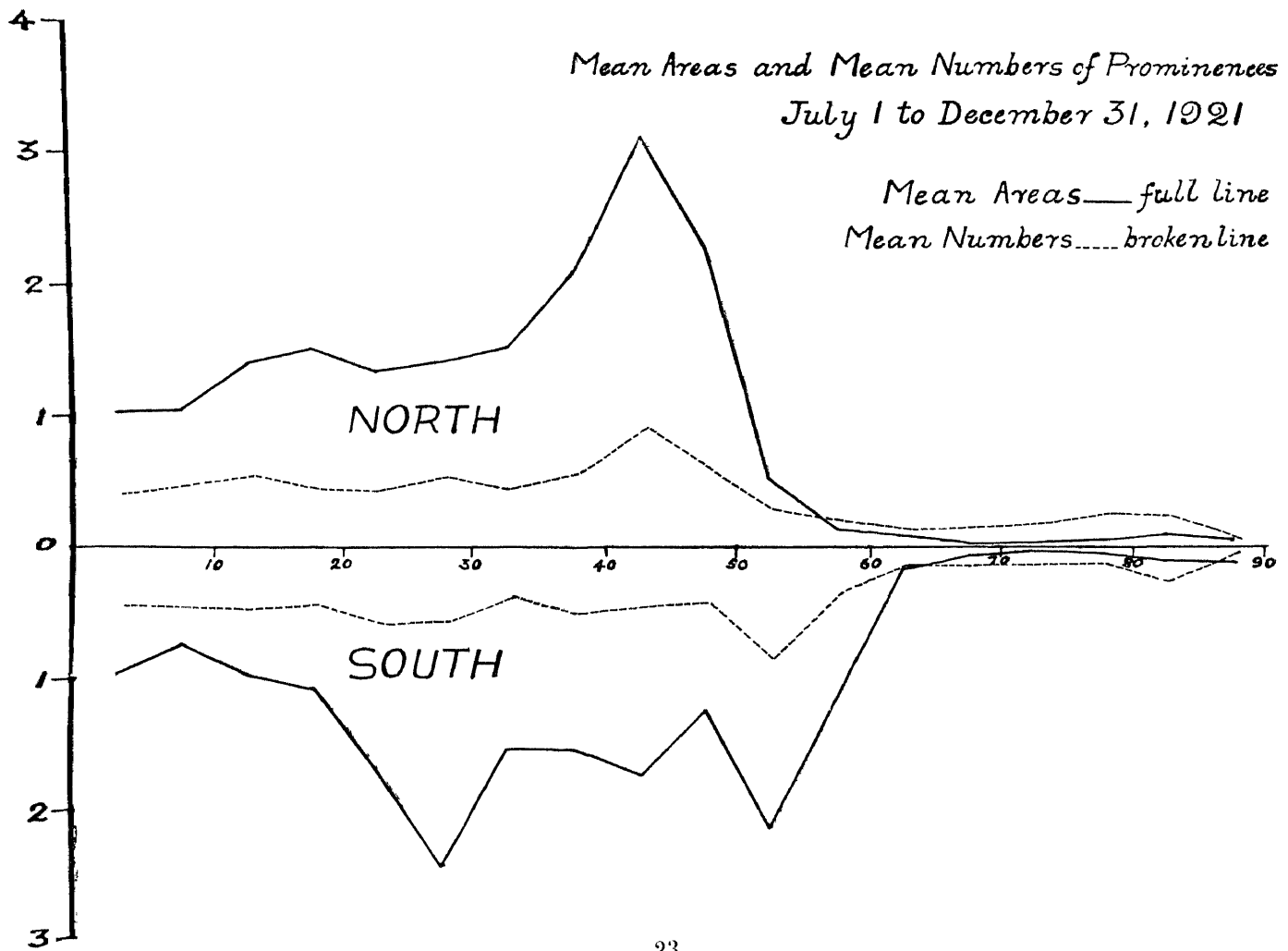


# Kodaikanal Observatory.

BULLETIN No. LXIX.

## SUMMARY OF PROMINENCE OBSERVATIONS FOR THE SECOND HALF OF THE YEAR 1921.

The distribution of prominences observed and photographed during the half-year ending 31st December, 1921, 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  $5^\circ$  of latitude. The ordinates represent tenths of a square minute of arc for the full line and numbers for the broken line. The means are corrected for incomplete or imperfect observations, the total of 156 days being reduced to 132 effective days.



The distribution curve is very much like that of the previous half-year even in detail. There is a slight diminution of activity in the equatorial region, and the zone of greatest activity has advanced  $5^{\circ}$  towards higher latitudes in the northern hemisphere.

