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Kodaikanal Observatory.

BULLETIN No. CXXXI.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE SECOND HALF OF 1949.

During this half year, K-prominence photographs could be taken at Kodaikanal on 113 days only; photographs for 69 days were obtained from the Mt. Wilson Observatory thus completing the records for all the days of the half-year. These were counted as 173½ effective days after weightage according to the quality of photographs. The mean daily areas (in sq. minutes of arc) and the mean daily numbers derived from all 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 of Kodaikanal and Mt. Wilson		Kodaikanal data only.	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	2·56	5·71	2·46	6·26
South	1·67	3·80	1·27	4·06
Total	4·23	9·51	3·73	10·32

Both the areas and the numbers show decreases, the decreases being 4% and 13% respectively compared with the corresponding values of the previous half-year.

The distribution of areas and numbers in 5° ranges of latitude is represented in the following diagram.

Diagram I.

The areas show peaks of activity at 40°-45° and 65°-70° in the northern hemisphere and 30°-35° in the south. The numbers are nearly uniformly distributed between 0° and 70° latitude in the northern hemisphere and between 0° and 40° in the southern.

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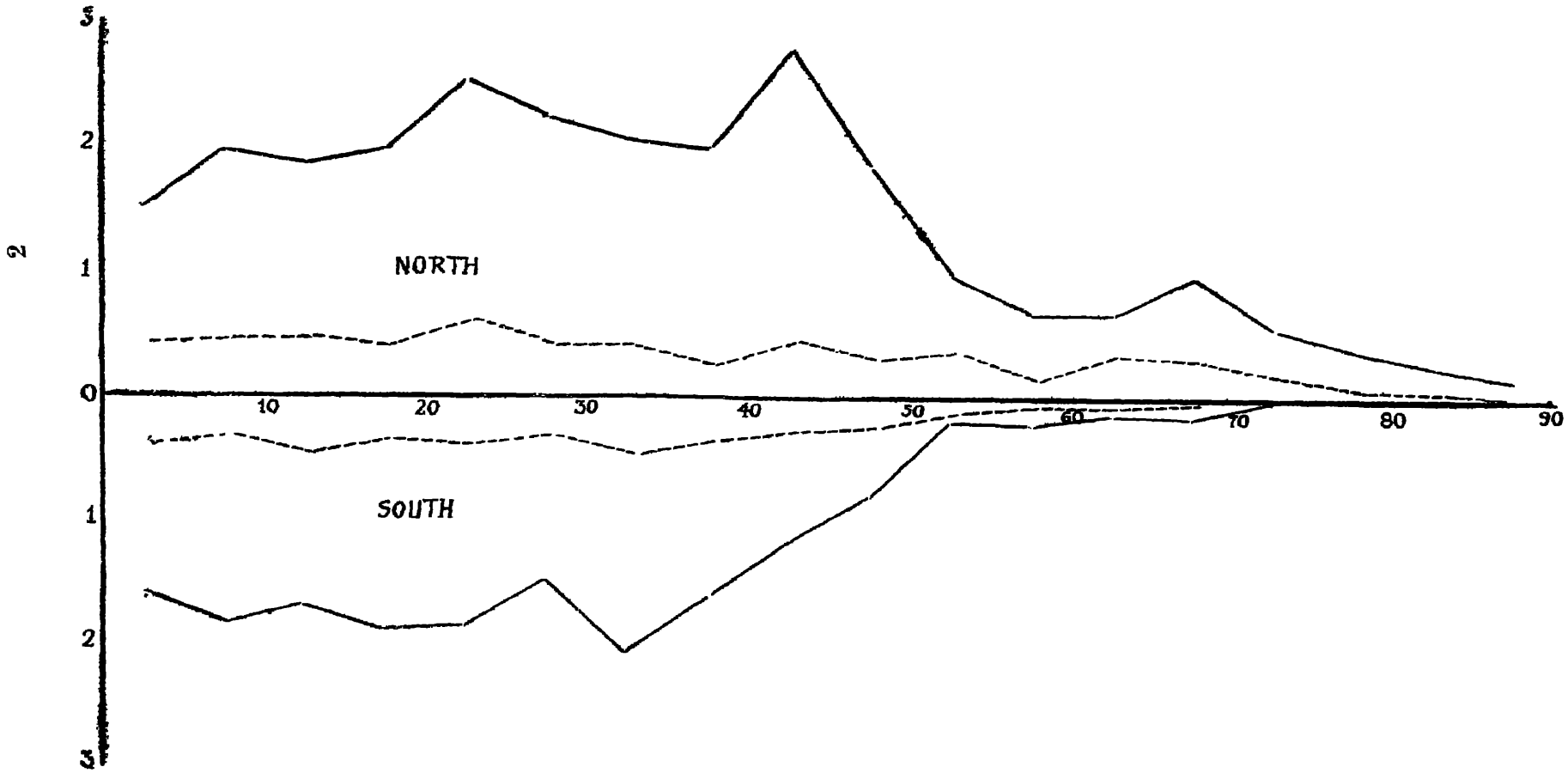
DIAGRAM I

