

Kodaikanal Observatory.

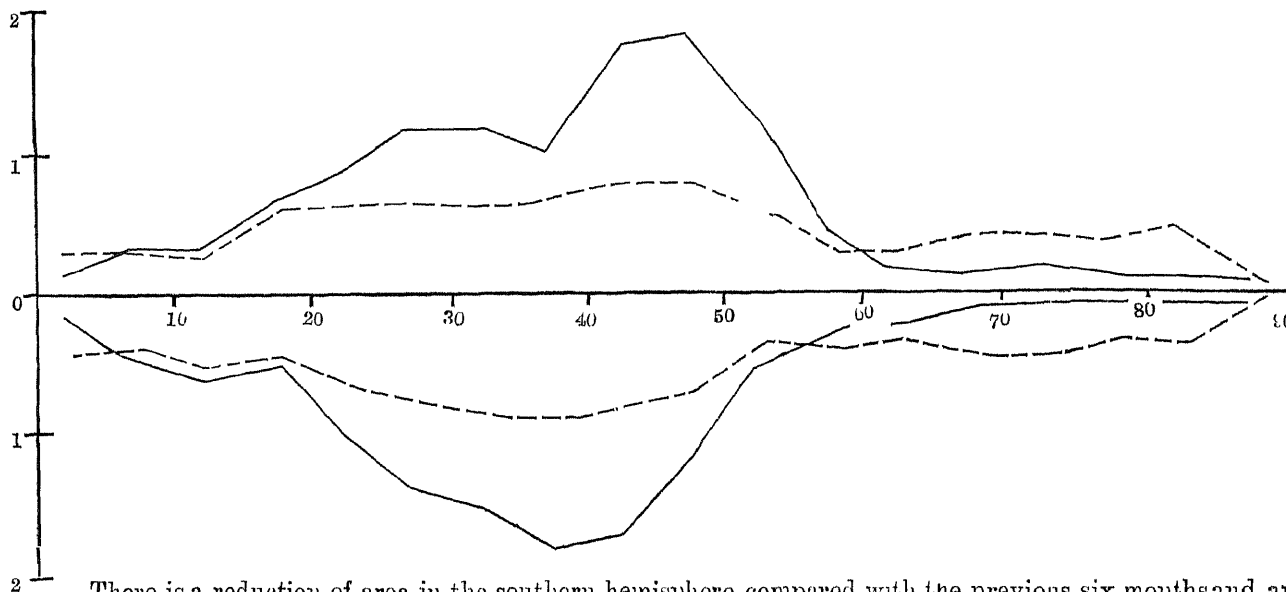
BULLETIN No. XXXI.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF THE YEAR 1913.

THE distribution of the prominences in latitude during the six months ending June 30, 1913, is represented in the accompanying diagram. In this the full line gives the mean daily areas, and the broken line the mean daily numbers, for each zone of 5° of latitude. The scale of ordinates represents tenths of square minutes of arc for the full line and numbers for the broken line. The means are corrected for partial or imperfect observations the total of 166 days of observation being reduced to 153 "effective" days.

MEAN AREAS AND MEAN NUMBERS OF PROMINENCES. JANUARY 1ST TO JUNE 30TH, 1913.

Mean areas—full line
Mean numbers—broken line.



There is a reduction of area in the southern hemisphere compared with the previous six months and an increase in the north, the area for the whole sun remaining the same. The reduction in the south affects chiefly the zones 15°—20° and 45°—50° and the increase in the north is mainly in the region 40°—50°.

By these changes the two hemispheres have become sensibly equal in activity both as regards areas and numbers.

The usual reduction of area is shown in the polar regions (60° to 90°) and in the immediate vicinity of the equator, indicating the general dependence of the distribution on the solar rotation.

The mean daily areas and numbers for each hemisphere corrected for partial observations are as follows:—

	Mean areas (Square minutes)				Mean numbers.
North	1.23	9.61
South	1.19	9.56
Totals	2.42	19.17

The monthly, quarterly, and half yearly frequencies, corrected for partial observations, and the mean height and extent, are given in the following table.—

Abstract for the first half of 1913.

Months.	Number of days of observation		Number of prominences.	Mean daily frequency.	Mean height.	Mean extent
	Total.	Effective.				
January .. .	26	23	461	20.0	29.9	1.39
February ...	27	25	515	20.6	29.9	1.15
March	31	30	653	21.8	29.2	1.14
April	29	28	530	18.9	30.3	0.99
May	28	26	448	17.2	30.0	1.03
June	25	21	327	15.6	26.3	0.86
First quarter .	84	78	1629	20.9	29.3	1.21
Second quarter .	82	75	1305	17.4	29.2	0.97
Half year .	166	153	2934	19.2	29.2	1.11

Compared with the previous six months the mean frequency has remained practically unaltered, the mean height has slightly increased and the mean extent has slightly diminished.

Mean height.

The mean apparent height of the prominences, $29''.2$, exceeds that found for the previous six months by $0''.6$.

The total number of prominences recorded during 166 days of observation which attained heights of $60''$ or more is 334 or an average of 2.0 per diem as against 1.6 per diem during the latter half of 1912. Five prominences were photographed exceeding $180''$ in height. The highest was photographed on January 26th at latitude $+30^\circ$ west. This was a small pointed cloud closely resembling in form the brighter part of the nebula photographed near Nova Persei. At $8^h 20^m$ it was about $4'$ above the sun's limb but appeared to be receding from the sun at a speed of about 30 kilometers per second, and at $9^h 50^m$ it was outside the field of the spectroheliograph.

