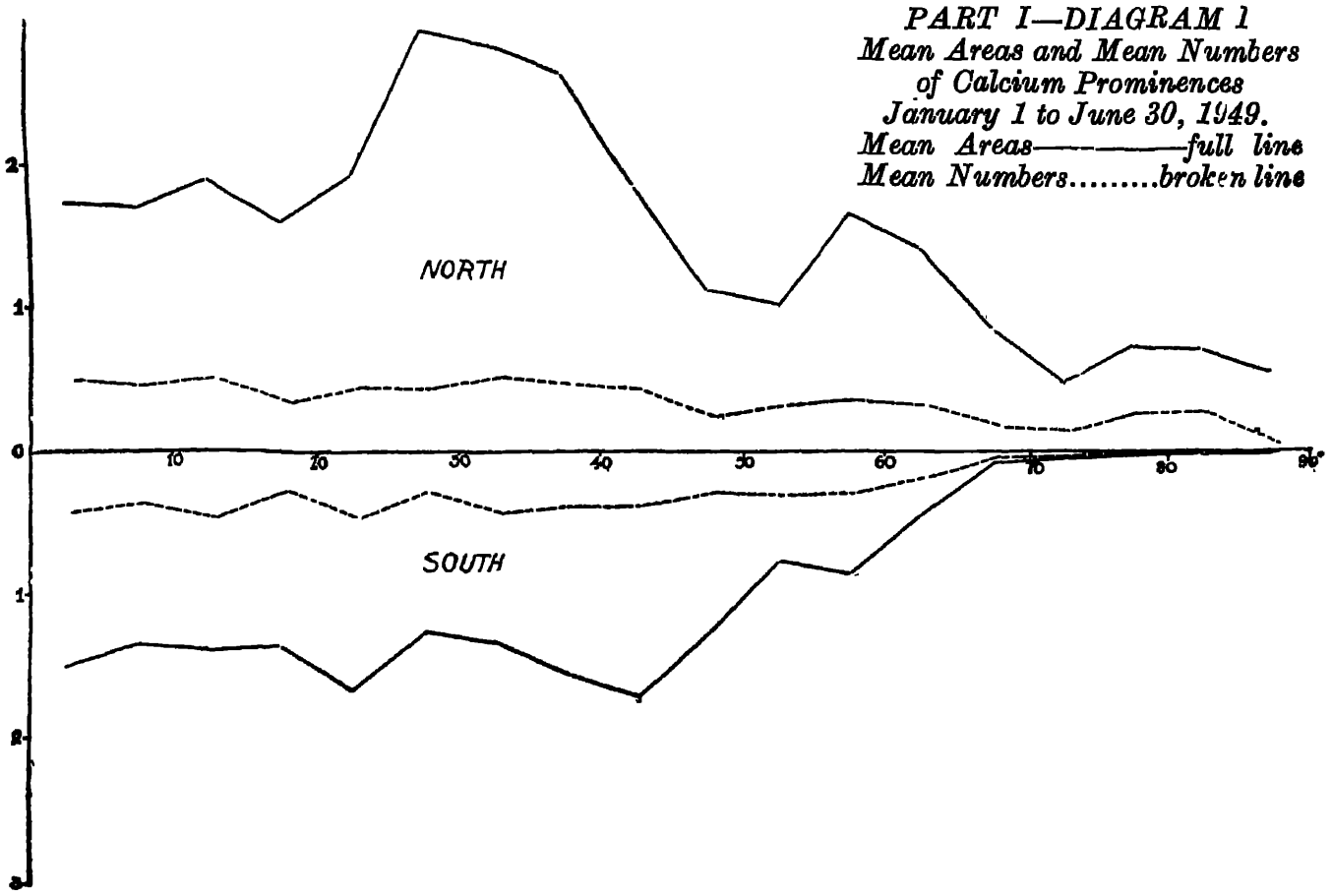


The areas show peaks of activity at zones 25°—30° and 55°—60° in the northern hemisphere and at 20°—25° and 40°—45°in the southern hemisphere.

