

# Kodaikanal Observatory.

BULLETIN No. CXII.

## SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF THE YEAR 1936

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 the days when the Kodaikanal records are imperfect or wanting. In response to our requirements for the first half of the year 1936, the Mount Wilson Observatory supplied Calcium ( $K_{232}$ ) prominence plates for 18 days and  $H\alpha$  disc plates for 10 days, the Meudon Observatory supplied Calcium ( $K_3$ ) disc plates for 5 days and  $H\alpha$  disc plates for 18 days, the Ewhurst Observatory (Mr J. Evershed's) supplied  $H\alpha$  prominence plates for 2 days and  $H\alpha$  disc plates for 3 days and the Solar Physics Observatory, Cambridge, supplied Calcium prominence plates for 4 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 181 days for which plates were available being reduced to 164 effective days.

	Mean daily areas (square minutes).	Mean daily numbers.
North	3.35	6.95
South	3.57	7.09
Total	6.92	14.04

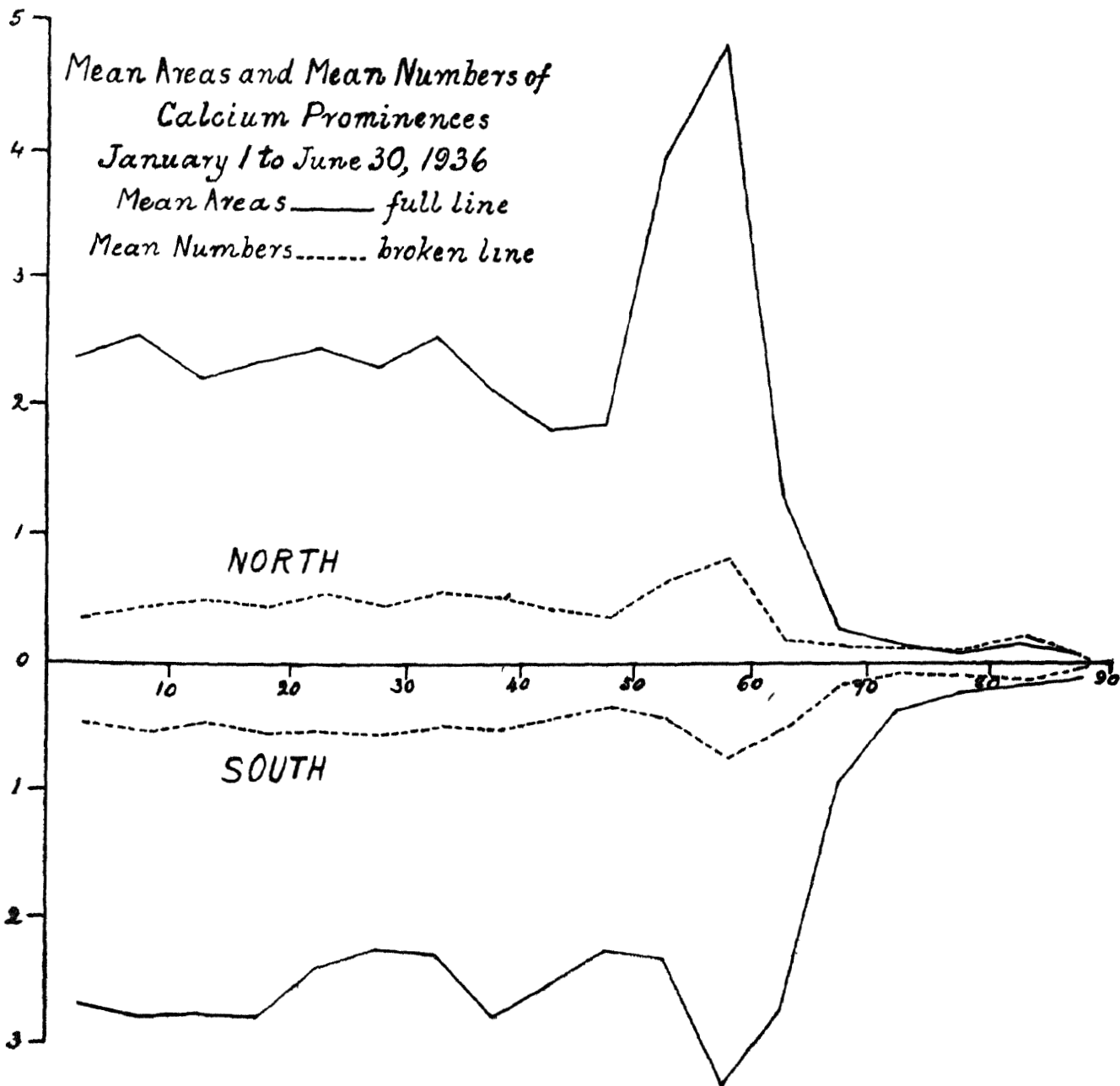
Compared with the previous half-year, areas show an increase of 29 per cent and numbers an increase of 3 per cent. The increase in areas is slightly more in the southern hemisphere than in the northern.

