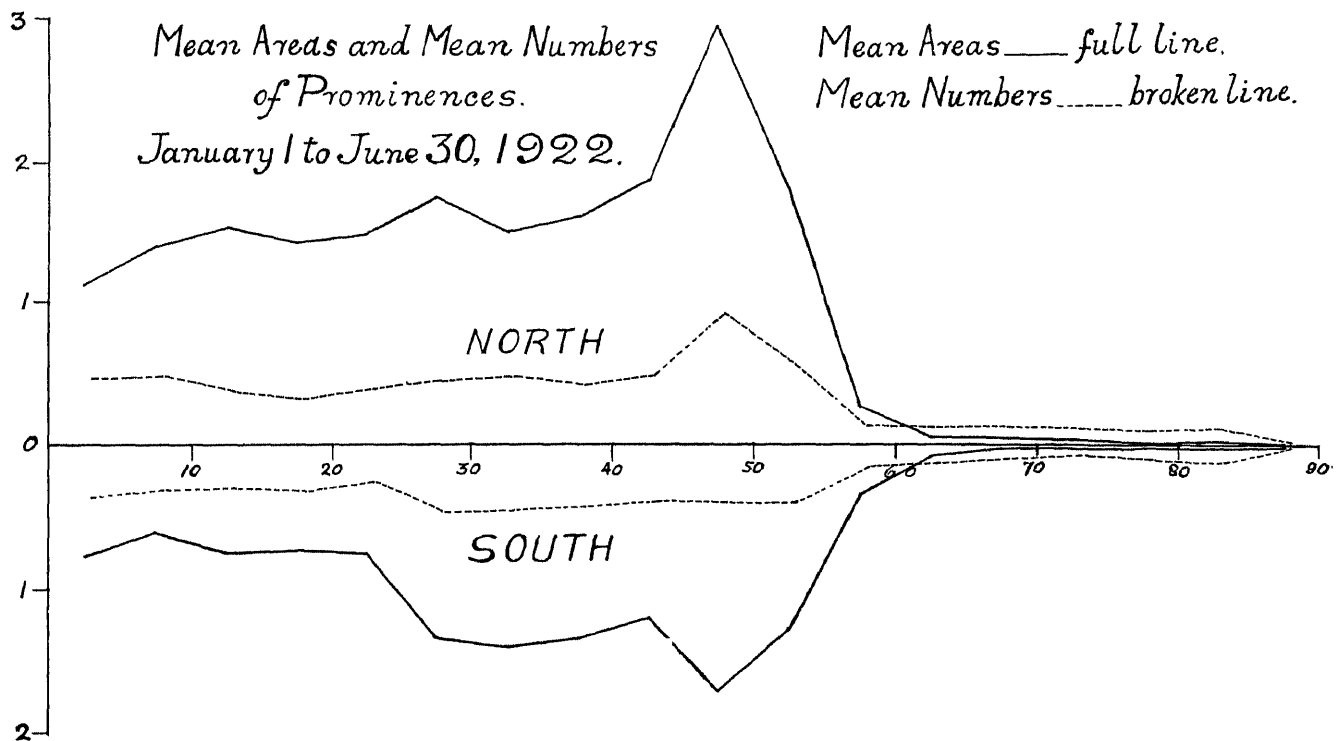


Kodaikanal Observatory.

BULLETIN No. LXX.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF THE YEAR 1922.

The distribution of prominences observed and photographed during the half-year ending 30th June, 1922, 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. The means are corrected for incomplete or imperfect observations, the total of 161 days being reduced to 153 effective days.



The curve shows maxima in the belt 45° — 50° in both hemispheres and is very similar to that for the previous half-year.

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

								Mean daily areas (square minutes).	Mean daily numbers.
North	...	...	...	...	...	...	...	1.90	6.15
South	...	...	...	...	...	...	...	1.27	4.90
Total								3.17	11.05

Compared with the previous half-year, both areas and numbers have decreased by about 30 per cent in the southern hemisphere; in the northern hemisphere areas show a slight increase and numbers a slight decrease. On the whole there is a decrease of 11 per cent in areas and of 18 per cent in numbers. Prominence activity is now more pronounced in the northern hemisphere, in which the mean daily areas are 50 per cent and the mean daily numbers about 25 per cent more than in the southern. The northern prominences were also slightly brighter than the southern.