The numbers show practically uniform activity from 0°—45° in both the hemispheres.

A very large prominence of base 63°, height 180″ and area about 18 sq.minutes was recorded on June 2. By June 4, it almost disappeared.

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

TABLE I

Months	Number of days (effective)	Areas	Numbers	Daily means		Mean height	Mean extent
				Areas	Numbers		
1949							
January	26½	99.50	302	3.75	11.40	47.14	4.86
February	25½	113.15	270	4.39	10.49	57.11	5.49
March	29½	124.75	345	4.26	11.80	46.29	5.08
April	27½	127.25	307	4.67	11.27	49.06	5.41
May	24½	84.05	281	3.40	11.35	40.21	4.06
June	27½	161.05	260	5.80	9.37	46.98	5.22
1st quarter	81½	337.40	917	4.14	11.25	47.99	5.13
2nd quarter . . .	79½	372.35	848	4.67	10.63	45.49	4.90
1st half year . . .	161½	709.75	1765	4.40	10.94	46.79	5.02

The distribution of the prominences about the sun's axis was as shown below :—

	East	West	Percentage East
Total area (sq.minutes)	343	367	48.31
Total numbers . .	859	906	48.67

Both areas and numbers show a slight eastern defect.

Observations with Prominence Spectroscope :—The details of the metallic prominences observed during the half year are given in table II.

TABLE II

Date 1949	Time I.S.T.		Base	Latitude		Limb	Height in H (seconds of arc)	Lines in which observed	Remarks
				North	South				
January	h.	m.							
4	08	30	8		25	E	64	D_1, D_2, & b_1, b_2, b_3 b_4	Height over D's=16″ Height over b's=20″
5	09	15	1		17·5	W	14	Do.	—
21	09	00	3	12·5		W	22	Do.	Height over D's=15″ Height over b's=13″
30	08	00	5	25		W	44	Do.	Height over D's=36″ Height over b's=30″
February									
7	08	00	4	19		E	46	Do.	Height over D's=35″ Height over b's=35″
19	09	55	3		22	W	38	Do.	—
24	09	40	5	27		E	102	Do.	Height over D's=62″ Height over b's=62″
March									
2	10	10	—	30		E	24	Do.	Height over D's=8″ Height over b's=too small
6	08	30	5	28·5		E	90	D_1 and D_2	Faint over D_1 & D_2
14	09	20	1		22	E	22	Do.	—
17	08	00	1		20	E	50	D_1, D_2 & b_1, b_2 b_3 b_4	Height over D's=23″ Height over b's=22″
24	10	10	1	1		E	22	Do.	—
26	08	00	1	32		E	63	Do.	Height over D's=38″ Height over b's=29″
—	08	15	3	25·5		W	66	Do.	—
April									
19	08	35	1	26		E	64	Do.	—
May									
25	09	35	4	11		E	12	Do.	—
June									
26	09	20	1	19		E	25	Do.	—

The distribution of metallic prominences was as follows :—

Latitudinal zone	1°—10°	11°—20°	21°—30°	31°—40°	Mean Latitude	Extreme Latitudes
North	1	4	6	1	21 ·4	1° & 32°
South	..	2	3	..	21 ·3	17°·5 & 25°

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

TABLE III

Date & month	Time I. S. T. (GMT. +05h. 30m	Mean latitude		Limb.	Displacements		Remarks
		North °	South °		To red Å	To violet Å	
January	h. m.						
4	08 30		25	E	5·0	3·0	At different points.
5	09 10		56·5	W		2·0	At base.
5	09 15		17·5	W	3·0		At base (metallic).
7	09 05	2·5		E	1·0	Slight	At top; also displaced at many places slightly to both-ways.
8	09 15	15		E		1·0	At base.
9	08 45	13·5		E	2·0	2·0	At 2 points.
9	08 50		0·5	W		0·5	At base.
15	09 45		46·5	W		0·5	At top.
16	11 00		21·5	W	0·5	0·5	At many points.
16	10 12	23·5		W	1·0	1·0	At top.
17	10 00		22	W	0·5	0·5	At several points.
18	09 02	25·5		E	1·0		At many places.
21	09 00	12·5		W		Slight	At top, metallic (not seen on plates taken at 8-10 and 8-20).
30	07 55	23		W	0·7		At base, metallic.