For comparison with bulletins issued prior to the co-operation of other observatories the means based on Kodaikanal photographs alone are also given, 159 days of observation being counted as 149 effective days.

	Mean daily areas (square minutes).	Mean daily numbers
North (Kodaikanal photographs only)	3.43	6.91
South (do.)	3.57	7.04
Total	7.00	13.95

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  $5^\circ$  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 zone of maximum activity has advanced  $10^\circ$  towards the pole in the northern

hemisphere and only 5° in the southern. In the southern hemisphere the distribution in areas is more uniform than in 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 one 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, and 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 FIRST HALF OF 1936.

Months.	Number of days (effective).	Areas	Numbers.	Daily means.		Mean height.	Mean extent.
				Areas.	Numbers.		
1936.							
January . . . . .	28½	208.7	371	7.26	12.90	41.40	8.58
February . . . . .	28	191.1	391	6.82	13.96	41.29	7.57
March . . . . .	27½	169.4	424	6.03	15.10	43.55	7.12
April . . . . .	29	209.7	369	7.23	12.72	45.43	8.66
May . . . . .	27	212.2	385	7.86	14.26	43.90	7.88
June . . . . .	23½	143.0	362	6.09	15.40	36.45	6.23
First quarter . . . . .	84½	569.2	1,186	6.74	14.04	42.13	7.73
Second quarter . . . . .	79½	564.9	1,116	7.11	14.04	41.99	7.60
First half-year . . . . .	164	1134.1	2,302	6.91	14.04	42.06	7.67

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January to June 1936.	East.	West.	Percentage East.
Total number observed . . . . .	1134	1168	49.26
Total area . . . . .	552.8	572.8	49.34

*Metallic Prominences.*

Thirty seven metallic prominences were observed during the half-year and their details are given below :—

TABLE II —LIST OF METALLIC PROMINENCES —JANUARY TO JUNE 1936

Date	Time		Base.	Latitude		Limb	Height	Lines (See note at end of table)
	I	S T		North	South			
	H	M	"	"	"		"	
<b>1936</b>								
<b>January</b>	1	10 34	2	29		E	10	4, 10 11 and 12
	2	10 15			54	E	10	4 and 10
		10 15			58	E	10	4 and 10
		10 15			60	E	10	4 and 10
	10	8 56	2		10	W	20	4 and 10
	25	9 14	5		29 5	W	20	1, 2, 4, 9, 10 11 and 12
	26	9 45	7		32 5	W	25	4 and 10
		9 56	7		32 5	W	35	1, 2, 4, 9, 10, 11 and 12
	27	9 17	4		33	W	15	1, 2, 4, 9, 10 11 and 12
	28	9 14	4		33	W	20	4 and 10
	30	9 42	6	30		E	30	1, 2, 4, 9, 10, 11 and 12
<b>February</b>	6	10 26	5		27 5	E	30	1, 3, 4, 9, 10, 11 and 12.
	7	10 19	4		27	E	30	1, 2, 3, 4, 5, 6, 8, 9, 10, 11 and 12
	8	10 5	5		28 5	E	20	1, 3, 4, 9, 10, 11 and 12
	10	9 15	1	6 5		W	25	1, 2, 4, 9, 10, 11 and 12
	15	9 30	4		22	W	25	4 and 10
		9 50	4		17	E	15	1, 3, 4, 9, 10, 11 and 12
	16	10 25	2	19		E	20	4 and 10
	19	9 35	3	21 5		W	15	1, 2, 4, 9, 10, 11 and 12
	22	10 30			30	W	10	4, 10, 11 and 12
<b>March</b>	1	9 23	4		31 5	W	20	1, 3, 4, 9, 10, 11 and 12
	13	11 0	1		19 5	W	10	4 and 10
	15	8 49	4		24	E	15	4 and 10
	19	9 55	4		14	E	20	1, 2, 4, 9, 10, 11 and 12
	23	8 52	2		30	W	15	1, 2, 4, 9, 10, 11 and 12
	24	8 52	1		29 5	W	25	4 and 10.
		8 45	1		16 5	W	20	1, 2, 3, 4, 9, 10, 11 and 12
		8 43	3	12 5		W	10	4 and 10.
	26	9 35	1		22	E	15	1, 2, 4, 9, 10, 11 and 12.
		9 13	4	22		W	20	1, 2, 3, 4, 9, 10, 11, 12 and line 5371-7.
<b>April</b>	3	9 25	2		15	W	20	1, 2, 3, 4, 6, 7, 8, 9, 10, 11 and 12

