

Kodaikanal Observatory.

BULLETIN No. CIV.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE SECOND HALF OF THE YEAR 1933.

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 for those days when the Kodaikanal records are imperfect or wanting. In response to our requirements for the second half of the year 1933, the Mount Wilson Observatory supplied calcium (K_{28}) prominence plates for 50 days and $H\alpha$ disc plates for 28 days, the Meudon Observatory supplied calcium (K_3) disc plates for 7 days and $H\alpha$ disc plates for 45 days, and the Pitch Hill Observatory, Ewhurst (Mr J. Evershed's), supplied $H\alpha$ disc plates for 7 days.

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 182 days for which plates were available being reduced to $161\frac{1}{2}$ effective days.

	Mean daily areas (square minutes)	Mean daily numbers
North	1.38	4.49
South	0.89	3.73
Total	2.27	8.22

Compared with the previous half-year, areas show an increase of 9 per cent mainly in the northern hemisphere, and numbers a decrease of 11 per cent.

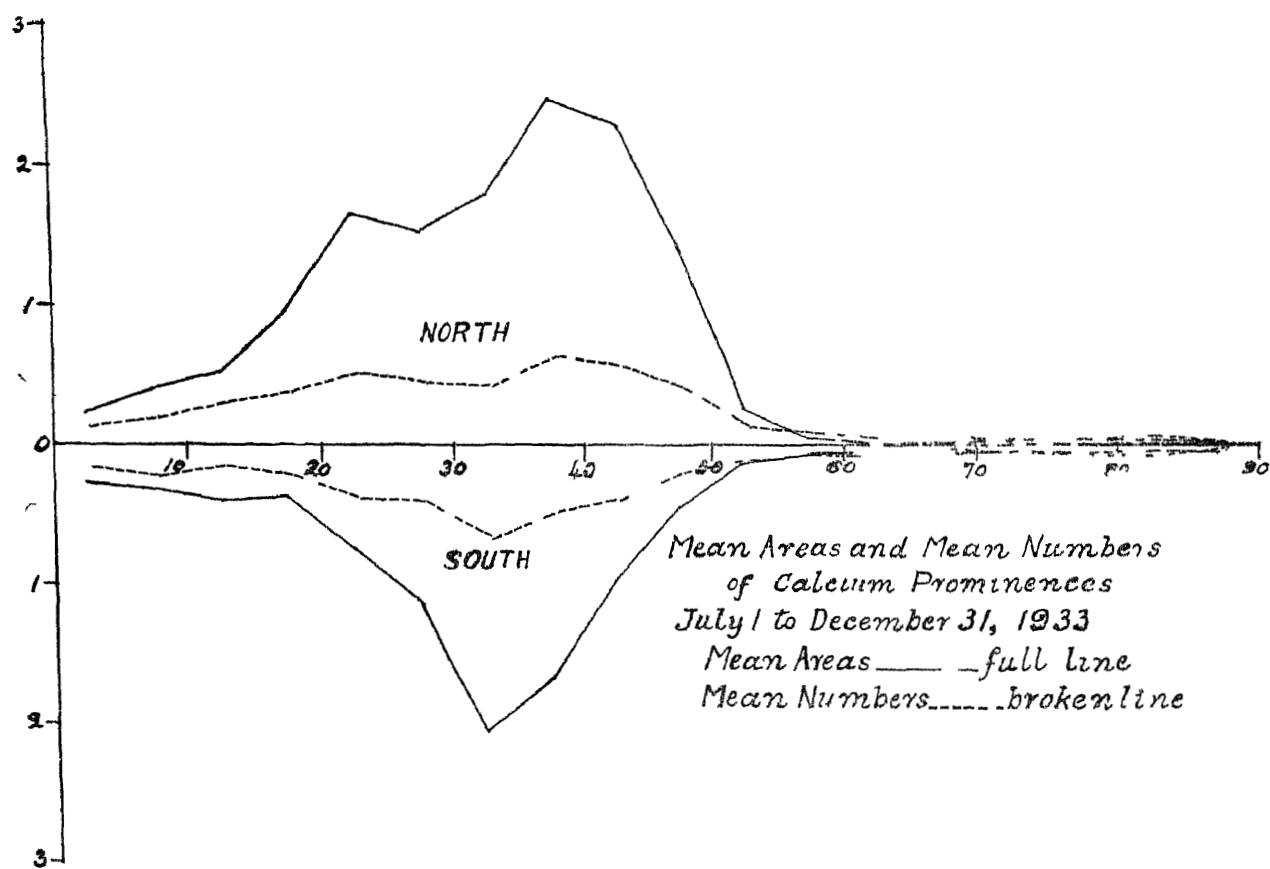
For comparison with bulletins issued prior to the co-operation of other observatories, the means based on Kodaikanal photographs alone are also given, 137 days of observation being counted as 110 effective days.

