NO—SPO/34/1.

Kodaikanal Observatory.

BULLETIN No. CV.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF THE YEAR 1934.

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 first half of the year 1934, the Mount Wilson Observatory supplied calcium (K_{2v2}) prominence plates for 25 days and H α disc plates for 10 days, the Meudon Observatory supplied calcium (K_3) disc plates for 5 days and H α disc plates for 18 days, and the Pitch Hill Observatory, Ewhurst (Mr J. Evershed's), supplied H α disc plates for 7 days

When only incomplete or im perfect 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 181 days for which plates were available being reduced to 167 effective days.

	Mean daily areas. (Square minutes.)	Mean daily numbers.
North	1·72	6·17
South	1·68	6·39
Total . .	3·40	12·56

Compared with the previous half-year, areas and numbers show an increase of 50 per cent. and 53 per cent., respectively.

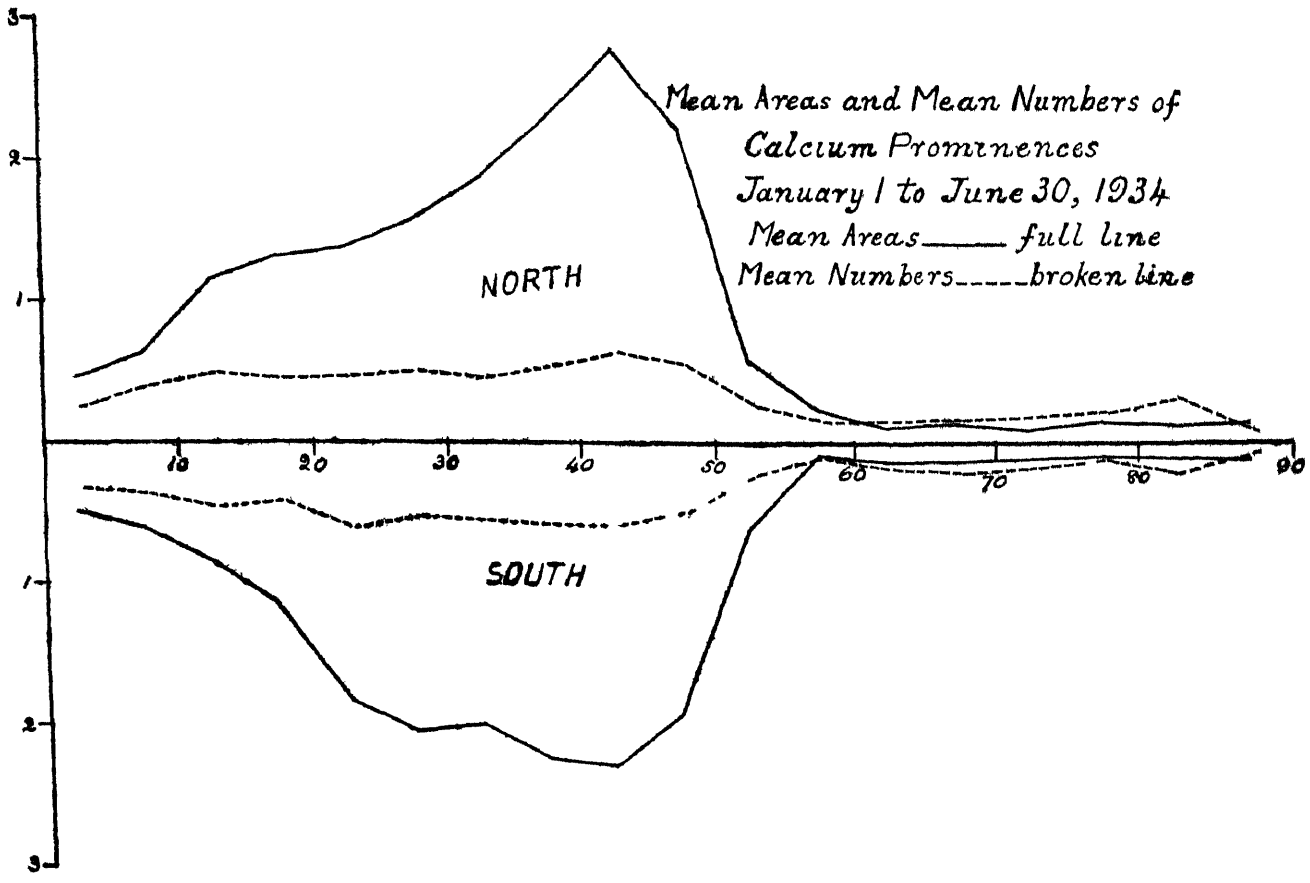
For comparison with bulletins issued prior to the co-operation of other observatories, the means based on Kodaikanal photographs alone are also given, 158 days of observation being counted as 146 effective days

	Mean daily areas. (Square minutes)	Mean daily numbers.
North (Kodaikanal photographs only)	1·80	6·38
South (Ditto)	1·75	6·55
Total . .	3·55	12·93

Price annas 5 or 6d.