Date	Time I S T	Base	Latitude		Limb	Height	Lines (See note at end of table)
			North	South			
April 1936	7	9 18	3	18 5	E	20	1, 2, 3, 4, 5, 6, 8, 9, 10, 11 and 12
	15	9 23	1		E	15	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12 and lines 5197 8, 5208 7, 5269 7, 5270 5, 5284 3, 5324 3, 5328 2, 5337 0, 5371 7, 5397 3
	16	10 10	10		E	15	1, 2, 3, 4, 8, 9, 10, 11 and 12
	18	10 30		14	W	10	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12 and lines 5197 8, 5227 4, 5269 7, 5270 5, 5284 3, 5324 3, 5328 2, 5371 7, 5397 3, 5406 0, 5424 8, 5430
May	4	9 15	3		E	20	1, 2, 3, 4, 9, 10, 11 and 12
	10	10 8	4		E	15	4 and 10
June	11	11 6	3		W	15	1, 2, 3, 4, 9, 10, 11, 12 and line 5328 2

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

No	$\lambda$	Element	No	$\lambda$	Element.
1	4924 1	Fe +	7	5276 2	Fe +
2	5016 4	He	8	5316 8	Fe +
3	5018 6	Fe	9	5363 0	Fe +
4	$b_4, b_1, b_2, b_1$	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°—40°	41°—50°	51°—60°	Mean latitude.	Extreme latitudes
North	1	4	4		..		19° 2	6° 5 and 30°
South	1	6	14	4		3	27° 8	10° and 60°

Eighteen were on the east limb and 19 on the west limb.

## Displacements of the Hydrogen Line

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

TABLE III — DISPLACEMENTS OF THE HYDROGEN LINE JANUARY TO JUNE 1936.

Date	H u I S T		Lat tud		Limb	Displacement			Remarks.
			N rth	S uth		Red	Violet	Both ways	
1936	I	M				A	A	A	
January 2	10	39	23		E		Slight		At top
	10	24		3	E	Slight			In chromosphere
	10	15		55	E		1		At top.
3	11	12		87	E		1		In chromosphere
4	9	14		50	E	0 5			At base
	9	30		15	W	1			At top
	9	30		21	W		1		At base
	9	30		25	W		1		Do
5	9	25		13	W	1 5			At top extends from -12° to -14°
6	9	30	17 7		E	1 5			At top
	9	20		37 5	W		0 5		At base
	9	14		15 5	W	1 5			At top
7	8	50		46 5	W		Slight		At base extends from -45 to -48°
	8	50		43	W	Slight			At top.
	8	45		17 5	W		0 5		At base
8	10	17		50	W		1		At top.
9	9	30		78	E			1	At base.
	9	10		7 5	W	0 5			At top
10	9	0		3 5	W	0 5			At middle of prominence extends (from -2° to -5°)
	9	0		4	W	0 5			At middle of prominence.
	9	0		7 5	W			1	At base; extends from -6° to -9°
	9	0		4	W		0 5		At middle of prominence, extends from -3° to -5°
17	9	10	41		W		Slight		In chromosphere
18	10	0		27 5	E	1			At base
	10	0		33 5	E	1			At top; extends from -32° to -35°
	10	34	82		W	1			At top
2	11	23	50 5		E	Slight			At top
	11	36	19 5		W		3		In chromosphere.
	11	38	20		W	2			At top
23	9	14		16 5	W	0 5			At top; extends from -15° to -18°
24	9	22	11		E	Slight			In chromosphere.
	9	24		4	E		0 5		At top extends from -2° to -6°
	9	15		32	W	1 5			At top
	8	77	22		W	1			At base.
25	9	40	8		E	Slight			In chromosphere.
	9	15		33	W	1	0 5		At top; extends from -32° to -34°
	9	7	27		W		0 5		At top; extends from +23° to +27°
	9	0	72 5		W	Slight			At base
26	9	18	82		E	0 5			At top.
	9	43		44 5	W		0 5		At base; extends from -43° 5 to -45° 5.
	9	40		30 5	W			1	At base; extends from -29° to -32°
	9	30		67 5	E		1		At top
27	9	20		38 5	W		1 5		At base.
	9	17		33	W			0 5	Do
	9	8		21 5	W	1 5			At top extends from -20° to -25°
	9	0	28		W	1			At top
28	9	32		26	E	Slight			At base.