TABLE III—*contd.*

Date and month	Time I. S. T. (G. M. T.+ 05h. 30m.)	Mean latitude		Limb	Displacements		Remarks
		North °	South °		To red. Å	To violet Å	
February	h. m.						
7	08 00 to 08 05	19	..	E	7 to 8	0·5	At 08-00 the brightest part was D_3 displaced in Hcc to R by 4A, while the fainter part was displaced to R by 7 to 8°; to violet D_3 the displacement was 0·5 A in Hcc In D3, the prominence D_3 was displaced to R by 2·5A at 08-03. In D_1, D_2, it D_3 was displaced to R by 0·5 A was 08-02. In Hcc it D_3 as displaced to R by 1·5 A at 08-05. No displacement was seen in b's.
7	08 20		17·5	E	0·5	0·5	At base.
17	09 05	5·5		W	2·5		At base.
19	09 55		23·5	W	2·0		At top, metallic.
21	09 10		28·5	W	1·5		At middle.
23	08 33		8·5	W	2·0		At top.
24	09 40	27·5		E		Slight	At base.
26	08 40	30		E		1·5	At middle.
26	08 50	24		W	1·0	Slight	To red at middle and violet at base.
March 2	10 00		12·5	E	2·5		At base.
	10 00	19		E	0·5	1·0	At base.
3	09 15	0·5		W	0·75	0·75	At base.
6	08 30	28·5		E		2·0	Prominences seen faintly in D_1 and D_2.
7	08 03	26		W	2·0		At top and middle.
9	09 00	53		W	2·0		At base.
10	08 00	33		W	0·5	0·5	At middle. } Same prominence.
10	08 15	33		W	0·5	1·0	At middle. }
11	09 50	28		W		1·0	A little above the base.
12	07 35	27		W		2·0 1·5	2 Å to V at base and 1·5 Å is at middle.
14	09 20		22	E	1·0	1·0	At base ; metallic.
19	08 20	10·5		W	0·5	0·5	At base.
21	09 45		11·5	W		Slight	At base.
26	08 15	25·5		W		2·0	At base, metallic.
28	09 00		1·5	E	0·5		At base.

Date & month	Time I.S.T. (GMT.+ 05h. 30m.)	Mean latitude		Limb	Displacements		Remarks
		North °	South °		To red. Å	To violet. Å	
April	h. m.						
7	07 50	34·5		W	1·0		At top.
14	08 45	23·5		W	1·0	1·0	At base.
	08 50	4		E		1·0	At base.
26	09 40		47·5	W	2·0		At middle.
28	07 55		25	W		0·5	At base.
May							
8	09 00		4·5	W	1·0		Displaced at different places.
	09 15		42	W		4·0	At base.
25	08 20		12	W		1·5	At base.
	08 40		35·5	W	0·5	0·5	At base.
	09 35	11		E		0·5	At base, metallic.
28	09 15	4·5		E		0·5	At base.
June							
1	09 30		52·5	W	1·0		At base.
	09 35		24	E		1·0	At middle.

The number of displacements was 51 as against 63 in the previous half year and their distribution was as follows :—

Latitude		North	South	Total
0°—30°	..	24	17	41
31°—60°	..	4	6	10
61°—90°	..	—	—	—
Total	..	28	23	51
East limb	..			18
West limb	..			33

Of these 15 were towards red, 19 towards violet and 17 both ways simultaneously.

A large displacement of about 7·5 Å to red was observed over a metallic prominence on the NE limb on the 7th of February.