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, there has been increased activity in nearly all belts of latitude, particularly in the belts 10°—20,° 45°—55° in the northern hemisphere and in the belts 10°—30°, 40°—45° in the southern hemisphere The lower of these belts corresponds to the sunspot belts The activity in the southern hemisphere has increased sufficiently to be almost equal to that in the northern The maximum of prominence activity has moved about 5° towards the poles in both hemispheres since the previous half year



The monthly, quarterly and half yearly areas and numbers and the mean height and the 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 chrom osphere of individual prominences and dividing by the total number of prominences

TABLE I —ABSTRACT FOR THE FIRST HALF OF 1934.

Months 1934	Number of days (effective)	Areas	Numbers	Daily means Areas	Numbers	Mean Height	Mean Extent
January	27	64 9	271	2 4	10 0	35 4	3 89
February	28	87 1	365	3·1	13 0	30 3	4 32
March	29¼	79 7	355	2·7	11 9	34·0	4·64
April	28¼	98 7	382	3 5	13 5	33·0	4 86
May	29¼	148 1	395	5 1	13 5	35 8	6 34
June	24¼	89 5	329	3 6	13 3	33 8	3 78
First quarter	84¾	231·7	991	2 7	11 7	33 0	4 32
Second quarter	82¼	336 3	1106	4·1	13 4	34 2	5 07
First half	167	567 0	2097	3 4	12 6	33 7	4 71

Distribution East and West of the Sun's Axis

Unlike the previous half-year both areas and numbers show a slight preponderance in the east limb as will be seen from the following table —

1934 January to June.	East.	West.	Percentage East.
Total number observed	1,073	1,024	51 17
Total areas in square minutes	3,008	2,673	52 95

Hydrogen Prominences at the Limb —The taking of daily photographs of hydrogen prominences as part of the regular programme has been discontinued from the beginning of the year

Metallic Prominences .—Five metallic prominences were observed during the half-year and their details are given below —

TABLE II.—LIST OF METALLIC PROMINENCES. JANUARY TO JUNE 1934.

Date 1934.	Time I. S. T. H.	M.	Base	Latitude. North.	South.	Limb.	Height.	Lines (See note at end of table.)
January	..			Nil.				
February 24	10	15	2	28	..	E	15	4, 10
March				Nil				
April 28	9	37	6		26	W	30	1, 2, 4, 8, 9, 10, 11
May 16	8	41	4	24		E	20	1, 3, 4, 5, 7, 8, 10, 11, 12
26	9	44	2	.	34	W	10	1, 3, 4, 8, 9, 10, 11, 12.
27	9	25	4	..	32	W	10	1, 3, 4, 9 10, 11, 12.
June				Nil.				

Note.—The key to the wave-lengths of metallic lines is as follows —

No.	λ	Element.	No.	λ	Element
1	4924·1	Fe +	7	5276 2	Fe + Cr.
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°—430°	Mean latitude	Extreme latitudes
North	0	0	2	0	26°	24° & 28°
South	0	0	1	2	30° 7	26° & 34°

Two were on the east limb and three on the west limb

Displacements of the Hydrogen Line —Particulars of the displacements observed in the chromosphere and prominences are given in the following table —

