

Kodaikanal Observatory.

BULLETIN No. LXXVI.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF THE YEAR 1924.

In pursuance of the programme of work adopted since 1st January 1923 under the auspices of the International Astronomical Union, all observatories taking prominence and H α spectroheliograms of the Sun have been requested 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 first half of the year 1924, the Mount Wilson Observatory sent prominence plates in calcium K light for 37 days and H α disc plates for 11 days; Meudon Observatory sent K β disc plates for 23 days and H α disc plates for 11 days and the Yerkes Observatory sent prominence plates for 3 days. No plates were requisitioned from the Heliophysical Institute at Utrecht as the days on which photographs were available there were represented in the Kodaikanal series.

When incomplete or imperfect photographs from more than one observatory are available for the same day, 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.

The mean daily areas and numbers of prominences during the half-year are given below. The means are corrected for incomplete or imperfect observations, the total of 180 days being reduced to 162 effective days.

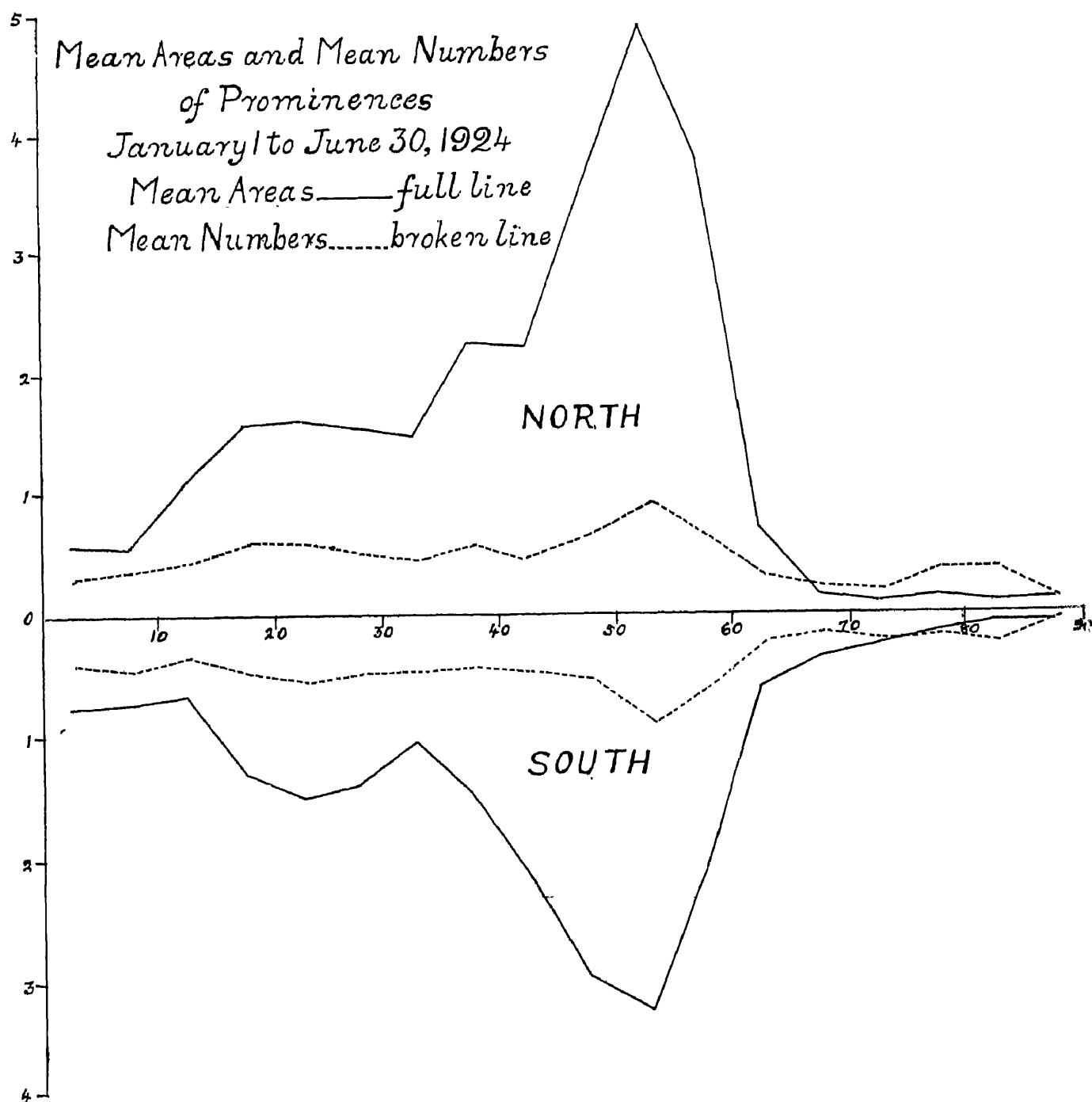
								Mean daily areas (square minutes).	Mean daily numbers.
North	...	...	...	...	...	...	...	2'62	8'10
South	...	...	...	...	...	...	...	2'08	7'34
						Total	...	4'70	15'44