Date.	Hour I. S. T		Latitude.		Limb	Displacement.			Remarks.	
			North	South		Red	Violet	Both ways.		
	H.	M.	°	°		A	A	A		
1936. January 28— contd.	9	16		36	W	1.5			At top, extends from $-34^{\circ}$ to $-36^{\circ}$	
	9	15		33	W	1			At top	
	9	14		23 5	W	1			Do	
	9	2	57.5		W		1		Do, extends from $+56.5^{\circ}$ to $+58.5^{\circ}$	
	29	9	18		24	W	1			Do; extends from $-23^{\circ}$ to $-25^{\circ}$
		9	10	21		W	0 5	2		To Red at base to violet at top, extends from $+20^{\circ}$ to $+22^{\circ}$ .
	30	9	8	29		W		0 5		At top, extends from $+27^{\circ}$ to $+31^{\circ}$
		9	37	37		E	2 5			At base.
		9	35	22		E		1 5		Do
		9	34		44 5	W	1			At top, extends from $-42.5^{\circ}$ to $-46.5^{\circ}$
9		22		36	W			1	At base; extends from $-35^{\circ}$ to $-37^{\circ}$	
9		22		32	W	1			At top	
31	9	15	4		W		1		At base	
	9	10	26		W	0 5			At top, extends from $+24^{\circ}$ to $+28^{\circ}$	
	9	8	28 5		W		0 5		At middle	
	9	4	40 5		W	1			At top, extends from $+39.5^{\circ}$ to $+41.5^{\circ}$	
	9	3	48 5		W	Slight			In chromosphere	
	10	19	38		E		1		At top	
	February	1	9		79	W		1		At top
		9	0		28	W		1		Do
		5	11	52		E	1			Do, extends from $+50.5^{\circ}$ to $+53.5^{\circ}$
		10	56		23	E	1			Do
10		56		27	E	1			At base	
6		10	18		16	E		0 5		At top
		10	19		21 5	E	1			Do.
		10	26		27.5	E			1	At base, extends from $-25^{\circ}$ to $-30^{\circ}$ .
		10	7		25.5	W	1			At top
7		9	55	66		W	0.5			In chromosphere
	10	22		15	E	1.5			Do.	
	10	2		29	E		Slight		At top.	
	10	2		32 5	E	1			Do	
	10	2		32 5	E		2		Do, extends from $-36.5^{\circ}$ to $-40.5^{\circ}$	
	10	28		38 5	E	2			Do	
8	9	53		83.5	W		1		To red at top, to violet at base, extends from $-28^{\circ}$ to $-30^{\circ}$ .	
	10	5		28	E	2 5			At base	
	9	48	46		W		0 5		Do.	
	8	55	78		E	2	Slight		At top; extends from $-1^{\circ}$ to $4^{\circ}$ .	
10	9	18	2 5		W	1			Do, extends from $+4^{\circ}$ to $+8^{\circ}$	
	9	18	5		W			2	At base, extends from $+8^{\circ}$ to $+10^{\circ}$ .	
	9	15	9		W				At top	
	9	7	12		W	2		1	In chromosphere, extends from $+17^{\circ}$ to $-19^{\circ}$	
	9	7	18		W				At top; extends from $-26^{\circ}$ to $-29^{\circ}$ .	
12	10	0		27 5	E	1			At base.	
	10	36	26 5		W	2		1	Do.	
14	9	17		58.5	E		Slight		At top, extends from $-8^{\circ}$ to $-12^{\circ}$	
	9	17		10	E			1	Do.	
15	9	48		17	E		0 5		At top.	
	9	50		17	E		0 5		At base	
	9	32		26.5	W		2 5		At top, extends from $-13^{\circ}$ to $-17^{\circ}$	
	9	32		25.5	W				Do.	
	9	29		15	W	0 5			At top.	