TABLE III —DISPLACEMENTS OF HYDROGEN LINE

Date 1934		Hour I S T H	M	Latitude North	South	Limb	Displacement Red A	Violet A	Both ways A	Remarks
January	2	10	22	35		E	0 5			At base
	3	9	26		17	E	1			Do
	4	9	52	27		E		1		At top
	5	9	08		39 5	W		0 5		At base
		9	04	12		W		0 5		Throughout the prominence
	12	9	30	57		E	0 5			At top
	17	10	25	3 5		W	0 5			Do
February	1	9	03	66		E		1 5		At base
	2	9	12	26		W		1		Do
		9	9	51 5		W		1		Do
	9	8	50	45		E		1		Do
		8	40	35 5		E	0 5			In Chromosphere
	10	9	35	5 5		E	0 5			At base
		9	27	27		W	1 5			At top
	11	8	47	42 5		E		0 5		At base
	13	8	26	33 5		E		0 5		At top
	14	8	26	42 5		E		0 5		In the middle of the prominence.
		8	40		31 5	W		0 5		At top
	16	9	22	22 5		E	0 5			Do
		9	18		34 5	W	Sl			Do
	19	10	34	58 5		E	1			In Chromosphere
	20	9	38	24		E		1		At base
	21	8	58	25		E		0 5		At top
		9	05	41 5		W		0 5		At base
		9	04	44 5		W	1			At top
	22	9	14	78 5		E		1 5		Do
		9	16	82 0		W		1		In Chromosphere
	23	9	35	34 5		E	0 5			At top
	26	10	22	64				0 5		In Chromosphere
	28	9	5	38 5		E		0 5		At top
March	2	9	11	59 5		W	Sl			In Chromosphere
	20	8	36	10		F		0 5		At top
	22	9	03	33 5		E		0 5		At top, extends over 2° from 34° to 36°
	24	9	00	21		E		Sl		At top
	26	9	12	29		E	Sl			At base
	28	9	20	27 5		E		1		At top
	29	9	12	10 5		W	1 5			Do
	30	9	04		1	E	Sl			Do

TABLE III.—DISPLACEMENTS OF HYDROGEN LINE—*contd*

Date. 1934		Hour I S T		Latitude North	Latitude South	Limb	Displacement Red	Displacement Violet.	Displacement Both ways	Remarks
		H	M	°	°		A	A	A	
April	1	9	04	36 5		E	1			At top
		9	18		73	E		1		In Chromosphere
	4	9	47		25 5	E		1		At top
	5	9	49	12		E		0·5		Do
	11	8	48		44	E	Sl			At base.
		8	40	55 5		W		Sl		At top
	13	8	55	41 5		E		Sl		At base
	17	8	50	40		W		0·5		At top.
		8	48	42		W	0 5			At base
	20	8	34	45		E		Sl		At top
		8	55		40·5	E	Sl			Do.
	22	8	48	10		W	Sl			Do.
	24	9	06	56 5		W		Sl		Do
	25	8	51		31	W		0 5		Do Extends over 2° from 30° to 32°
		8	50		25	W		0 5		At top
	27	9	5		73 5	E	1			Do
	28	9	20	71 5		E			Sl	In Chromosphere
		9	48		26	W	6			At top extends over 6° from 23° to 29°.
		9	55		28	W	2 5	3		Both at top, extends over 2° from 27° to 29°.
		9	44		24	W	3 5			At top, extends over 2° from 23° to 25°
May	1	8	42	43 5		E		Sl		At top
	2	8	54	35		E	Sl			At base
	3	8	58	38		W		Sl		In the middle of the prominence, extends over 2° from 37° to 39°
	4	8	50	1		W		Sl		At top
	5	10	32		3	E	0·5			Do
	6	9	30	37		E		Sl		In Chromosphere
		9	20	74 5		W			1	At top
	9	9	48	71·5		E	Sl			In Chromosphere
		9	7		25	E	0·5			At top, extends over 2° from 24° to 26°
	16	8	41	24		E		2		At top, extends over 4° from 22° to 26°
		9	55	5		W		0 5		At top, extends over 2° from 4° to 6°.
	20	9	26		69 5	E	2			At top.
		9	9	73·5		W	1	1 5		To red at top and to violet at base
		9	6	86 5		W	Sl			In Chromosphere.
	21	9	20	35·5		E		0·5		At top.
		8	56	82		W	1			In Chromosphere.
	23	8	04	44·5		W		Sl		At top
	26	10	00		87 5	W	1			At base
		9	44		34	W	1	0 5		Extends over 2° from —33° to —35°
		9	10		16	W	1			At top, extends over 2° from —15° to —17°.
		9	6	19		W	0 5			At top
	27	9	22		33·5	W	1·5			At top.
		9	21		29	W	1 5			At top, extends over 2° from —28° to —30°.
		9	18		16 5	W	0·5			At top, extends over 3° from —15° to —18°.
	30	10	5	28 5		W		0 5		At top
June	3	8	44	44·5		E	Sl			At base.
	4	9	48		80	E		0 5		Do
		9	37		13·5	W	1			At top
		9	37		10·5	W		1		Do
	15	9	6	53		W		Sl		Do
	22	8	48		60	W		0·5		Do.