Compared with the second half of the year 1923, areas show an increase of 19 per cent in the northern hemisphere and 6 per cent in the southern. In the case of numbers, there is an increase of 3 per cent in both the hemispheres.

For comparison with bulletins issued prior to the co-operation of other observatories, the means based on Kodaikanal photographs alone are also given, 170 days of observation being counted as 150½ effective days.

								Mean daily areas (square minutes).	Mean daily numbers.
North (Kodaikanal photographs only)	...	...	...	...	...	...	...	2'71	8'43
South	do.	...	...	...	...	...	...	2'16	7'59
						Total	...	4'87	16'02

The distribution of the prominences in latitude is represented in the accompanying 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. The curve shows an increase of activity in the lower latitudes and a slight advance towards the poles, compared with the previous half-year.



The monthly, quarterly and half-yearly areas and numbers, and the mean height and mean extent of the prominences on photographs from all the 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 FIRST HALF OF 1924.

Months.	Number of days (effective).	Areas.	Numbers.	Daily Means.		Mean height.	Mean extent.
				Areas.	Numbers.		
January	27½	142.4	484	5.2	17.8	32.1	3.76
February	26½	150.0	448	5.7	16.9	38.1	3.85
March	29	128.4	435	4.4	15.0	33.1	3.77
April	28½	133.0	440	4.7	15.4	32.0	3.98
May	27	109.4	382	4.1	14.1	37.4	4.02
June	23¾	98.8	313	4.2	13.1	36.3	4.45
First quarter	82¾	420.8	1367	5.1	16.5	33.6	3.80
Second quarter	79½	341.2	1135	4.3	14.3	34.9	4.12
First half-year	162	762.0	2502	4.7	15.4	34.2	3.94

Distribution east and west of the Sun's axis.

Both areas and numbers continued to show a western preponderance as will be seen from the following table :—

1924 January to June.	East.	West.	Percentage East.
Total number observed	1187	1315	47.44
Total areas in square minutes	380.6	381.4	49.94

Metallic prominences.

No prominences showing metallic lines were observed during the half-year.

Displacements of the hydrogen lines.

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

TABLE II.—DISPLACEMENTS OF HYDROGEN LINES.

Date.	Hour L.S.T.		Latitude.		Limb.	Displacement.			Remarks.
			North.	South.		Red.	Violet.	Both ways.	
1924	h.	m.	°	°		Å.	Å.	Å.	
January	1	9 34	70		E		Slight		
	2	9 38		83.5	E		0.5		
	10	8 59	82		E		Slight		
	10	9 7		4	W	0.5			At base.
	10	9 4	61.5		W	Slight			At top.
	10	9 1	85.5		W		Slight		
	11	8 53	50		W		Do.		
	13	8 40	84.5		E		Do.		
	13	9 4		18	E	0.5			At base.
	13	8 47	28		W		Slight		
	13	8 45	57.5		W	0.5	0.5		To red at top; to violet at base
	14	8 46	52		E		Slight		
	14	9 6		37	E		Do.		
	14	8 57		3	W	Slight			At top.
	14	8 54	56.5		W		0.5		At base.
	14	8 52	64.5		W	0.5			At top.
	14	8 49	83.5		W	1			Do.
	14	8 50	86		W		Slight		At base.
	15	8 44		44	E	Slight			
	16	9 21	85		E		0.5		At top.
	16	9 28	50		W	Slight			Do.
	17	8 58		30	W		0.5		
	17	8 51	50		W		0.5		At base.
	17	8 44	83.5		W		Slight		
	18	8 52	74		E	0.5			
	19	8 58	42		W	Slight			At top.
	20	8 34		56.5	E	Do.			At base.
	20	8 32		73.5	E	Do.			
	21	8 43	81.5		E	1			At top.
	21	8 59	48.5		E		1		Do.
	21	9 4	36		E		0.5		Do.
	22	8 54		68.5	E	Slight			
	22	9 6	55.5		W			Slight	More towards violet.
	23	9 12		76.5	E		2		At top.
	23	8 44		5	W	0.5			Do.
	23	8 39	58.5		W	1			Do.
	24	8 55	16		E	0.5			
	24	8 52		15	W	1			At top.
	24	8 48	22		W	0.5			
	24	8 44	57.5		W		Slight		
	25	8 35	47.5		E	Slight			
	26	8 51		50.5	E	1			At top.
	26	9 18	81		W		0.5		At base.
	28	8 54	66.5		E		Slight		
	28	8 58	64.5		W		Do.		
February	1	8 34	76.5		E		Slight		
	1	8 45	64.5		E	1			At top.
	1	8 51		73	W	Slight			Do.
	1	8 37	60.5		W	Do.			
	3	11 28	83.5		E	0.5			At top.
	3	11 24	62		E		Slight		At base.
	4	8 50	77.5		E		Do.		
	4	8 54	55.5		W		1		At base.
	5	9 4		65	W	0.5			At top.
	5	9 2		30	W		Slight		
	5	8 46	67		W	Slight			