Date	H I S T		I at tu l		L n b	Displacement			Remarks.
			N rth	S uth		Red	V let	Both ways	
1936	H	M				A	A	A	
February 15— contd									
16	9	24	37		W	0 7			At top extends from +35° 5 to +39 5
	10	7	10		E			1	At base extends from +18 to +20°
	10	8	14		E	0			In chromosphere
	10	30		18	E		0		At top
	10	10		31	W	0 5			Do extends from -29° 5 to -32 5
17		6	7		E	0 5			Do extends from +25 to +29
18	8	44	17		E	Slight			At top
	8	74	31		W	Slight	Slight		Red at top v1 let at base
	8	78	38 7		W		0 5		At base
	8	0	34 5		W	Slight	Slight		T red at top to v1 let at base
19	9	55		82	W	Slight			In chromosphere
	9	41		1	W	0 5			At top
	9	3	19		W	5			Do extends from +18 to +20°
	9	30	41		W		1 5		Do
	10	3		2	E		1		Do
27	9	7	23 5		E			0 5	At base extends from +22° to +25
	9	31		18	E	1			At top
	9	15		61 5	W	1 5			Do extends from -59° to -64
	9	5		60 5	W		4		Do ; extends from -59° to -62°
	9	40		57 5	W	2			Do extends from -55 5 to -59 5.
	9	55		32	W	1 5			Do extends from -29° 5 to -34 5
	8	52		17	W		0 5		Do
8	9	12		39	W	Slight			Do
	9	5		20 5	W	0 5			Do
29	9	30		35 5	W		Slight		At base.
	9	46	8		W	4			At top
	9	46	8 5		W		4		At base.
	9	46	14		W		2		At base
	10	4	44 5		W		1		In chromosphere.
March									
1	9	17	14		W	Slight			At top; extends from +13° to +15°
	9	17	8		W		Slight		Do
2	9	0	66 5		E		1		In chromosphere.
	9	3		45 5	E	Slight			Do
	9	12	22		W		1		At top.
	9	12	27		W		0 5		Do.
	9	5	44 5		E	Slight			At top
4	9	3	32 5		E	Slight			At base
	9	12		15	W		1		In chromosphere
6	11	22		15	W		1		At top extends from -14° to -16°
	11	37	54 5		W	1			At middle
	11	37	60 5		W	1			At top
7	9	9		21 5	F		0 5		At top extends from -19° to -24
	9	0		30	E	1			Do extends from -29° to -32°
8	8	31	70		E	0 5			Do
9	9	47		30 5	F	1			Do ; extends from -29° 5 to -31 5
13	11	0		19 5	W		0 5		At base.
	10	5		23	W				At top.
14	9	48	8 5		E	1			Do
	9	29		18	E		Slight		Do.
	9	29		19	E		Slight		Do
	9	29		8	E		1		At middle extends from -24 to -26°
1	8	49		25	E		Slight		In chromosphere
16	9	3	15		E	Slight			At top; extends from -14° to -17
	9	6		15 5	W	0 5			