The mean daily areas and numbers corrected for imperfect observations are given below :—

								Mean daily areas (square minutes).	Mean daily numbers.
North	...	...	...	...	...	...	...	1.76	6.56
South	...	...	...	...	...	...	...	1.79	6.96
Total								3.55	13.52

These figures represent a decrease of 23 per cent in areas and 8 per cent in numbers compared with the previous half-year. The decrease is more marked in the southern hemisphere in the case of areas and has resulted in equalising the activity in the two hemispheres. The southern prominences were slightly brighter than the northern.

The monthly, quarterly and half-yearly areas and numbers, and the mean height and mean extent of the prominences are given in table I. The unit of area is 1 square minute of arc.

TABLE I.—ABSTRACT FOR THE SECOND HALF OF 1921.

Months.	Number of days (effective).	Areas.	Numbers.	Daily Means.		Mean height.	Mean extent.
				Areas.	Numbers.		
July	16	52.0	194	3.25	12.1	30.1	3.10
August	24	67.6	339	2.82	14.1	27.7	2.75
September	22	89.1	261	4.05	11.9	33.6	3.87
October	21	83.2	285	3.96	13.6	33.8	3.65
November	24	90.3	403	3.75	16.8	30.7	3.03
December	25	86.5	313	3.46	12.5	31.7	3.17
Third quarter	62	208.7	794	3.37	12.8	30.2	3.21
Fourth quarter	70	260.0	1001	3.71	14.3	31.9	3.25
Second half-year	132	468.7	1795	3.55	13.6	31.2	3.23

*Distribution east and west of the Sun's axis.*

Both areas and numbers show a slight western preponderance as will be seen from the table below :—

1921 July to December.	East.	West.	Percentage east.
Total number observed	879	916	48.97
Total areas in square minutes	231.5	237.2	49.39

The average brightness of a prominence was the same on the east limb as on the west.

*Metallic prominences.*

Fourteen metallic prominences were observed of which seven were recorded during the month of December. Details of these prominences are given in the following table :—

TABLE II.—LIST OF METALLIC PROMINENCES OBSERVED AT KODAIKANAL, JULY TO DECEMBER 1921.

Date.	Hour I.S.T.	Base.	Latitude.		Limb.	Height.	Lines.
			North.	South.			
July 1921.	H. M.	°	°	°		"	
July 1	9 16		11		E	10	5016, 6677, 7065.
August 24	9 3		11		E	25	b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , D <sub>1</sub> , D <sub>2</sub> .
August 30	9 5	13	13		W	15	5016, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5197.7, 5234.8, 5270.6, 5316.8, 5363.0, D <sub>1</sub> , D <sub>2</sub> , 6677, 7065.
September 16	8 35			10	W	10	4924.1, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5316.8, D <sub>1</sub> , D <sub>2</sub> , 6677.
September 23	8 46		17		W	55	b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5316.8, D <sub>1</sub> , D <sub>2</sub> .
November 24	10 55		14		W	20	b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , D <sub>1</sub> , D <sub>2</sub> .
November 25	10 16		7		W	65	4924.1, 5016, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5270.5, 5276.2, 5316.8, D <sub>1</sub> , D <sub>2</sub> , 6677.
December 1	8 20			4	W	60	4924.1, 5018.6, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5316.8, D <sub>1</sub> , D <sub>2</sub> , 6677.
December 2	8 35	4		1	W	20	4924.1, 5018.6, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5234.8, 5276.2, 5284.2, 5316.8, 5363.0, D <sub>1</sub> , D <sub>2</sub> , 6677, 7065.
December 15	9 24	8		1	E	20	4924.1, 5018.6, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5316.8, D <sub>1</sub> , D <sub>2</sub> .
December 15	9 32			9	E	10	b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5316.8, D <sub>1</sub> , D <sub>2</sub> .
December 21	10 29	5	10.5		W	50	b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5316.8.
December 22	8 40	4	10		W	70	4924.1, 5018.6, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5234.8, 5316.8, 5535.06, D <sub>1</sub> , D <sub>2</sub> , 5991.6, 6469.4, 6484.2, 6516.3, 6677, 7065.
December 23	8 50		10		W	15	4924.1, 5018.6, b <sub>1</sub> , b <sub>2</sub> , b <sub>3</sub> , b <sub>4</sub> , 5316.8, 5535.06, D <sub>1</sub> , D <sub>2</sub> .

The metallic prominences recorded above were distributed in latitude as follows :—

—		1° to 10°	11° to 20°	Mean latitude.	Extreme latitudes.
North ... ..		3	6	11.5	7 and 17
South ... ..		5		5.0	1 and 10

Ten were on the west limb and four on the east.

*Displacements of the hydrogen lines.*

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

TABLE III.