	Mean daily areas (square minutes)	Mean daily numbers
North (Kodaikanal photographs only)	1.47	4.65
South Do.	0.99	4.13
Total	2.46	8.78

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. Comparing the distribution of prominence areas with the previous half-year there has been increased activity in the belt

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30°—50° in the northern hemisphere and in the belt 30°—40° in the southern, and decreased activity near the equator, the maximum activity is near 35° in both hemispheres. Prominence areas are again considerably greater in the northern hemisphere than in the southern.



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 1 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 1933

Months 1933	Number of days (effective)	Areas	Numbers	Daily means		Mean height	Mean extent
				Areas	Numbers		
July	28½	71.9	238	2.5	8.4	42.3	4.61
August	28½	54.2	243	1.9	8.6	40.1	3.86
September	26½	60.9	225	2.3	8.4	41.4	4.00
October	24½	50.2	188	2.1	7.8	39.0	4.52
November	25½	64.9	209	2.6	8.3	41.3	4.11
December	28½	63.6	224	2.2	7.8	38.1	4.75
3rd quarter	83½	187.0	706	2.2	8.5	41.2	4.16
4th quarter	78½	178.7	621	2.3	7.9	39.5	4.47
2nd half year	161½	365.7	1327	2.3	8.2	40.4	4.30

Distribution East and West of the Sun's Axis.—Areas showed a considerable defect and numbers a slight defect at the east limb as will be seen from the following table.—

1933 July to December	East	West	Percentage East
Total number observed	651	676	49·06
Total areas in square minutes	166·8	198·9	46·61

Hydrogen Prominences at the Limb—During the half-year, photographs of the prominences in hydrogen light were taken in this Observatory on 108 days which were counted as $81\frac{1}{2}$ effective days. The mean daily areas of hydrogen prominences in square minutes of arc are given below.—

	Mean daily areas (square minutes)
North	0·71
South	0·41
Total	1·12

Compared with the previous half-year, *H α* prominence areas show only a small increase, viz., 3 per cent. The ratio of *H α* areas to calcium areas is 46 per cent, which is less than in the first half-year. The latitude distribution of *H α* prominences is similar to that of calcium prominences.

Metallic Prominences—No metallic prominences were observed during the half-year, as against 3 in the first half.

Displacement of the Hydrogen Line—Particulars of the displacements observed in the chromosphere and prominences are given below.—

TABLE II.—DISPLACEMENTS OF THE HYDROGEN LINE.

Date	Hour		Latitude		Limb	Displacement			Remarks	
	L.	S.	T.	North		South	Red	Violet		Both ways.
1933 July	3	9	58	66			0·5		At top	
	18	8	47	32	W		0·5		At base, extends over 2° from + 31° to + 33°.	
August	25	8	18	46·5	W	0·5			At base	
	28	9	28		W	0·5			Do	
September	16	9	15		E		0·5		At base.	
	23	9	01	58·5	W		0·5		In chromosphere.	
October	22	10	02	37	E		2		At base Extends over 2° from + 36° to + 38°.	
	23	8	32	21	E		0·5		In chromosphere	
	26	9	14	31	W	Slight			Do	
November	2	10	20	85·5	E	1			At top	
	13	9	06	42	E	1			Do	
	16	9	17		W		Slight		At base	
	23	10	17	34	E		0·5		In chromosphere.	
December	4	9	52	87	E	1·5			At top	
	6	9	01	56	E	0·5			Do	
	9	9	40	10	E		0·5		In chromosphere	
	11	10	01		W		0·5		At top	
	17	8	35	42	W		0·5		In chromosphere	
	19	9	09		E		0·5		At base	
	21	9	27	54	W	Slight			In chromosphere.	
	29	9	14	45	E	Slight			Do	
	30	9	25	51	W		1·5		At top	