Date.	Hour I. S. T		Latitude.		Lmb	Displacement.			Remarks.	
			North.	South.		Red.	Violet.	Both ways.		
	h.	m	°	°		A	A	A		
1936. March contd	16--	9	1	37		0 5			At top; extends from -14° to -17°. In chromosphere. At base, extends from -14° to -16°. Do, extends from -24° to -28°. At top Do Do. Do Do, extends from -21° to -31°. To red at base, to violet at top, extends from -19° to -26°. At base, extends from +19° to +23°. At top, extends from -32° 5 to -35° 5 At base Do Do At top At base In chromosphere At top Do, extends from -7° to -10°. At base, extends from -21° to -23°. At top At top, extends from -32° 5 to -35° 5. At base, extends from +11° to +13°. At base, extends from +20° to +24°. At top Do, extends from +25° to +27°. At base extends from +21° to +23°. In chromosphere Do At top Do extends from +50° 5 to +52° 5 At base At top, extends from +40° 5 to +46° 5 At base At top, extends from +41° 5 to 43° 5 Do, extends from -17° to +20°. At base Do At top Do Do Do, extends from -28° to -30°. At base At top Do Do. Do Do At base At top, extends from +15° to +18°	
		8	58	73.5	W		Slight			
		19	9	55		E	2.5			
			9			W		1.5		
		21	9	15		E	Slight			
		22	9	10	30	W	1			
		23	9	15		E	1			
			9	16		E		1		
			8	52		W		1 5		
			8	50		W	2	3		
	24	8	31	21	E		1			
		8	52		W		1			
		8	45		W		1.5			
		8	43	14	W		0 5			
	25	9	5	20	E	1				
		9	5	21	E		1			
		9	14		W		1			
		9	29		W		1			
	26	8	57	70 5	E	0 5				
		9	33		E	1 5				
		9	35		E	0 5				
		9	40		E	1 5				
		9	22		W	0 5				
		9	15	12	W	1				
		9	13	22	W			1		
	27	9	33	30	E	0 5				
		10	0	26	E		0 5			
		10	15	22	E		0 5			
April	2	10	0	23	E	1				
		10	7		W		1			
		10	16	6	W	1				
	3	8	55	51.5	E		1			
		8	55	45	E		0 5			
		8	55	43 5	E		1			
		9	25		W	Slight				
		11	10	42 5	E		0 5			
		9	18	18 5	E		1			
		9	39		E	0 5				
	8	9	16	22	E	0 5				
		9	5	14	W	1				
		9	5	19	W	1 5				
	11	8	37		W		0.5			
		8	34		W	0 5				
		8	29	16	W		Slight			
	12	9	27	27	E	1				
		9	24		F		1	Slight		
		10	51	36	W					
	14	9	25	20	W	1				
		9	25	34	W	1				
	15	9	12		E		1			
		9	23		E		2			
		9	12		E	0 5				
		10	30	16 5	W	1				

Date	H u f s l		Latitude		Limb	Displacement.			Remarks.
			N rth	Sc uth		Red	Violet	Both ways.	
1936						A	A	A	
April 15—contd									
16	10 32	3 5	10	W		1		At top.	
	10 2		60 5	E	2	1 5		At middle	
	9 42		28	W	1 5			At base	
	9 36		5 5	W	0 5			At top	
	9 32			W	0 5			Do.	
19	8 55	8 5		W	Slight			At top; extends from +7° to +10°	
	8 55	13		W	2	1 5		To red at top, to violet at base extends from +12° to +14°	
	8 47	36 5		W		1		At base	
21	9 12		3	E	Slight			Do.	
	9 7		28	W		0 5		Do	
23	9 2	52 5		E		0 5		At top.	
	9 20		38	W	0 5			Do; extends from -37° to -39°	
	9 19		26	W				Do extends from -25° to -27°.	
	9 17		18.	W	0 5			Do extends from -17° to -19°	
4	8 50	34 5		E		0 5		At middle; extends from +32° to +37°	
29	10 55	3		W		1		At base.	
30	9 30	13		E	1	0 5		Do.; extends from +42° to +14°	
	9 32		4 5	E	1			At top; extends from -3° to -6°	
	9 18		38 5	W	1			Do. extends from -35° to -42°	
	9 7	63 5		W		Slight		In chromosphere.	
May									
1	9 7		24	E		Slight		At top	
	9 34		43	W	1			Do	
	9 34		52	W	1			Do	
	9 35		36	W	1			Do	
2	9 27	22		E	1			Do extends from +20° to +24°	
4	9 0		12	E		0 5		At base extends from -10° to -14°	
	9 15		20	E	1			At top	
	9 10		29 5	E		1		At base	
8	9 22	26		W				Extends from +25° to +27°.	
10	10 8		24	E		0 5		At top; extends from -23° to -25°.	
	10 3		17	W	0 5			To red at top, to violet at base.	
11	9 16		27	E		0 5		At top extends from -26° to -28°	
	9 20		42 5	E	0 5			At base extends from -43° to -44°	
	8 50	36		W	4			At middle; extends from +34° to +38°	
	8 50	39 5		W				At top; extends from +38° to +41°	
	8 50	43 5		W		3 5		Do.; extends from +41° to +48°	
	9 20	10		E		1		Do.	
13	9 18		13 5	E	1			Do.; extends from -17° to -15°.	
	9 18		19	E	1			At base.	
14	8 57	17		W	1			At top; extends from +16° to +18°.	
	8 57	20		W		0 5		At base.	
29	10 7	16		E	1			At top; extends from +12° to +17°.	
	10 15		15	W				At base.	
30	9 34	41		E	1			Do.; extends from -35° to -37°.	
	9 20		39	E	Slight			At top; extends from -37° to -42°.	
	9 20		41	E		Slight		At middle; extends from -42° to -50°.	
	9 19		48	E	1				