Date.	Hour I.S.T.		Latitude.		Limb.	Displacement.			Remarks.
			North.	South.		Red.	Violet.	Both ways.	
1924	h.	m.	°	°		A.	A.	A.	
February	10	8 41	34.5		E	0.5			At top.
	10	8 48	33		W		0.5		At base.
	11	8 48	16		W		Slight		
	12	9 40	36.5		E	1			
	12	9 51		16	W	0.5			At top.
	12	9 47	69		W		Slight		
	15	9 0		83	E	0.5			
	15	8 50		40.5	W		Slight		
	16	8 30	1		W		Do.		
	17	8 44	79.5		E		Do.		
	17	8 40	54.5		E		0.5		At base.
	18	11 49		34.5	E	0.5			At top.
	21	8 40	41.5		E		Slight		
	21	9 1	12		E	0.5			At base.
	21	8 45	57.5		W	0.5			At top.
	22	8 35	23		W		1		
	23	8 44	43.5		W	Slight			At top.
	24	8 52	62		E	0.5			Do.
	25	10 5		55.5	E	Slight			
	25	10 5		57.5	E		0.5		At top.
	26	8 35		75	W	Slight			
	27	9 3		35.5	W	1			At top.
	28	8 52	38.5		E		Slight		
	28	9 20		70.5	W	0.5			At base.
	28	9 6		24	W	1			At top.
	28	8 57	69		W	0.5			Do.
	28	8 55	80		W		0.5		At base.
	March	3	8 50	82.5		E	1		
4		9 8	53.5		E	Slight			
4		9 6		4	E		Slight		
7		8 50	25		E	0.5			
7		9 13		64.5	E	Slight			
7		9 4		54.5	W		0.5		At base.
7		9 0	25		W	0.5			At top.
9		8 36	59.5		E	1			Do.
9		8 58		63	E	Slight			
10		8 58	80		E	1			
10		8 50	63		E	1			
11		8 24	60.5		W		Slight		
13		8 52	70		E	0.5			At top.
13		9 9		46.5	E		1		Do.
13		9 11		82	W		0.5		At base.
16		8 28		78	W		Slight		
17		9 4	59.5		E	Slight			At top.
18		8 40		24	E	Do.			
18		8 31	34.5		W	0.5			
20		9 6		70.5	W	1			At top.
22		10 52	37		E	0.5			Do.
22		11 6	71		W		Slight		
23		8 48	25		E	0.5			
24		8 38	62		E	1			At top.
24		8 40	29.5		E	0.5			
24		8 59		50.5	E		0.5		At top.
25		8 44	13		E	0.5			
25	8 40	Equator.		W		Slight			
27	8 51	58.5		E		Do.			
April	3	8 52	52.5		W		1		At base.
	3	8 49	75.5		W		Slight		Do.
	4	8 34	47.5		W		2		
	5	8 25	60.5		E	Slight			
	5	8 17		82	E	Do.			
	5	8 30		34.5	W		Slight		
	6	8 34	66.5		E	Slight			
	6	8 47		60.5	W		0.5		At base.
6	8 46		52.5	W		0.5		Do.	