Mean Areas and Mean Number of Calcium Prominences
July 1 to December 31, 1949
Mean Areas—— ——Full line
Mean Numbers.....Broken line



The monthly, quarterly and half-yearly means of areas, numbers, heights and extents of prominences are shown in Table I.

TABLE I.

Months	Number of days (effective)	Areas (Sq. mts.)	Numbers	Daily means		Mean height	Mean extent
				Areas (Sq. mts.)	Numbers		
1949—							
July	27½	135·30	265	4·92	9·64	44·87	4·78
August	30½	149·85	283	4·91	9·28	49·63	4·71
September	29	149·35	274	5·15	9·45	46·24	4·92
October	29½	109·25	270	3·74	9·23	44·35	4·07
November	28½	107·85	293	3·78	10·28	38·87	4·05
December	28½	81·20	263	2·85	9·23	38·21	4·21
3rd quarter	87	434·50	822	4·99	9·45	40·06	4·80
4th quarter	86½	398·30	826	3·46	9·55	40·45	4·11
2nd half year	173½	732·80	1648	4·23	9·51	43·70	4·45

The following table gives the distribution of areas and numbers east and west of the sun's axis :—

1949 July—December	East	West	Percentage East
Total areas (in sq. minutes)	323·45	409·35	44·14
Total numbers	802	846	48·67

The eastern defect in both the areas and the numbers persists as in the previous half-year ; the defect is more-pronounced in the case of areas.

Observations with the Prominence Spectroscope :—10, metallic prominences were observed during the period under review. Their details are shown in the table given below :

TABLE II

Date 1949	Time I.S.T.	Base	Latitudes		Limb	Height in Hd (seconds of arc)	Lines in which observed	Remarks.
			North	South				
September—	H. M.							
4	08 25	1	45		E	64	D_1, D_2, & b_1, b_2 b_3, b_4'	Height over D's=24″·8 Height over b's=24″
	08 30	1	23·5		E	41·6	do.	Height over D's=16″·8 Height over b's=16″·0
October—								
8	09 30	5	17·5		E	33·6	do.	Height over D's=16″·0 Height over b's=10″·0
14	00 30	3		13·5	E	48	do.	Height over D's=12″·0 Height over b's= not measured.
	09 35	1	5		W	22	do.	Height very slight in D's and b's.
November—								
10	08 55	3	3·5		W	13·6	do.	Height over D's=8″·8 Height over b's=8″·0
	09 14	1		20·5	E	36·8	do.	Height in D's and b's too small to measure.
December—								
1	08 35	2	18		E	46·4	do.	Height over D's=30″·4 Height over b's=21″·6
	08 42	4	29		W	37·6	D_1 and D_2	Height in D's very slight
	09 00	4		32	W	32·8	D_1, D_2, & b_1, b_2 b_3, b_4'	Height in D's=10″·4 Height over b's=12″·0

The distribution of the metallic prominences was as follows :—

Latitudinal zone	1°—10°	11°—20°	21°—30°	31°—40°	41°—50°	Mean latitude	Extreme latitudes
North	2	2	2	..	1	20°·2	3°·5 and 45°
South	..	1	1	1	..	24°·0	13°·5 and 32°

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

TABLE III.

Date and month	Time I.S.T. (GMT.+ 05h. 30m	Mean latitude North °	Mean latitude South °	Limb	Displacements To red A°	Displacements To violet A°	Remarks.
July—	H. M.						
1	09 35	6·5		W	0·5	0·5	At base.
26	08 35		18·5	E	2·0	1·5	At base.
August—							
21	09 35	4·5		W	0·5	0·5	At base.
September—			Nil				
October—							
8	09 05	24·5		W	0·5	0·5	At base.
	09 11	15		E		7 to 8	Metallic.
29	09 40	65		E		0·3	Entire prominence.
November—							
2	09 00		31·5	E	0·5		At top.
	09 10		7·5	E		2·5	At base.
8	09 30	18·5		W	12·0	0·5	At base.
10	08 50	28		W		0·5	At top.
13	08 45	16·5		E		0·5	At base.
December—							
1	08 35	23		E		0·5	At middle ; metallic at 25°-27°.
	08 30	31		E	0·5		At base.
8	08 40		71	W	0·75		At base.
15	08 40	43		W	1·0		At top and base.
	08 30	23		E	0·5		At top.
	09 05	6		E		0·5	At middle.