Date.	Hour I.S.T.	Latitude.		Limb.	Displacement.			Remarks.
		North.	South.		Red.	Violet.	Both ways.	
1921.	H. M.	°	°		A	A	A	
July 1	9 16	11		E	2	2		To red at top, to violet at base.
July 2	9 47	82.5		E		1		
July 2	9 23	26		E	0.5			
July 2	9 23	22		E		1		

Date.	Hour I.S.T.		Latitude.		Limb.	Displacement.			Remarks.
			North.	South.		Red.	Violet.	Both ways.	
1921.	H.	M.	°	°		A	A	A	
July	3	8 23	40		W	Slight			
	3	8 22	54		W		Slight		
	6	10 26	Pole		...		1		
	6	9 50		9	E	1			
	6	10 20		4.5	W		2		
	7	9 28		10	W		0.5		At base.
	7	9 16		3	W	1			At top.
	10	8 52	45		W	0.5			At base.
	12	8 21	Equator		W	Slight			
	12	8 20		60.5	W		Slight		
August	26	8 55	35		W		Slight		
	4	10 34		8	E	1			
	5	8 32	40		E		Slight		
	6	8 57		5	W		1		At base.
	6	8 56		9	W	Slight			Do.
	7	8 32		77.5	W	1			To red at top, to violet at base.
	9	8 46	26		E	Slight			At top.
	9	8 44		7	E		Slight		
	9	8 51		82.5	W	Slight			
	12	9 3	6		W		Slight		
	13	8 59	35		E		Slight		
	13	8 46		41	E	1			
	13	9 23	13.5		W	1			
	14	8 37	42.5		W	1			At top.
	16	9 0	82.5		W	2			
	18	8 57	57		E		1		At base.
	19	8 49		1	W	1			At top.
	22	10 33	9		W	1			
	23	8 49	34		E	0.5			At base.
	23	8 52		12	E	Slight			
24	9 15	83		E	1				
24	8 49		66	E		Slight			
24	9 35		21	W	1				
24	9 35		24	W	0.5				
24	9 17		70.5	W	0.5				
25	8 48	77		W		1			
26	9 26	22		E	Slight				
29	9 24		6	E	1.5				
29	9 16		21	W		1.5		At top.	
29	9 6	15		W	0.5			At base.	
29	8 58	67		W		0.5		Do.	
30	9 24		9.5	E	1			At top.	
30	9 5	13		W	2			To red at top, to violet at base.	
30	9 2	18		W		1.5		At base.	
Sept.	3	9 25	82		E	1			At top.
	4	8 52	22		E	Slight			At base.
	4	8 40	18		W		0.5		Do.
	5	8 42	1		E		0.5		At top.
	5	8 16		23	E		Slight		
	10	9 44	54.5		E	0.5			
	13	8 35	34.5		W		Slight		
	16	8 30	82.5		W	Slight			
	17	9 36	14.5		E			1	At top.
	18	8 50	13		E	1			Do.
	19	8 36	74.5		E		0.5		
	19	8 49		31.5	W	1			At top.
	19	8 40	73.5		W	Slight			
	20	8 59	73.5		E	1			
	20	9 5	15		E	1.5			
22	8 42	31.5		W		Slight			
23	8 41	83		E		Slight			
23	8 46	20		W			1		
26	9 3		5	W	1				
27	9 10		53.5	E		1		At base.	
27	8 47	21.5		W	0.5			Do.	

