

Kodaikanal Observatory.

BULLETIN No. XCVIII

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE SECOND HALF OF THE YEAR 1931

In pursuance of the programme of work adopted since 1st January 1923 under the auspices of the International Astronomical Union, all observatories taking spectroheliograms of the sun have been asked to co-operate with the Kodaikanal Observatory by supplying copies of their photographs on those days when the Kodaikanal records are imperfect or wanting. In response to our requirements for the second half of the year 1931, the Mount Wilson Observatory supplied calcium (K_2) prominence plates for 47 days and $H\alpha$ disc plates for 28 days, the Meudon Observatory supplied calcium (K_2) disc plates for 4 days and $H\alpha$ disc plates for 19 days, and the Pitch Hill Observatory (Mr. Evershed's) at Ewhurst, Surrey, England, supplied one $H\alpha$ disc plate.

When only incomplete or imperfect photographs for any day are available from more than one observatory, the best photograph is chosen as representing the solar activity of that day after weighting it according to its quality, and the remaining photographs are ignored.

Calcium Prominences at the Limb

The mean daily areas and numbers of prominences photographed during the half-year by means of the K line of calcium are given below. The means are corrected for incomplete or imperfect observations, the total of 171 days for which plates were available being reduced to 159 effective days.

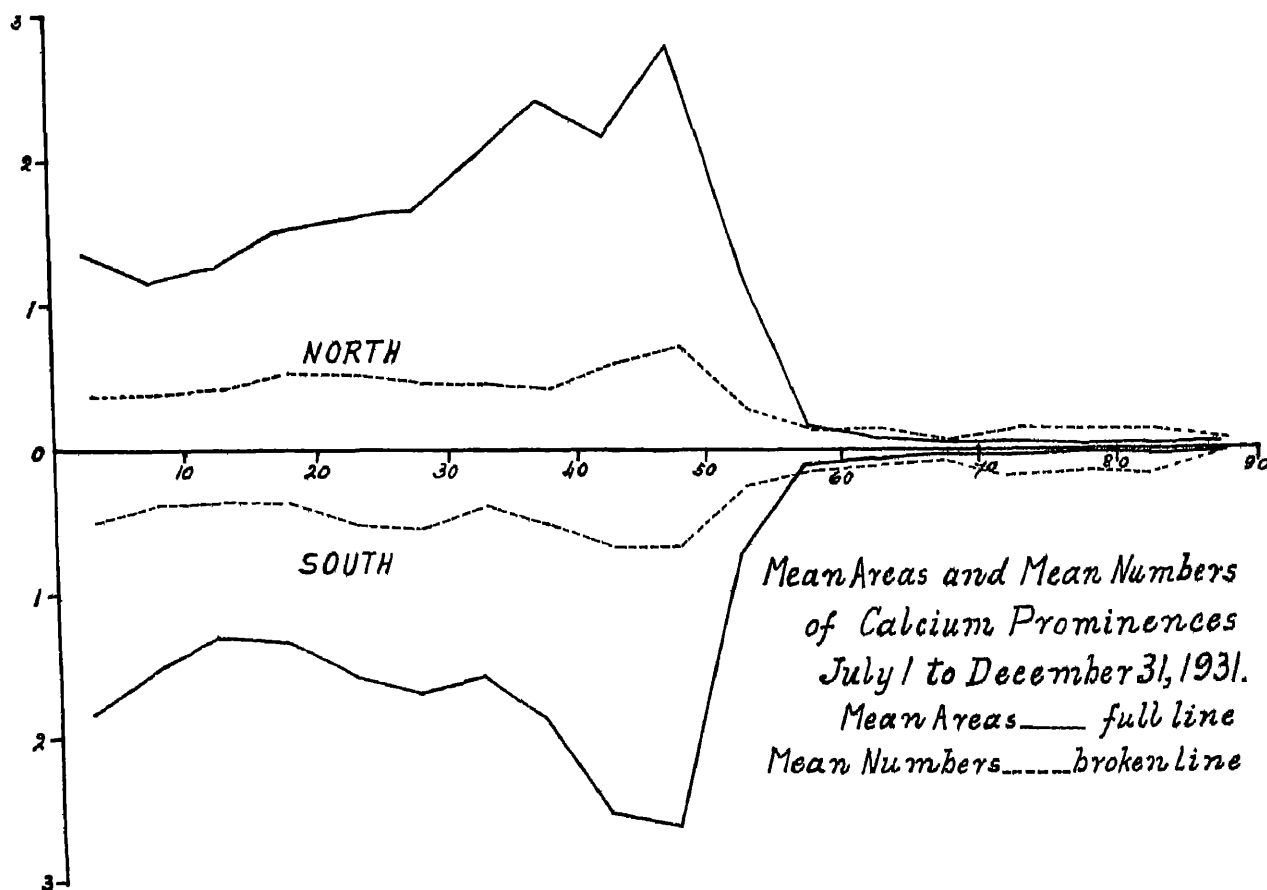
	Mean daily areas (square minutes)	Mean daily numbers
North	1.94	5.93
South	1.89	6.20
	—	—
Total	3.83	12.13
	—	—