Date.	Hour I.S.T.		Latitude.		Limb.	Displacement.			Remarks.
			North.	South.		Red.	Violet.	Both ways.	
1924	H.	M.	°	°		A.	A.	A.	
April	6	8 42	12		W		Slight		At top.
	7	8 43	50.5		W	1			
	8	8 33	70		W		0.5		
	10	8 48	65.5		E	0.5			
	10	8 50	83		W	0.5			
	13	8 45	63.5		E	0.5			At top.
	13	8 28	11		E	0.5			
	13	8 52	81.5		W		Slight		At top.
	15	8 34	60.5		E	Slight			
	15	8 42	69.5		W		Slight		
	20	9 6		44	E	1			At base.
	22	8 51	Equator.		E		Slight		
	24	9 21	42		E	Slight			At base.
	24	9 16		22	W		Slight		Do.
	25	9 24	79		W	1			At top.
	26	9 21	19		W	Slight			Do.
	27	8 38	17		E		0.5		At base.
	27	9 15		54.5	E	0.5			Do.
	27	8 56		32	W	1			At top.
	28	8 42	80		E	Slight			
	28	8 54		28	W		0.5		At base.
	29	8 41		29	W	Slight			At top.
	29	8 32	85		W	0.5			Do.
	30	9 31		79	E	1			At base.
	30	9 19	18		W	Slight			At top.
May	1	9 27		18	E		Slight		Do.
	1	9 26		24	E		0.5		Do.
	2	8 42	61.5		E	0.5			Do.
	2	9 2	51		E	Slight			
	4	9 15	41		E	0.5			
	6	8 27	86.5		E	0.5			At top.
	6	8 23	53		E		0.5		At base.
	6	8 15	4		E		1		At top.
	6	8 34		6	W	0.5			
	8	8 41	21		E		0.5		At base.
	9	8 52	16		E		Slight		Do.
	9	9 20		23	W	Slight			
	11	8 59	15		E		1		At top.
	11	9 7		31	E	0.5			Do.
	13	8 42	18		E		0.5		At base.
	16	9 12	55.5		E	0.5			
	17	10 40		36	E	0.5			At base.
	18	9 46	36		E		0.5		Do.
	19	9 12	39		W	1			At top.
	20	8 30	63		E		Slight		At base.
	20	9 15	20		E	1			At top.
	24	9 30		23	W	1			
	26	11 4		30	W	1			At top.
	26	11 0		13	W	0.5			Do.
	27	8 47	81		E	Slight			Do.
	27	8 50	65.5		W		Slight		Do.
	30	9 10		60	E	1			At base.
	31	10 10		53.5	E	2			Do.
June	6	10 40	30		W	0.5			
	8	9 24	31		E		1		At base.
	9	9 32		36	E	0.5			Do.
	19	9 1	82		E		Slight		Do. ; 0.5 A to Red at 9 23 h. m.
	19	9 14	26.5		W	0.5			
	22	10 50	78		E		Slight		
	24	8 58	35		W		Do.		
	26	9 9	16		E	Slight			
	29	8 45	86.5		E	Do.			
	29	8 54	70		W		Slight		At base.
	30	8 54	83.5		E	1			At top.
	30	9 5	32		W		Slight		
	30	8 58	56		W		0.5		At base.

The total number of displacements was 188, of which two were on the equator and the rest were distributed as follows :—

Latitude.	North.	South.
1°—30° ...	26	21
31°—60° ...	43	22
61°—90° ...	57	17
Total ...	126	60
East limb ...	...	...
West limb ...	...	...
		101
		87
		188

One hundred and five displacements were towards the red, 82 towards the violet and one both ways simultaneously.

Reversals and displacements on the disc.

Forty-three bright reversals of the H α line, 25 dark reversals of the D $_3$ line and 17 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 ...	24	19	19	24
Dark reversals of D $_3$...	11	14	9	16
Displacements of H α ...	8	9	8	9

Fourteen displacements were towards the red and the rest towards the violet.

Prominences projected on the disc as absorption markings.