Date	Hour L S T		Latitude.		Limb	Displacement.			Remarks
			North	South		Red.	Violet.	Both ways.	
	H	M	°	'		A	A	A	
1936.									
May 30 - <i>contd</i>									
	9	46	11		W				At base.
	9	15	11.5		W		2		Do
June									
	5	8	75.5		W			0.5	At top, extends from +53° to +58°.
	6	10		17	W	2			
	9	11		14.5	W	1			At top.
	11	7		21	W	1.5			At base; extends from -20° to -22°
	11	7		23	W	2			At top
	11	8		29	W			1	Do, extends from -28° to -30°.
	13	50	18		E			Slight	Do
	19	15		13	E			Slight	Do.
	21	10		15	W			1	At base

The total number of displacements was 274 as against 83 in the previous half-year and their distribution was as follows —

						North.	South.
1°—30°	.	.	.	.	.	72	100
31°—60°	.	.	.	.	.	38	44
61°—90'	.	.	.	.	.	11	9
					Total	121	153
East limb	.	.	.	.	.		114
West limb	.	.	.	.	.		160
					Total		274

Of these displacements, 140 were towards the red, 117 towards the violet and 17 both ways simultaneously

#### *Reversals and Displacements on the Sun's Disc.*

Four hundred and forty-one bright reversals of the  $H\alpha$  line 416 dark reversals of the  $D_2$  line and 72 displacements of the  $H\alpha$  line were observed with the spectroscope during the half-year Their distribution is given below —

		North.	South.	East.	West.
Bright reversals of $H\alpha$	.	173	268	206	232
Dark reversals of $D_2$	.	162	254	192	224
Displacements of $H\alpha$	.	30	42	27	45

Thirty-seven displacements were towards the red, 13 towards the violet and 22 both ways simultaneously.

The Hale spectrohelioscope has been used daily (except on Sundays and holidays) for the observation in the light of the  $H\alpha$  line of changing phenomena and of displacements which cannot be readily photographed The hours allotted by the International Astronomical Union to this observatory for spectrohelioscope observations are 2-30 to 3-00, 4-00 to 4-30, 5-30 to 6-00, and 6-30 to 7-00 G. M. T. or 8-00 to 8-30, 9-30 to 10-00, 11-00 to

11-30 and 12-00 to 12-30 I. S. T , but observations are continued at other times in cases where interesting developments are likely to occur. A summary of the observations made during the first half of 1936 is given below —

		East limb.	West limb.	Total.
Displacements in prominences . . . . .		62	36	98

	North.	South.	East.	West	Total
Displacements in H $\alpha$ dark markings . . . . .	18	21	21	18	39
Displacements in H $\alpha$ bright flocculi . . . . .	2	5	1	6	7

	Displacements towards			Total
	Red.	Violet.	Both ways	Total
Prominences . . . . .	54	44	.	98
H $\alpha$ dark markings . . . . .	26	11	2	39
H $\alpha$ bright flocculi . . . . .	2	4	1	7

*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 a total of 181 days which were counted as 175 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 . . . . .	4343	19.66
South . . . . .	5197	25.01
Total . . . . .	9540	44.67

The above show an increase of 74 per cent in areas and 61 per cent in numbers, compared with the previous half-year.