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 FIRST HALF OF 1922.

Months.	Number of days (effective).	Areas.	Numbers.	Daily Means.		Mean height.	Mean extent.
				Areas.	Numbers.		
January	28	83.8	334	2.99	11.9	27.8	2.98
February	22	70.4	256	3.21	11.6	33.1	3.55
March	31	107.0	367	3.45	11.8	34.0	3.95
April	27	99.3	297	3.68	10.0	36.7	4.87
May	23	70.6	236	3.07	10.3	33.8	4.08
June	22	54.2	201	2.46	9.1	36.8	4.09
First quarter	81	261.2	957	3.22	11.8	31.6	3.50
Second quarter	72	224.1	734	3.11	10.2	35.8	4.41
First half-year	153	485.3	1691	3.17	11.1	33.4	3.90

Distribution east and west of the Sun's axis.

Areas show an excess in the western hemisphere, but in the case of numbers there is a slight eastern preponderance as shown below :—

1922 January to June.	East.	West.	Percentage east.
Total number observed	857	834	50.7
Total areas in square minutes	234.0	251.3	48.2

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

Metallic prominences.

The activity of prominences showing metallic lines which was noticed in December 1921 was well maintained during the first three months of the period under review. During the half-year 34 metallic prominences were seen. Details of these are given in the following table:—

TABLE II.—LIST OF METALLIC PROMINENCES OBSERVED AT KODAIKANAL, JANUARY TO JUNE 1922.

Date.	Hour. I.S.T.	Base	Latitude.		Limb.	Height	Lines.
			North.	South.			
1922	II. M.	°	°	°			
January	4	9 12	9		E	55	4924·1, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
	5	8 40	5	10·5	E	40	4924·1, b ₁ , b ₂ , b ₃ , b ₄ , 5234·8, 5316·8, D ₁ , D ₂ , 7065.
	6	8 54	3	7·5	E	15	4924·1, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 7065.
	8	8 55		21	E	30	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
	17	9 3	1	5·5	W	10	4924·1, b, b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
February	31	9 5	3	9·5	E	20	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8.
	1	8 58		18·5	E	165	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
	15	9 33		11·5	W	70	4921·9, 4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5197·7, 5234·8, 5275·4, 5276·2, 5284·3, 5316·8, 5363·0, D ₁ , D ₂ , 6677, 7065.
	19	9 50			W	30	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5276·2, 5284·3, 5316·8, D ₁ , D ₂ , 6677, 7065.
	20	8		79·5	E	15	4924·1, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5276·2, 5316·8, D ₁ , D ₂ .
	26	8 45		6·5	E	50	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677.
	27	9 2	1	14·5	E	10	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
	28	8 53	8	17	E	80	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
	28	8 55	4		E	20	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
March	1	9 19		23·5	E	55	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
	6	10 8	5	14·5	E	30	4922·3, 4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5222·1, 5234·8, 5270·5, 5273·4, 5276·2, 5316·8, D ₁ , D ₂ , 6677, 7065.
	8	9 14		12	W	55	4922·3, 4924·1, 5016, 5018·6, 5048·2, b ₁ , b ₂ , b ₃ , b ₄ , 5197·7, 5234·8, 5276·2, 5284·3, 5316·8, 5363·0, 5425·4, 5535·1, D ₁ , D ₂ , 6677, 7065.
	9	9 4	6	12	W	40	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
	10	8 45	4	12	W	35	4922·3, 4924·1, b ₁ , b ₂ , b ₃ , b ₄ , 5234·8, 5316·8, D ₁ , D ₂ , 6677, 7065.
	14	8 30	2	23·5	W	45	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
	18	8 22		3	W	25	4924·1, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5234·8, 5316·8, 5535·1, D ₁ , D ₂ , 6677.
	19	9 5	5		W	25	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
	19	8 52	2	11	W	10	5016, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677.
	20	8 42	1		W	20	4924·1, 5016, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
	20	8 56		8	W	15	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5234·8, 5316·8, 5363·0, D ₁ , D ₂ , 6677, 7065.
	23	9 11		9·5	E	80	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
	24	9 30	11	16·5	E	25	4924·1, 5016, b ₁ , b ₂ , b ₃ , b ₄ , 5234·8, 5316·8, 5363·0, D ₁ , D ₂ .
	27	9 20	3	9·5	E	15	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
	28	9 45		26	E	70	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, 5363·0, D ₁ , D ₂ .
	31	9 5		11	E	15	4924·1, 5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5204·7, 5208·6, 5227·2, 5234·8, 5269·7, 5276·2, 5283·8, 5316·8, 5363·0, D ₁ , D ₂ , 6677, 7065.
April	3	9 3		24	E	45	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂ .
	7	9 5	3	8·5	E	40	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
May	20	8 36	5	8·5	E	25	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .
June	15	8 40	3	5	E	35	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ .

The distribution in latitude of the metallic prominences is as follows —

	1 t 10	11 t 20	21 to 30	31 t 40°	71 t 80	M l t t d	Extr m l t t d
N rth	12	12	5	1	1	15 0	3 d 79 5
S th	3					12 1	1 n d 32

Twenty two were on the east limb and 12 on the west

Displacements of the hydrogen lines

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

TABLE III

D t	H ur I S T	L t t d		L mb	D p l m t			Remarks
		N rth	S uth		R d	V l t	B th w ys	
1922								
J uary								
2	H M 10 50	70 5		W	A	A	A	
4	9 12	9		E		Slight		At t p
4	9 12	4		E		1		D
4	9 4		46	E	1			At bas
5	8 44	64		E		Slight		D
5	9 7	20		E		1		At t p
5	8 40	10 5		E	15			At bas
5	8 46	66		W			Slight	
7	10 7		49	W	0 5			At t p
8	8 55	21		E		15		Do
8	9 4	2		W	15			
12	8 52		15	E	1			At b
12	9 16		30	E	1			D
12	9 0	30		W	1			
12	8 56	50		W		Slight		At b
13	9 4	59 5		E	15			
13	9 13		14	W	Slight			
14	10 30		2	E	0 5			
15	8 46	43		W		Slight		At ba o
16	8 36		67 5	E	3			
17	8 38	50		E		0 5		At bas
17	9 0	8 5		W	3	2		T ed at top to v olet at base
18	9 12	1		L	1			
18	8 54	41		W	0 5			At t p
19	8 48	83		E		0 5		
19	9 8	4 5		E	1			At la
19	8 52	71 5		W		Slight		
20	8 56	20		E		Slight		
20	8 56		19 5	E	Slight			
21	9 4	56 5		E		0 5		
21	9 10	68		W		0 5		At la o
22	9 36	49 5		L		Slight		At t p
23	9 29		46 5	E	Slight			
23	8 36	38		W	0 5			At ba
23	8 36	35		W	1			At top
23	8 31	54 5		W	0 b			
24	8 47	59 5		W		Slight		
25	9 32	84 5		E		2		At top
25	8 44		52 5	E			0 5	
25	9 14		30	W	Slight			At t p
26	8 55		8	W	1			D
26	8 50	18		W		0 5		
27	8 35	51 5		E	Slight			
28	9 38	33		E		Slight		At t p
29	8 37	72		E	1			D
29	9 2	4		E		1		At b s
29	8 42	51		W	2			At top
31	9 15	21		E	1	1		T ed a p to v olet t b e
	9 15	7		E		1		At base A to ed whol heght
								at 11h 45
31	9 18		P 1		3			O wh l promin ce