87 bright reversals of Hα line, 77 dark reversals of D3 and 12 displacements of the Hα line (4 towards red, 4 towards violet and 4 bothways) were observed on the sun's disc in the neighbourhood of sunspots. Their distribution was as following ;—

	North	South	East	West	Total
Bright reversals of Hα line	52	35	46	41	87
Dark reversals of D3	48	29	40	37	77
Displacements of Hα	8	4	8	4	12

Observations with spectrohelioscope—Observations with the Hale sepectrohelioscope in the Hα line were continued as in previous year for noting the changing phenomena and displacements on sun's limb and disc. The displacements observed are summarised below ;—

	North	South	East	West	Total
In prominences	20	13	17	16	33
In Dark Markings	21	10	19	12	31
In Bright Flocculi	3	1	2	2	4

A list of solar flares observed during this half year is given below ;—

TABLE IV

Date	Time in I. S. T. Beginning	Maximum	End.	Mean latitude	Mean longitude from C.M.	Intensity.	Maximum Width of Hcc line	Remarks
1949	H. M.	H. M.	H. M.	°			A°	
January								
21	08 15	..	08 40	+23	24E	1	1·9	From spectrohelioscope.
23	..	08 00	09 31	a)+19 b)+22	a) 5W b) 5E	3	..	From spectroheliogram
25	..	08 35	09 05	+25	16W	2	2·3	From spectrohelioscope and spectroheliogram.
February								
4	08 10	..	09 15	−10	20E	1	..	From spectrohelioscope
11	08 25	..	09 00	+14	74E	1	..	Do
15	08 30	..	08 50	+13	18E	1	1·4	From spectrohelioscope and spectroheliogram.

TABLE IV—(*contd.*)

Date	Time in I. S. T.			Mean latitude	Mean longitude from C.M.	Intensity	Maximum width of Hcc line	Remarks
	Beginning	Maximum	End					
March	H. M.	H. M.	H. M.	°	°		A°	
8		09 45 10 30		0	25W	1		From spectroheliosoope.
22		09 00	08 45	+25	45W	1		do.
25		14 20		+17	72W	1		From spectroheliogram.
29		09 44	09 52	+3	16E	1	1·6	From spectroheliosoope and spectroheliogram.
April								
5	08 10	08 13	08 15	—11	25W	2	5·6	
7		15 15		—9	74W	1	No change in width	
12		08 35		+19	52E	1	do.	
May								
4		07 45		+6	23E	1	do.	
6		14 30		—17	70E	1		Observed through cloud; no details available.
10	09 00	09 15	10 00	—17	20E	2	2·6	
29		11 45		+3	35E	1		Observed through cloud ; no details available.
June								
1		07 33	08 00	+1	9W	1	No change in width	
13		07 45	10 00	+16	62W	1	1·68	
15		07 56	10 00	—16	25E	1	Width 1·68 at 08 15	1·42 at 08 25
16		08 00	08 30	—3	12E	2	No change in width	
30		07 50	08 10	—18	37W	1	do.	

A solar flare of intensity 3 in association with a large sunspot group was observed on 23rd January. It was accompanied by widespread radio-fadeouts and a severe magnetic storm.

Prominences projected on the disc as dark markings.—Hα flocculus photographs were taken at Kodaikanal on 163 days and photographs were received for 15 days from Mt. Wilson and 14 days from Meudon Observatories On the whole data were available for 180 days which were counted as 169½ effective days.