Photographs of the Sun's disc in H α light were available from all the co-operating observatories for a total of 179 days, which were counted as 173 effective days. The mean daily areas of H α absorption markings (corrected for foreshortening) in millionths of the Sun's visible hemisphere and the mean daily numbers are given below :—

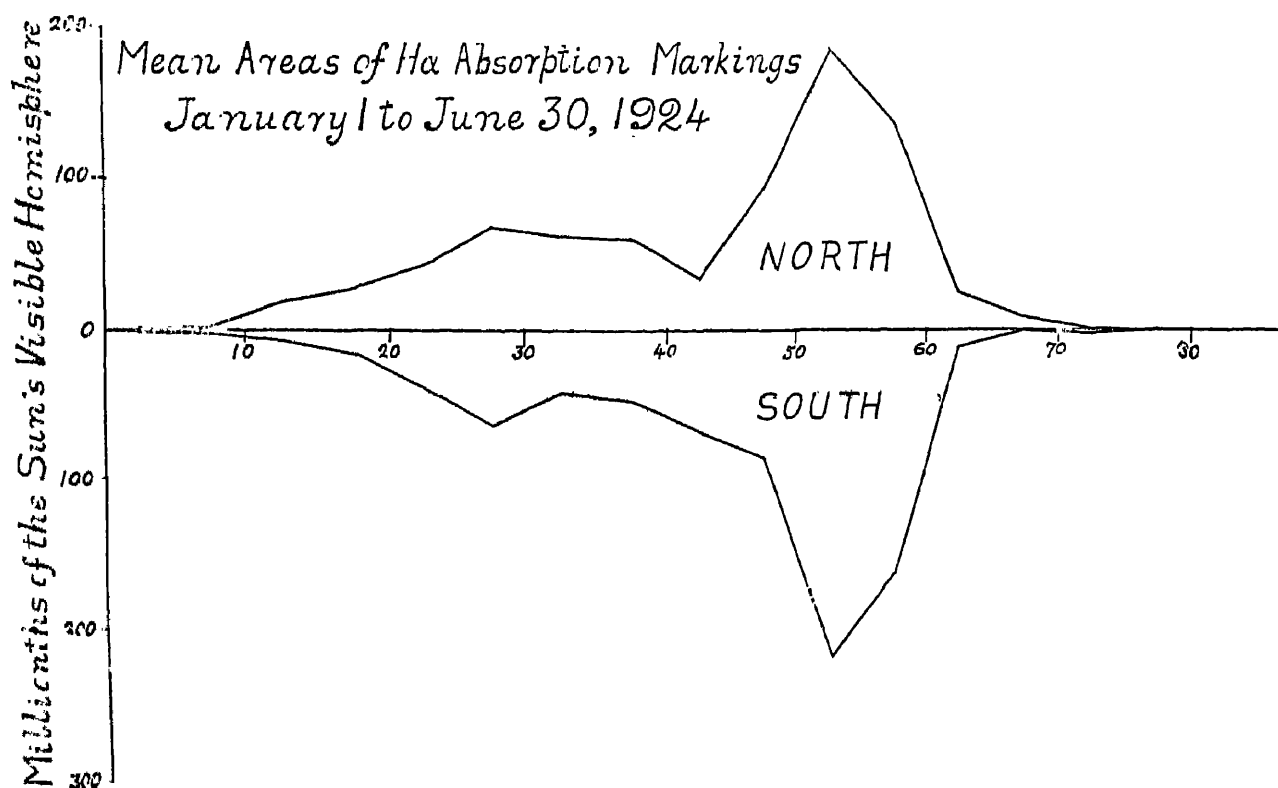
	Mean daily areas.	Mean daily numbers.
North ...	769	6.0
South ...	772	5.9
Total ...	1541	11.9

Compared with the previous half-year, areas have increased by 19 per cent in the northern hemisphere and by 30 per cent in the southern. In the case of numbers there is an increase of 11 and 26 per cent respectively in the two hemispheres. The greater percentage of increase in the southern hemisphere has resulted in an equalization of activity in the two hemispheres. This is at variance with prominences at the limb which show during the period under review a distinct northern preponderance.

For comparison with bulletins issued prior to the co-operation of other observatories, the means based on Kodaikanal photographs alone are also given, 161 days of observation being reduced to 155 effective days.

	Mean daily areas.	Mean daily numbers.
North (Kodaikanal photographs only) ...	756	6.1
South do. ...	770	5.9
Total ...	1526	12.0

The distribution of the mean daily areas in latitude is shown in the following diagram and is essentially similar to that of prominences at the limb in point of regions of activity.



As in the case of prominences at the limb, the absorption markings show a western preponderance the percentage east being 47.41 for areas and 45.53 for numbers.

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

THE OBSERVATORY, KODAIKANAL,
13th March 1925.

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