Date.	Hour I.S.T.		Latitude.		Limb.	Displacement.			Remarks.
			North.	South.		Red.	Violet.	Both ways.	
1922.			°	°		A	A	A	
February	H.	M.							
	1	9 46	20		E	1.5			At base.
	1	8 58	15		E	4			Do.
	1	9 8	14		E	2			
	1	9 8	6		E		1		
	1	8 50		31	E	2			At base.
	1	8 45		82	E	1			
	1	10 3	70		W	2			At top.
	4	11 15	15		E		1		Do.
	4	11 3		79.5	W	1			
	4	11 29	39.5		W	0.5			
	6	8 40	75		E	1			At top.
	6	8 44	41.5		E		1		
	7	9 15		56.5	E	1.5			
	8	9 41	47.5		E		1		Over whole height.
	8	9 28	14		E	0.5			
	8	9 9		50.5	E	Slight			At base.
	8	9 52		18	W	2			At top.
	11	9 55	71		E	1			
	11	9 23		9	E	1			
	12	8 48	33.5		E	Slight			
	12	8 36	41.5		W		3		
	15	9 7	54.5		E	1.5			
	15	9 33	9.5		W	1			
	15	9 33	13		W	2.5			Over whole prominence.
	18	9 16		39	E	1			At top.
	19	9 19	69		E	1			At base.
	19	9 13	35		E	1			Do.
	19	9 50		2	W	2		2	
	19	9 50	Equator		W	1		1	
	20	8 31	71.5		E		Slight		At base.
	21	8 39		61	E		Slight		
	21	8 40		70	E	0.5			
	22	8 58		2.5	E	2			
	23	8 54	6.5		E		0.5		At base.
	24	9 0.		3.5	W	1.5			
	26	8 45	8.5		E		0.5		
	26	8 34	51.5		W		0.5		
	28	8 53	12		E	1.5			
	28	8 44		22	W	1			At top.
March	1	9 53	66		E	0.5			
	2	9 26	6		E		1		
	2	9 13	48		W	1			At top.
	3	8 42	46.5		E		Slight		
	3	8 36		8	W	Slight			At top.
	4	9 15	62		E		1		
	4	8 58		1	E	1			At base.
	6	10 8	14.5		E	1.5		2	
	7	8 35		38.5	E	0.5			
	8	9 14	9		W	6		3	
	9	9 22		2	W		1.5		At base.
	10	8 45	12		W		0.5		
	11	9 21	57		E		1		At top.
	11	9 27	22		W	Slight			Do.
	12	8 55	51.5		E		0.5		At base.
	12	9 10	15.5		W		1		Do.
	12	9 10	19		W	1			At top.
	13	10 12	1		E	1			
	13	9 15	13		W		1		At base.
	14	8 32	80		W		Slight		
	15	9 14	9		W	1			At top.
	15	9 26	70		W	2			
	16	8 57	78.5		E	1			At top.
	16	9 21	4		E		1		Do.
	16	9 1	47		W	1			Do.
	17	8 30	53.5		W	3			At base.
	18	8 32		60	E	1			
	18	8 22	Equator		W		Slight		
	19	9 27		74.5	W		0.5		

Date.	Hour L.S.T.		Latitude:		Limb.	Displacement.			Remarks.
			North.	South.		Red.	Violet.	Both ways.	
1922.	H.	M.	°	'		A	A	A	
March	19	9 5		3	W	2			At top.
	20	8 39		6	W	1			Do.
	20	8 53	7		W		2		Do.
	20	8 53	7		W	1			At base.
	22	8 46	7		E		1		
	23	9 11	9		E	3	1		
	24	8 42	64		E		1.5		At base.
	26	9 2	78.5		W	0.5			Do.
	27	9 5		30	E		1		Do.
	27	9 10		82	E	2			Do.
	28	9 50		5	E		0.5		Do.
	30	9 6	15		W	1			At top.
	31	9 15	48		E		0.5		At base.
	31	9 5	11		E		2		Do.
April	2	9 20		4	W	0.5			At base.
	2	9 17	12		W		0.5		
	4	8 55	56.5		E	Slight			
	4	8 52	27		E	1			At base.
	4	9 16		54.5	E	0.5			Do.
	4	9 6		3	W		Slight		
	5	8 57		78.5	W	Slight			
	6	8 34		62	E	Slight			
	6	8 58		2	E	Slight			
	6	8 49	25		W		0.5		At base.
	7	9 5	8.5		E		2		At top.
	9	8 42	47.5		E		0.5		
	12	9 52		15	E	Slight			At base.
	12	9 48		57.5	E	1			
	16	8 32	72		E		0.5		At base.
	16	8 45		25	E		0.5		At top.
	17	9 7	52		E	0.5			At base.
	20	8 26	36		E	3			Do.
	20	8 40		8	E	1			Do.
	21	8 50		20	E	3	4		To red at base, to violet at top.
	21	8 58		46.5	E	0.5			At base.
	21	8 58		48	E		1		At top.
	22	8 53		71	W	Slight			To red at base, to violet at top.
	23	8 53	61.5		E		0.5		At base.
	23	9 4	47.5		W		0.5		Do.
	25	9 12	31		E	0.5			At top.
	25	9 10	11		E		Slight		At base.
	27	9 16	66.5		E		Slight		
	27	9 10	48		E		Slight		
May	1	9 9	58		E	Slight			At base.
	1	8 57	1		E		1		Do.
	2	8 52	28		W		0.5		At top.
	4	9 2	19		E	1.5	1		To red at top, to violet at base.
	9	8 32	66		E	Slight			At base.
	9	8 49		36	W		2		Do.
	9	8 42	11		W	Slight			
	10	8 55	63		E	2	1		To red at base, to violet at top.
	11	9 12	55		E		Slight		At base.
	11	9 26		31	W	Slight			
	11	9 16	37		W	1			At top.
	18	8 40		7	E		Slight		
	19	9 5	25		E	Slight			
	19	9 1	5		W	Slight			
	19	8 54	83.5		W	0.5			At top.
	20	8 28	15		W	Slight			
	20	8 25	52.5		W	Slight			
	21	9 2	74		E	1			At top.
	21	9 21	68		E		0.5		At base.
	21	9 22	2		E	0.5			
	25	9 2	56		W	1			At top.
	27	9 28	65		E		Slight		
	28	8 28	82		E		Slight		At base.
	28	8 33		30	W	0.5			Do.
	29	8 36	47		E		0.5		Do.