The total number of displacements was 22 as against 64 in the previous half year and their distribution was as follows —

	North	South
1°—30°	2	2
31°—60°	11	3
61°—90°	3	1
Total	<u>16</u>	<u>6</u>
East limb		12
West limb		10
Total		<u>22</u>

Of these displacements 7 were towards the red, and 15 towards the violet

Reversals and Displacements on the Sun's Disc—One bright reversal of the H α line and one dark reversal of the D $_3$ line were observed during the half year. No displacements of the H α line were observed. The distribution is given below —

	North	South	East	West
Bright reversals of H α	1		1	
Dark reversals of D $_3$	1		1	
Displacements of H α				

Prominences projected on the Disc as Absorption Markings—Photographs of the sun's disc in H α light were available from Kodaikanal and the co operating observatories for a total of 184 days which were counted as 162½ effective days. The mean daily areas of H α absorption markings (corrected for foreshortening) in millionths of the sun's visible hemisphere and their mean daily numbers are given below —

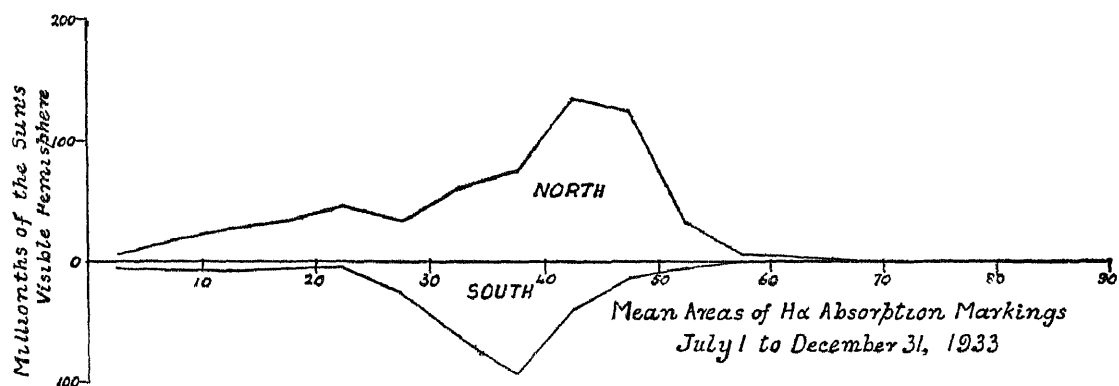
	Mean daily areas	Mean daily numbers
North	588	4.07
South	286	2.07
Total	<u>874</u>	<u>6.14</u>

The above show a decrease of 32 per cent in areas and 28 per cent in numbers compared with the previous half year, the decrease being greater in the northern hemisphere than in the southern.

For comparison with bulletins issued prior to the co operation of other observatories, the means based on Kodaikanal photographs alone are also given, 124 days of observation being reckoned as 99½ effective days

	Mean daily areas	Mean daily numbers
North (Kodaikanal photographs only)	581	3.82
South Do	310	2.00
Total	<u>891</u>	<u>5.82</u>

The distribution of mean daily areas in latitude is shown in the following diagram. Compared with the first half of the year there is decreased activity in the northern hemisphere from 0° to 40°, and decreased activity in the southern near the equator and in the belt 40°—45°



As in the previous half-year, both areas and numbers show an eastern preponderance, the percentage in areas being 54 and in numbers 52.

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

		Mean daily areas.
North	341
South	175
	Total	516

The uncorrected areas amount to 59 per cent. of the corrected ones, which is a slight increase over the two previous half-years.

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,
28th January 1935.

T. ROYDS,
Director, Kodakanal Observatory.