Compared with the previous half-year both areas and numbers show a decrease of about 6 per cent and 11 per cent respectively.

For comparison with bulletins issued prior to the co-operation of other observatories the means based on Kodaikanal photographs alone are also given, 142 days of observation being counted as 124 effective days.

	Mean daily areas (square minutes)	Mean daily numbers.
North (Kodaikanal photographs only) . .	2'13	6.54
South (do.) . .	2'08	6.74
Total ...	4.21	13.28

The distribution of prominences in latitude is represented in the following diagram, in which the full line gives the mean daily areas and the broken line the mean daily numbers for each zone of 5° of latitude. The ordinates represent tenths of a square minute of arc for the full line and numbers for the broken line. Compared with the previous half-year the diagram shows very little change in the distribution of activity in the various zones except for a slight fall near latitude 10°.



The monthly, quarterly and half-yearly areas and numbers, and the mean height and mean extent of the prominences on photographs from all co-operating observatories are given in Table I. The unit of area is $\frac{1}{4}$ square minute of arc. The mean height is derived by adding together the greatest heights reached by individual prominences and dividing by the total number of prominences observed; the mean extent is derived by adding together the lengths of the base on the chromosphere of individual prominences and dividing by the total number of prominences.

TABLE I—ABSTRACT FOR THE SECOND HALF OF 1931

Months	Number of days (effective)	Areas	Numbers	Daily means		Mean height	Mean extent
				Areas	Numbers		
1931						"	°
July	27½	111.6	334	4.2	12.1	33.2	5.48
August	28½	108.6	344	3.8	12.0	34.7	4.98
September	28½	128.5	391	4.5	13.7	32.9	4.89
October	28½	135.0	386	4.7	13.4	34.0	5.01
November	25½	72.2	294	2.5	11.6	30.0	4.24
December	20½	50.2	180	2.5	8.9	31.3	4.95
Third quarter	84½	351.7	1,069	4.1	12.6	33.6	5.10
Fourth quarter	74½	257.4	860	3.5	11.6	32.1	4.73
Second half-year	159	609.1	1,929	3.8	12.1	32.9	4.94

Distribution east and west of the sun's axis.

As in the previous half-year, both areas and numbers showed a defect at the east limb as will be seen from the following table—

1931 July to December.	East	West	Percentage East
Total number observed	.. 940	979	48.98
Total areas in square minutes	279.6	329.5	45.90

Hydrogen Prominences at the Limb

During the half-year, photographs of the prominences in hydrogen light were taken in this observatory on 119 days which were counted as 109 effective days. The mean daily areas, in square minutes of arc, of hydrogen prominences are given below—

	Mean daily areas (square minutes)
North	0.76
South	0.63
Total	1.39

Compared with the previous half-year, H α prominence areas show a decrease of about 3 per cent. The percentage of H α areas to calcium areas is 33, nearly the same as in the previous half-year. The curve of distribution of H α prominences is similar to that of calcium prominences. The northern preponderance is still more marked in the case of H α prominences than for calcium ones, the ratio of the northern areas to the southern being 1.21 and 1.02 for H α and K prominences respectively.