Date.	Hour I.S.T.	Latitude.		Limb.	Displacement.			Remarks.
		North.	South.		Red.	Violet.	Both ways.	
1922.	II. M.	°	°		A	A	A	
May	30	8 49	39	E	Slight			
	31	9 30	46	W	1			At base.
	31	10 30	49	W	2			At top.
June	2	8 34	31	E	Slight			
	2	8 30	10	W	Slight			
	3	9 30	75	E		Slight		
	6	8 23	27	W		Slight		
	6	8 18	53	W		1		At base.
	14	8 49	6	E		Slight		At top.
	15	8 36	70	E	Slight			
	15	8 45	52	W		1.5		
	16	9 40	80	E	2			
	19	8 49	36	E		1		At top.
	23	8 26	67	E		Slight		
	23	8 39	3	W		Slight		

The total number of displacements was 213, of which 3 were on the equator and the rest were distributed as follows :—

Latitude.	North.	South.
1°—30°	66	34
31°—60°	47	19
61°—90°	30	14
Total ...	143	67
East limb ...	...	126
West limb ...	...	86
Pole ...	...	1
Total ...	...	213

One hundred and seventeen displacements were towards the red, 94 towards the violet and 2 both ways simultaneously.

Reversals and displacements on the disc.

One hundred and eighteen bright reversals of the $H\alpha$ line, 37 dark reversals of the D_3 line and 42 displacements of the $H\alpha$ line on the disc were observed during the half-year. Their distribution is given below :—

	North.	South.	East.	West.
Bright reversals of $H\alpha$...	77	41	64	54
Dark reversals of D_3 ...	21	16	22	15
Displacements of $H\alpha$...	28	14	28	14

Of the displacements, 30 were towards the red, 10 towards the violet and 2 both ways simultaneously.