Distribution east and west of the sun's axis.

The eastern limb shows a slight preponderance in numbers and areas over the western as follows:—

1913 January to June—			East.	West.	Percentage east.
Numbers observed	...	...	1485	1449	50.61
Total areas in square minutes of arc	...	...	137.4	132.2	50.70

Metallic prominences.

Only five were observed during the six months, particulars of these are given in the following table:—

Metallic prominences during the first half of 1913

Date.	Time I.S.T.	Base.	Latitude		Limb.	Height.	Elements giving bright lines
			North.	South.			
January .. 4	H M. 8 44	1	25.5	.	E	40	Na, Mg, pFe.
Do. ... 4	8 55	..	26	..	W	10	Na, Mg, pFe.
March ... 13	8 35	1	.	46.5	W	25	Na, Mg, pFe.
Do. ... 26	8 24	2	.	44.5	W	70	Na, Mg, pFe and He.
Do. ... 26	8 24	0.5	.	41.5	W	25	

It is remarkable that two were observed on the same day (January 4) and at the same latitude, one being on the north-east limb and the other on the north-west limb; the latter was an exceedingly bright point of light exactly over a small sunspot (Greenwich No. 7008, Latitude + 26°).

Displacements of the hydrogen lines.

The number of displacements observed has largely increased compared with the record for the previous six months. This is partly due to increased attention being given by the observers to these observations and partly to the use of more powerful instruments during the last three months. Altogether 87 of these disturbances were recorded and more than half the number (49) were in the high latitude areas between 60° and the poles. Twenty-three were in mid-latitudes 30° to 60°, and fifteen in the equatorial region bounded by latitude 30°.

The largest displacement recorded was on February 1st at latitude + 81° east when the C line was displaced 3 Å towards the red at 9^h 40^m. Two minutes later it had changed to 3 Å towards the violet and at 9^h 51^m the disturbance had subsided.

Forty-five of the displacements were towards the red, thirty-two towards the violet and ten in both directions simultaneously. Fifty-six were on the east limb and thirty-one on the west. Finally the disturbances were almost equally distributed north and south of the equator.

Reversals and displacements of the hydrogen lines on the disc.

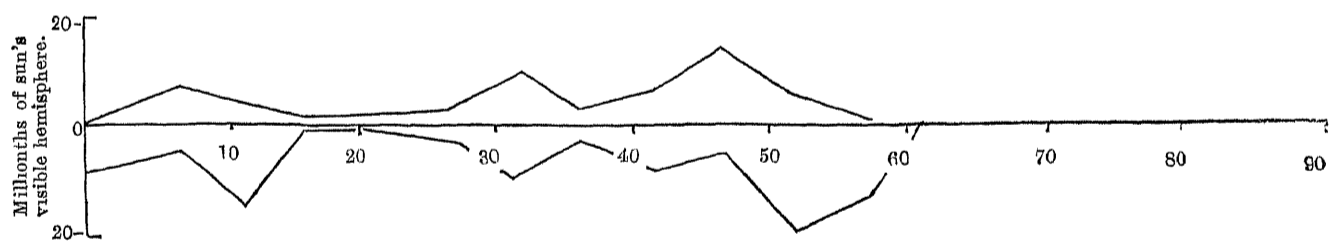
Those disturbances being closely associated with sunspots are rarely observed during years of minimum spot activity. No noticeable disturbances of the C line were recorded near the small spots of January, March and April but on February 21st 8^h 20^m the dark line was displaced about 3 Å towards the red near spot No. 7010 of the Greenwich series (Latitude + 27°) and on the 22nd 10^h 18^m the line was reversed in several places between main spot and the group of small spots following.

Prominences projected on the disc as absorption markings.

The sun's disc was photographed in H α light on 132 days and on 57 of these days absorption markings are shown. The distribution of the markings in latitude are given in the accompanying diagram in which the mean areas, corrected for foreshortening, are given for each zone of 5° of latitude.

MEAN AREAS OF H α ABSORPTION MARKINGS.
JANUARY TO JUNE 1913.

Total mean area for North hemisphere = 44 millionths.
Do. do. South hemisphere = 84 do.



The general distribution is almost the same as that of the prominences at the limb, the only noticeable difference is in the southern hemisphere where the maximum development of absorption markings is in a higher latitude than the maximum area of prominences. In the northern hemisphere the correspondence of the two curves is very close. As the majority of prominences do not produce absorption on the disc the diagram represents a much smaller number of observations than is the case with the prominence diagram on page 13.

Compared with the previous six months (See Kodaikanal Observatory Bulletin No. XXX, page 12) it appears that the three principal zones of activity in each hemisphere are in exactly the same latitudes in both periods, but the very active zone observed in 1912 at 10° to 20° south has in 1913 become of secondary importance. The reduction of activity in this zone is also shown in the prominence curves.

The mean areas per diem in millionths of the sun's visible hemisphere and the mean numbers are compared in the following table with the previous six months :—

		1912 July to December		1913 January to June.	
		Areas.	Numbers.	Areas	Numbers.
North	...	56	0.32	44	0.24
South	...	382	1.28	84	0.56
Total	...	<u>438</u>	<u>1.60</u>	<u>128</u>	<u>0.80</u>

There is here shown a great reduction in both numbers and areas in 1913, the mean numbers being reduced by half and the mean areas $3\frac{1}{2}$ times, so that the average size of the markings has also greatly decreased.

THE OBSERVATORY, KODAIKANAL,
14th July 1913.

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