Date.	Hour L.S.T.	Latitude.		Limb.	Displacement.			Remarks.
		North.	South.		Red.	Violet.	Both ways.	
1921.	h. m.	'	°		A	A	A	
Sept.	30	9 20	8	W	2			
	30	9 16	44.5	W	1			At top.
October	1	10 6		W		1		
	2	8 35	74.5	E		Slight		
	6	8 20	52.5	E	0.5			
	14	8 40	57.5	W		Slight		
	14	8 32	67.5	W		0.5		
	15	9 31		E		1		At top.
	15	9 54		W	1			Do.
	16	8 50	43	W	1			Do.
	17	8 35	20	E		Slight		Do.
	17	8 54	64.5	W		1		Do.
	17	8 52	69	W	Slight			
	18	8 39		W	Slight			
	19	8 43	59.5	E	2.5			
	19	8 39	61.5	E	2			
Nov.	2	11 13	60.5	E		0.5		
	2	10 53	24	W		1		At top.
	3	9 40	83.5	E	0.5			
	7	10 21	23.5	W	1			At base.
	10	8 43	35	E		Slight		
	11	8 26	6	E		1		Over upper part.
	11	8 23	48.5	E	Slight			
	11	8 20	52	E		Slight		
	12	9 34	7	E	1			
	12	9 26	6	E	1			At base.
	12	9 15	72	E	0.5			
	13	8 36	13	E	1.5			At base.
	13	8 24	16	E		1		At top.
	14	8 54	52	E	0.5			At base.
	14	9 29	9	W		Slight		At top.
	14	9 39	72.5	W	2			
	15	8 25	75.5	E		Slight		
	15	8 28	59	W			Slight	
	16	8 45	40.5	E		1		
	17	8 33	64	E		1.5		At top.
	17	8 40	35	E	0.5			Do
	17	8 28	2.5	W			Slight	
	19	8 42	6	E	Slight			
	19	8 38	50	E	Slight			
	21	10 16	47	E		Slight		
	22	8 55	5	W		Slight		
	23	10 29	52	E		Slight		At top.
	23	8 55	65	E	1			
	23	10 46	46	W	1			At top.
	24	9 57	69	W		1		At base.
	25	10 14	7	W	3			At top; only 1 A at 9h 54m.
	27	9 16	4	E	1			No prominence.
	28	9 6	13	E	0.5			
	29	8 35	47	E		Slight		
	30	8 56	3.5	W	1	0.5		To red at top, to violet at base.
	30	8 48	6	W	1			
	30	8 46	35	W	0.5			At top.
	30	8 42	77	W	0.5			
Dec.	1	8 36	78	E		Slight		
	1	8 30		W	3	2		To red at top, to violet at base. D <sub>3</sub> was displaced 2 A to violet at base. D <sub>1</sub> and D <sub>2</sub> were displaced 1 A to violet at base.
	1	8 55		W		1		At top.
	2	8 40	12	W		Slight		
	2	8 35	34	W	Slight			To red at north end, to violet at
	2	8 22	83	W		Slight		south end
	3	8 41	49	E		Slight		
	3	8 34		E	Slight			
	3	8 55	59	W		Slight		
	3	8 50	83	W		Slight		At top.
	3	8 50	39	W		Slight		

Date.	Time I.S.T.	Latitude.		Limb.	Displacement.			Remarks.
		North.	South.		Red.	Violet.	Both ways.	
1921.	H. M.	°	°		A	A	A	
December 6	8 30		16	W		Slight		
6	8 25	83		W				
7	9 6		18	E	1.5			
7	9 2		32	E		2		
7	9 0		41	E	1			
10	10 13	21.5		E		1		
10	9 45		57	E		Slight		
10	10 26		41	W		1		At base.
10	10 37	43		W	1			Do.
11	8 28		28.5	W		Slight		
11	8 25	50		W			Slight	
12	8 42		13	E		1		At top.
12	8 38		46	W	1			Do.
12	8 56	18		W	0.5			
12	8 50	70		W		0.5		
13	8 48		63	E			Slight	No prominence.
13	8 35		32	W		Slight		Symmetrically widened.
13	8 30	73		W	Slight			At base.
14	8 51		8	E	1	0.5		
14	9 35		51	E	2			To red at base, to violet at top.
15	8 46	75		E		Slight		
15	9 7	35		E	Slight			No prominence.
15	8 44	56		W		2		At base.
16	8 58	28		E		Slight		
19	8 50	62		W		Slight		
20	8 55		54	E	Slight			At base.
21	10 34	.5		W	1	2		
21	10 0	10.5		W	3	2		At top. At 10 <sup>h</sup> 11 <sup>m</sup> the displacement was 1 A to red and 2 A to violet.
22	8 34	74		E		0.5		
22	8 40	9		W	6	4		D <sub>a</sub> was displaced 6 A to red and C <sub>1</sub> was displaced 6 A to violet at 8 <sup>h</sup> 45 <sup>m</sup> .
23	8 53		4	W			0.5	
23	8 50	10		W		1		
23	8 41	57.5		W		Slight		
25	9 54	69		E		Slight		
25	10 0		56	W		0.5		No prominence.
26	8 41	19		W		Slight		
26	8 38	36		W		0.5		

The total number of displacements was 180, which is only 60 per cent of the number observed in the first half-year. One of them was on the equator, and the rest were distributed as follows:—

Latitude'	North	South
1°—30°	48	36
31°—60°	29	23
61°—90°	31	12
Total ...	108	71
East limb ...	...	86
West limb ...	...	93
Pole ...	...	1
Total ...	...	180

The activity is confined to the region between the equator and latitude  $60^\circ$  north and south. The reduction of area in the southern hemisphere is much more marked than in the case of prominences at the limb. The activity in this hemisphere is now more uniform in all the zones with the maximum at  $50^\circ$ — $55^\circ$ . In the northern hemisphere, the maximum activity occurs at  $40^\circ$ — $45^\circ$  as in the case of prominences at the limb. The  $H\alpha$  absorption markings have now reverted to an eastern excess, the percentage east being 54.40 in the case of areas and 52.45 in the case of numbers.

THE OBSERVATORY, KODAIKANAL,  
31st January 1922.

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