Metallic prominences

Only one metallic prominence was observed during the half year Its details are given below --

TABLE II—LIST OF METALLIC PROMINENCES—JULY TO DECEMBER 1931

Date	Time I S T	Base	Latitude		Lamb	Height.	Lines
			North	South			
1931	H M			°		"	
Nov 16	8 39	2	10		E	10	4924 1 5016, 5018 G, b ₄ , b ₃ , b ₂ , b ₁ , 5234 8 5276 2 5916 8, D ₂ D ₁ and 7065

Displacements of the hydrogen lines

Particulars of the displacements observed in the chromosphere and prominences are given in the following table --

TABLE III—DISPLACEMENTS OF THE HYDROGEN LINE

Date	Time I S T	Latitude		Lamb	Displacement			Remarks
		North	South		Red	Violet	Both ways	
1931	H M		°		A	A	A	
July	5	9 8	45	E	1			At top
	16	9 36	10	E	05			Do
	20	8 58	8	W		1		At base
	22	9 0		27		Slight		At top
		9 5	25	W	3			Do
	23	9 19		82	2			In chromosphere
		9 8	2	W	1			At base
	26	9 5		7	1			At top
		8 58		57 5	1			Do
August	31	9 56	13	E	1			At base
	18	8 49	45 5	E	1			Do
		8 40		33 5		Slight		Do
September	2	9 29	22 5	W	2			At top, extends over 5° from 20° to 25°
	4	8 55		74 5			Slight	In chromosphere
		8 52		35 5	1			At top
		8 45		1	05			Do
	5	8 40	82	W	Slight			In chromosphere
		8 58	58 5	E	Do			Do
		9 0	12	E		Slight		Do
	16	8 42	62	W	05			Do
	18	9 3		70 5				At top
		9 1		7		1		At base
		8 51		65	15		05	Do
		8 44	11	W	05			In chromosphere
	20	9 23		61		05		Do
	23	9 25	8	E	Slight			At top
		9 47	54	W		Slight		Do
	26	9 9	53	E	1			In chromosphere
	27	8 52	21	E	Slight			At top
October	1	8 54		7				In chromosphere
	2	8 55		16	1			At top, extends over 2° from 15° to 17°
	9	8 55		58 5	2			At top
		8 52	12	W		Slight		Do
	11	9 17	55	E		1		Do
	13	8 43		44 5	1			Do
	30	8 55	31	E	05			At base

Date	Time I S T		Latitude		Lamb	Displacement			Remarks
			North	South		Red	Violet	Both ways	
1931	H	M	°	°		A	A	A	
November 8	9	6	27		W		1		At base
9	9	34	19		W		1		
14	8	58		25	W	Slight			At top
16	8	29	39		E	0.5			At base
	8	39	10		E		0.5		Do
	8	39	1		E	1			At top
18	9	37		50	E	0.5			Do
22	10	10	29		E	2			In chromosphere
	10	50	3		W	1			At top
	10	49	11		W		1		
23	8	24		2	E	0.5			At base
December 5	10	26	37		W			Slight	At top
18	13	35	26.5		E	1			At top, extends over 3° from 25° to 28°
	9	31	15		W	1	1		To red at top, to violet at base
19	9	0		20	E	1			At base
	9	23		11	W	0.5			At top
28	10	36		34	W	1.5			Do
	10	36		28	W	1			In chromosphere
	10	34		5.5	W		0.5		At top
31	8	54		52.5	W		1		At base, extends over 3° from 51° to 54°

The total number of displacements was 57 as against 188 in the previous half-year and their distribution was as follows —

Latitude	North	South
1°-30°	21	12
31°-60°	9	8
61°-90°	2	5
	<u>Total</u>	<u>32</u> <u>25</u>
East limb		23
West limb		34
	<u>Total</u>	<u>57</u>

Reversals and displacements on the sun's disc

Seventy-nine bright reversals of the $H\alpha$ line, 74 dark reversals of the D_3 line and 9 displacements of the $H\alpha$ line were observed during the half-year. Their distribution is given below —

	North	South	East	West
Bright reversals of $H\alpha$	54	25	41	38
Dark reversals of D_3	51	23	38	36
Displacements of $H\alpha$	7	2	7	2

Seven displacements were towards the red and two towards the violet.