The total number of displacements observed was only 17 as against 51 in the previous half-year and their distribution was as folllows :—

Latitude	North	South	Total
0°—30° . . .	10	2	12
31°—60° . . .	2	1	3
61°—90° . . .	1	1	2
TOTAL .	13	4	17
East limb			10
West limb			7

5 of these displacements were towards red, 7 towards violet and the rest in both directions simultaneously

The largest Doppler shifts were observed on 2 prominences, *viz.* 7 to 8 A° to violet on a metallic prominence observed on October 8 at 09 h. 11m. I. S. T. on the NE limb and 12 A° to red in a prominence noticed on November 8 at 09 h. 30 m. I. S. T. on the NW limb.

Reversals and Displacements on the sun's disc.

The HL line was observed in emission on the disc in the vicinity of sunspots on 62 occasions and the D_3 line in absorption on 52 occasions. 12 displacements of the HL line were also recorded on the disc near spot regions. The distributions of these reversals and displacements was as given below :—

	North	South	East	West	Total
Bright reversals of HL line on the disc .	40	22	31	31	62
Dark reversals of D_3 line	34	18	27	25	52
Displacements of HL line	7	5	3	9	12

Observations with the spectrohelioscope.—The displacements of the HL line over prominences, dark marking and bright flocculi as observed with the Hale Spectrohelioscope are summarised below :—

	North	South	East	West	Total
Displacements in prominences . . .	16	8	14	10	24
Displacements in dark markings . . .	23	11	16	18	34
Displacements in bright flocculi . . .	10	5	10	5	15

	Displacements towards Red	Violet	Bothways
In prominences	5	9	10
In dark markings	14	3	17
In bright flocculi	..	..	15

The following table gives the list of solar flares observed during the half year :—