The total number of displacements was 92 as against 22 in the previous half year and their distribution was as follows —

	North	South
1° to 30°	21	15
31° to 60°	30	10
61° to 90°	11	5
	62	30
East Limb	46	
West Limb	46	
Total	92	

Of these displacements, 42 were towards the red, 48 towards the violet and 2 both ways simultaneously

Reversals and Displacements on the Sun's Disc —Sixty three bright reversals of the H α line, 61 dark reversals of the D_3 line and 11 displacements of the H α line were observed during the half year Their distribution is given below —

	North	South	East	West
Bright reversals of H α	35	28	28	35
Dark reversals of D_3	34	27	28	33
Displacements of H α	3	8	3	8

Five displacements were towards the red, four towards the violet and two both ways simultaneously

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 180 days which were counted as 175 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 —

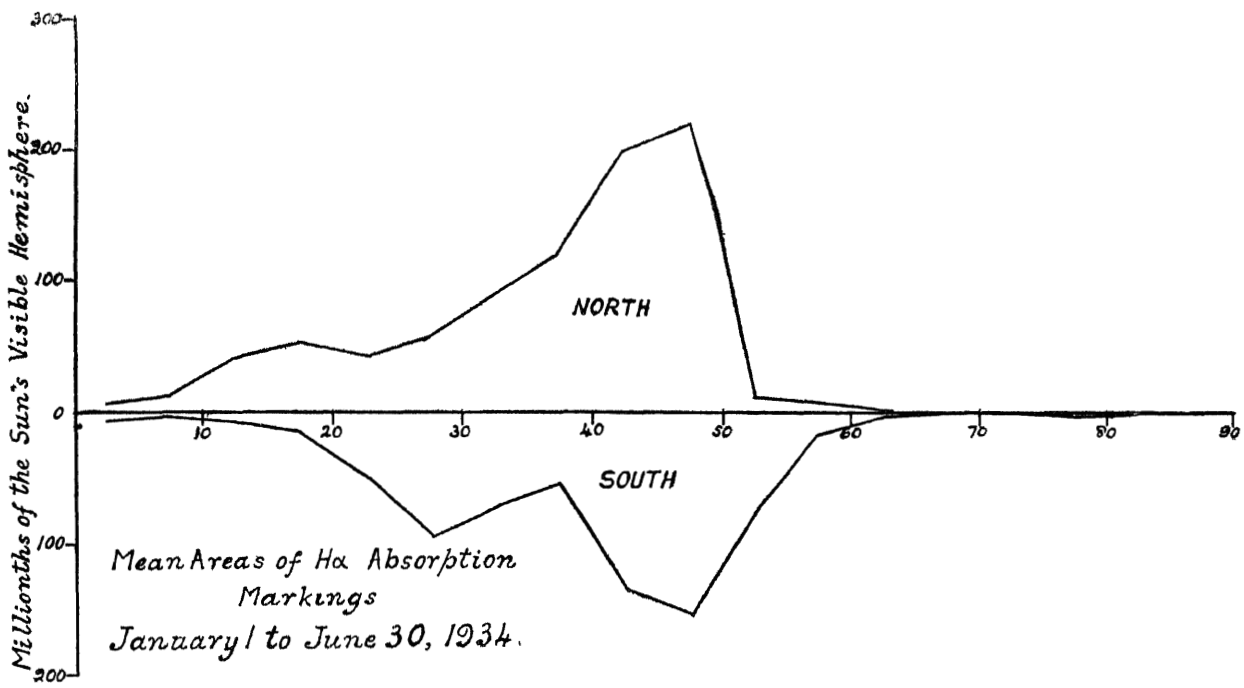
	Mean daily areas	Mean daily numbers
North	859	4 74
South	703	3 12
Total	1,562	8 86

The above show an increase of 79 per cent in areas and 44 per cent in numbers, compared with the previous half year, the increase being very marked in the southern hemisphere

For comparison with bulletins issued prior to the co operation of other observatories, the means based on Kodaikanal photographs alone are also given 153 days of observation being reduced to 146 effective days.

	Mean daily areas	Mean daily numbers
North (Kodaikanal photographs only)	847	4 82
South (Ditto)	684	4 24
Total	1,531	9 06

The distribution of mean daily areas in latitude is shown in the following diagram As in the case of prominence areas, there has been a general increase in nearly all latitudes, except near the poles The greatest increase is in the same belts as for prominence areas and the effect of the sunspot belts is again shown in the case of H α dark markings The same advance of 5° towards the poles is also seen in the maximum activity



As in the previous half-year, both areas and numbers show an eastern preponderance, the percentage in areas being 55 and in numbers 52.

The mean daily areas of H α absorption markings uncorrected for fore-shortening are given below .—

	Mean daily areas.
North	444
South	366
Total	810

The uncorrected areas amount to 52 per cent of the corrected ones, the percentage being slightly less than normal.

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,

30th March 1935

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