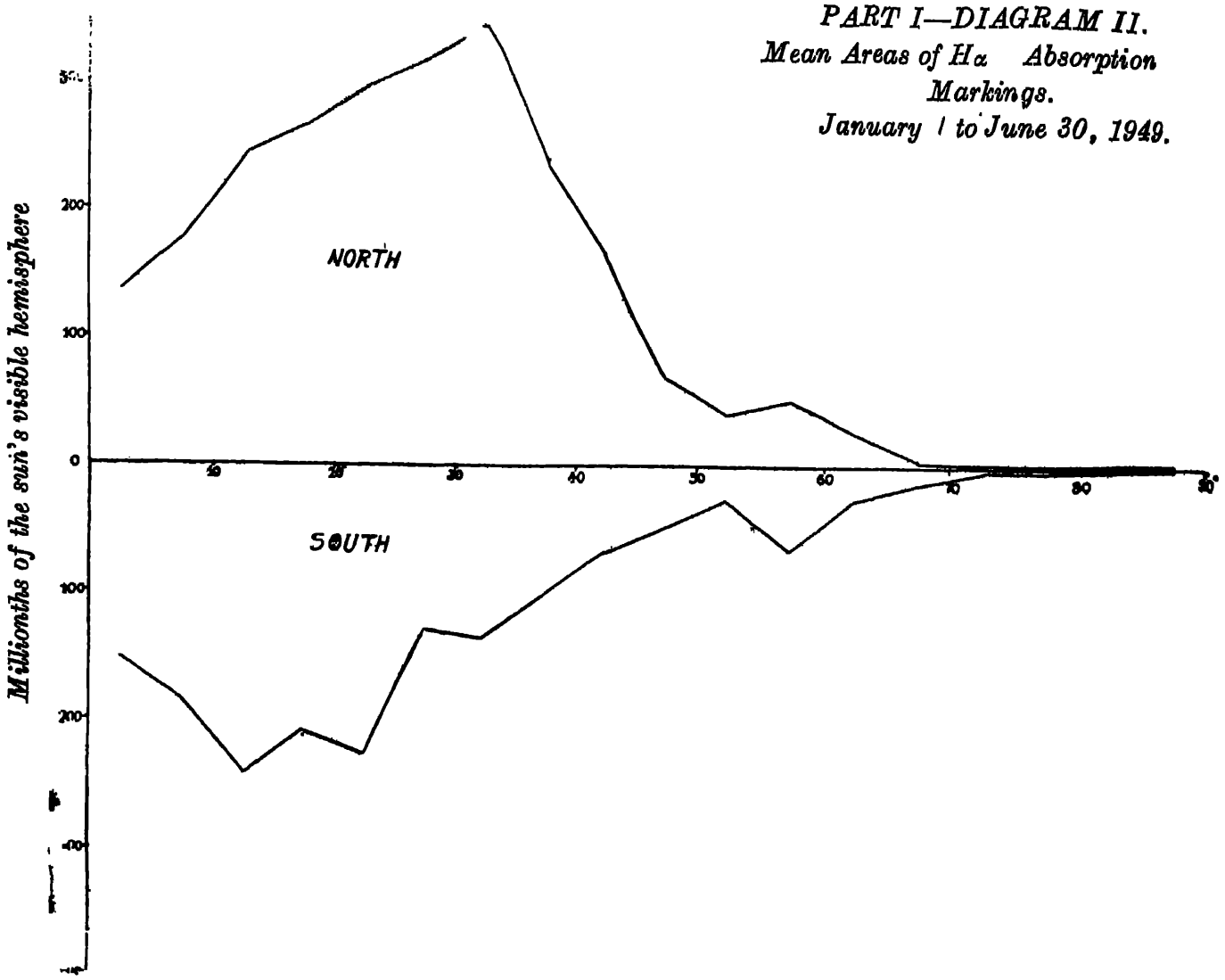
The mean daily areas in millionths of the sun's visible hemisphere (uncorrected for foreshortening) and mean daily numbers are given below :—

	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	2408	17·68	2357	17·15
South	1632	14·07	1627	13·89
Total	4040	31·75	3984	31·04

Compared with the previous half year, the areas and numbers show an increase of 24% and 4% respectively.

The following diagram illustrates the distribution in latitude of the areas of these markings :—

PART I—DIAGRAM II.
Mean Areas of Hα Absorption Markings.
January 1 to June 30, 1949.



In the northern hemisphere, the peak of activity occurs at zone 30°-35°, while in the southern hemisphere two peaks appear at zones 10°-15° and 20°-25°.

Thanks are due to the co-operating observatories for the photographs kindly supplied by them.

Kodaikanal,
April, 1950.

A. K. Das,
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