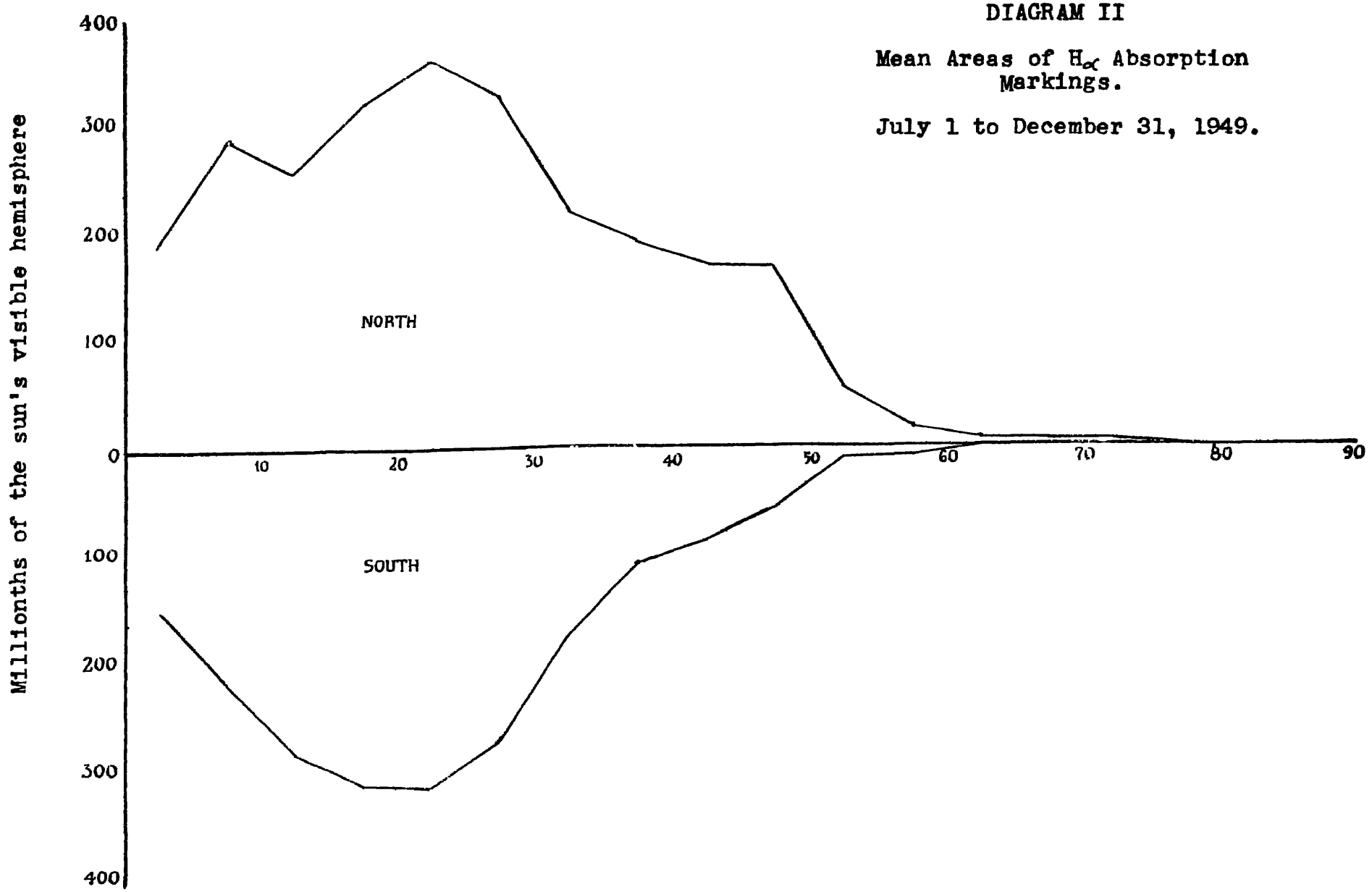
TABLE IV

Date	Time in I.S.T. Begining	Maximum	End	Mean latitude	Mean longitude from C.M.	Intensity	Maximum width of HL line
1949—	H. M.	H. M.	H. M.	°	°		A°
July—			NIL				
August—							
19	08 20	..	08 45	+12	5W	1	—
September—							
5	..	07 47	08 25	—17	7E	2	—
14	08 22	..	08 53	—17	70W	1	3·2
16	..	11 12	11 30	—13	18E	1	2
21	12 07	12 09	..	—17	32W	2	2·5
October—							
1	..	09 48	09 53	+10	80E	1	—
3	08 44	08 48	11 00	+7·5	50E	3	8
6	..	10 22	..	+8	17E	1	—
8	..	09 25	..	+18	71E	1	1·9
11	08 05	..	08 10	+14	31E	1	—
11	..	09 15	..	—15	42E	1	—
15	09 50	..	09 57	+14	32E	1	1·8
16	..	07 55	..	+18	40W	1	—
31	..	09 27	09 32	+24	60E	1	1·4
November—							
2	11 24	11 29	11 36	—9	80E	1	1·6
6	09 30	..	09 45	+22	24E	1	1·6
7	09 59	..	10 10	+20	80W	1	4·0
9	..	15 00	..	—9	7·5W	1	1·56
12	..	09 26	09 45	+8	26E	1	2·0
17	..	15 30	..	—2·5	46W	1	1·76
23	14 15	..	14 30	+20·5	52E	1	1·96
December—			NIL.				

DIAGRAM II

Mean Areas of H_α Absorption Markings.

July 1 to December 31, 1949.



Prominences projected on the disc as H_L absorption markings.—Spetroheliograms of the disc in HL line were obtained at Kodaikanal on 126 days during the half-year; the Mt. Wilson Observatory supplied 55 photographs and the Meudon Observatory 36. On the whole the data were available for 180 days which were reckoned as 172¼ effective days after due weightage.

The mean daily areas in millionths of the sun's visible hemisphere (uncorrected for foreshortening) and the mean daily numbers of the H_L dark markings as derived from the above photographs are given below:—

	Combined data of Kodaikanal, Mt-Wilson and Meudon		Kodaikanal data only	
	Mean daily areas	Mean daily Numbers	Mean daily areas	Mean daily Numbers
North	2575·5	20·32	2980 5	21·75
South	1991·5	17·44	2197·3	18·07
TOTAL	4567·0	37·76	5077·8	40·42

The values indicate increases of 13% and 19% in areas and numbers respectively compared with the corresponding means of the previous half year.

The distribution of areas and numbers about the sun's axis shows eastern defect in both the cases, the percentage east being 47·54 for areas and 48·57 for numbers.

The latitudinal distribution of the markings is shown in the following diagram;

Diagram II

The diagram shows that the zones of maximum activity were at 20°-25° in the northern hemisphere and at 15°-25° in the south.

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

KODAIKANAL,
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