Prominences projected on the disc as absorption markings

Photographs of the sun's disc in $H\alpha$ light were available from Kodaikanal and the co-operating observatories for a total of 175 days, which were counted as 166 effective days. The mean daily areas of $H\alpha$ absorption markings (corrected for foreshortening) in millionths of the sun's visible hemisphere and their mean daily numbers are given below —

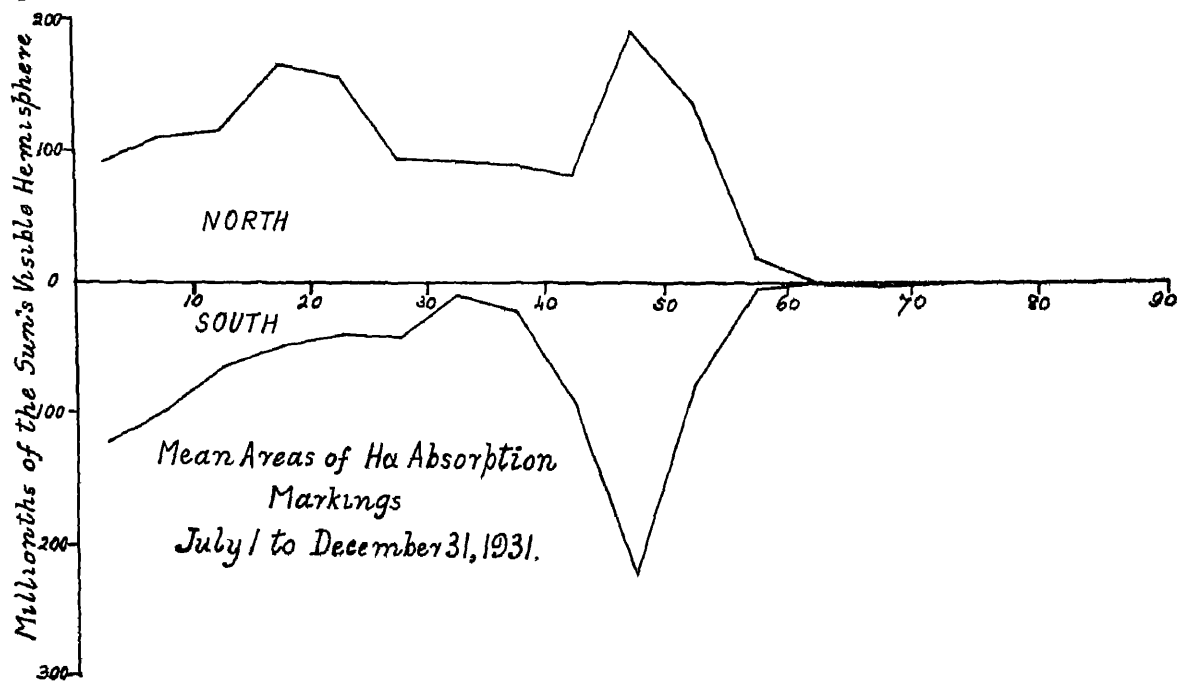
	Mean daily areas	Mean daily numbers
North	1,338	8.55
South	841	5.54
<u>Total</u>	<u>2,179</u>	<u>14.09</u>

The above show a decrease of less than 1 per cent in areas and of about 8 per cent in numbers, compared with the previous half-year.

For comparison with bulletins issued prior to the co-operation of other observatories, the means based on Kodaikanal photographs alone are also given, 133 days of observation being reckoned as 126 effective days.

		Mean daily areas.	Mean daily numbers.
North (Kodaikanal photographs only)	1,300	8'62
South (do.)	831	5'48
Total	..	2,131	14'10

The distribution of the mean daily areas in latitude is shown in the following diagram. The high latitude peaks in both the hemispheres noticed in the previous half-year have advanced 5° towards the poles and the small peak near 20° in the south has disappeared.



The areas and numbers show an eastern defect, the percentage east being 46 in both.

The areas of H α absorption markings uncorrected for foreshortening are given below:—

	Mean daily areas
North	769
South	454
Total ...	1,223

The uncorrected areas amount to 56 per cent of the corrected ones, the same as in the previous half-year. The curve of distribution in latitude is similar to that for the corrected areas as usual.

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

KODAIKANAL,
25th October 1932.

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