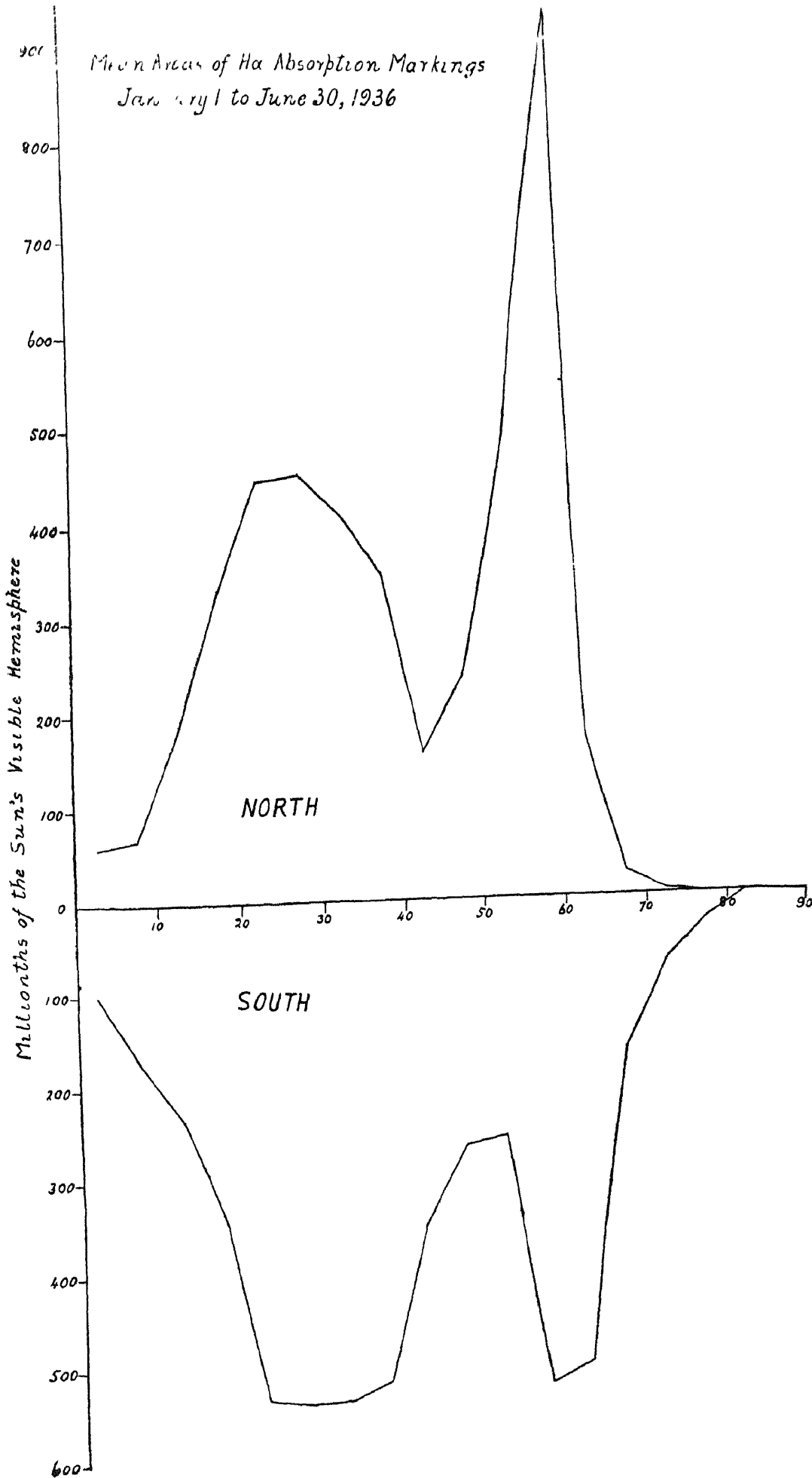
For comparison with bulletins issued prior to the co-operation of other observatories the means based on Kodaikanal photographs alone are also given, 151 days of observation being reduced to 149 effective days.

	Mean daily areas.	Mean daily numbers.
North (Kodaikanal photographs only) . . . . .	4354	19.36
South ( do. ) . . . . .	4956	25.17
Total . . . . .	9310	44.53

The distribution of mean daily areas in latitude is shown in the following diagram. Compared with the previous half-year the zone of maximum activity has advanced 5° towards the poles in both the hemispheres.

The ... of the ... in the ... of the ... almost an ...  
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Compared with the previous half-year both areas and numbers show a slight eastern defect, the percent age in areas being 49.14 and in numbers 49.92

The mean daily areas of  $H\alpha$  absorption markings uncorrected for fore-shortening are given below —

	Mean daily areas
North	2181
South	2830
Total	5011

The uncorrected areas amount to 53 per cent of the corrected ones. The curve of distribution in latitude is similar to that of the corrected areas as usual

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

A. L. NARAYAN,  
*Director, Kodaikanal Observatory*

KODAIKANAL,  
*The 2nd May, 1937.*