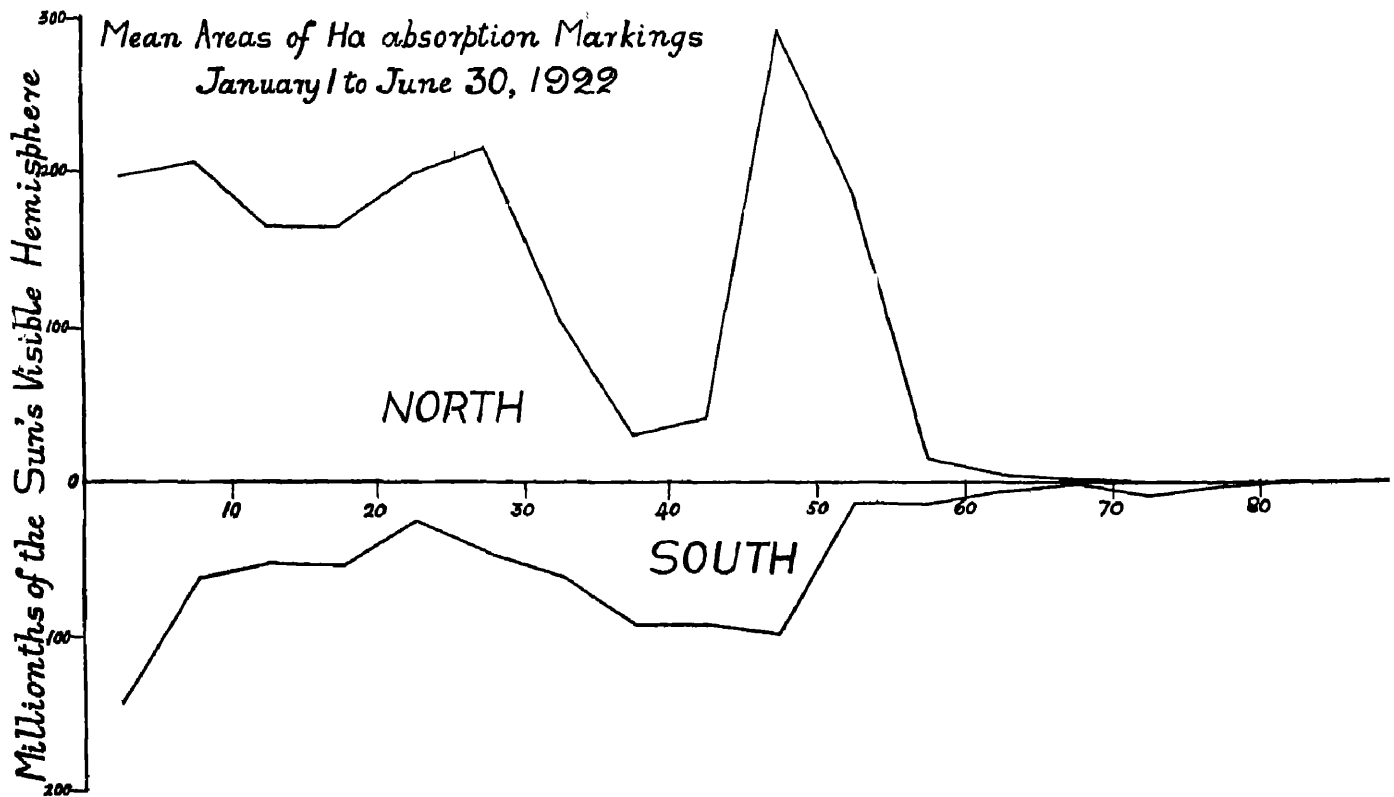
Prominences projected on the disc as absorption markings.

Photographs of the Sun's disc in $H\alpha$ light were obtained on 98 days counted as 81 effective days. The reduction in the number of days of observation is due to the $H\alpha$ spectroheliograph having been taken down for improvement during part of January and the whole of February. The mean daily areas in millionths of the Sun's visible hemisphere, corrected for foreshortening, and the mean daily numbers are given below :—

	Areas.	Numbers.
North ...	1824	135
South ...	768	76
Total ...	2592	211

Compared with the second half of 1921, there is an increase of 9 per cent in daily areas and a decrease of 5 per cent in daily numbers. The preponderance in activity in the northern hemisphere has now increased to 70 per cent of the total for areas and to 64 per cent for numbers.

The distribution of mean daily areas in latitude is shown in the following diagram:--



The distribution is similar to that for the second half of 1921, but there has been an increase near the equator in both hemispheres. Although there is a decrease in the activity beyond 50° in the southern hemisphere, there is some activity between 70° and 80° in that hemisphere.

There is again a preponderance on the eastern side of the central meridian, amounting to 58.10 per cent of the total for areas and 53.41 per cent for numbers.

THE OBSERVATORY, KODAIKANAL,
5th August 1922.

T. ROYDS,
Assistant Director.