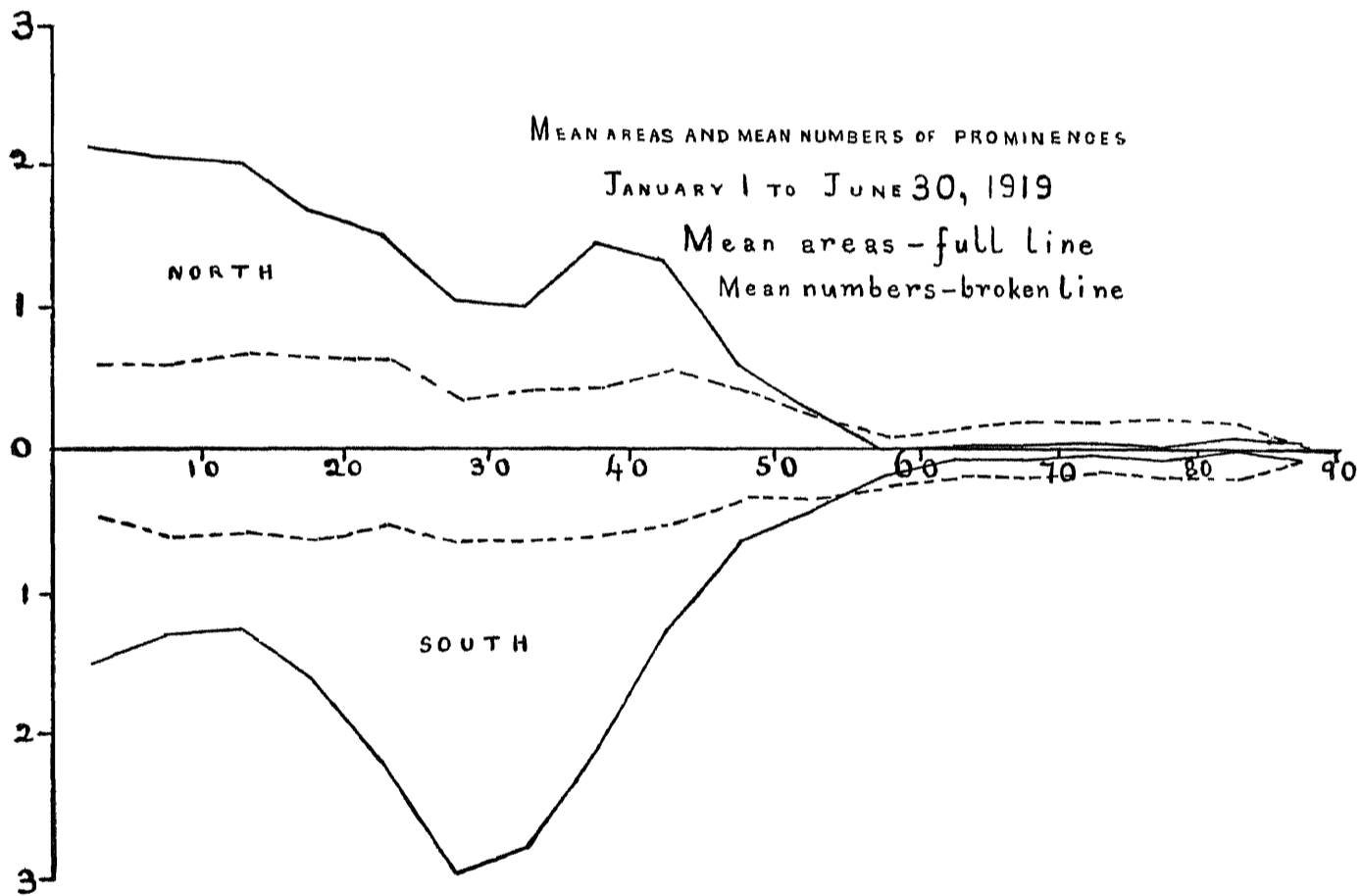


Kodaikanal Observatory.

BULLETIN No. LXI.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF THE YEAR 1919.

The distribution of prominences observed and photographed during the half-year ending June 30th, 1919, 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 174 days being reduced to 159 effective days.



The distribution in the southern hemisphere has been almost identically the same as during the latter half of 1918, the only notable change indicated being the suppression of a feeble activity near the south pole which was maintained until the end of 1918. In the north there has been a transfer of activity from the zone 25°—35° to 35°—45°, and a considerable increase between the equator and latitude 20°.

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

								Mean daily areas (square minutes)	Mean daily numbers
North	...	...	...	...	...	...	...	1.55	6.86
South	...	...	...	...	...	...	...	1.81	6.78
Total								3.36	13.64

This indicates for areas a slight increase in the northern hemisphere and a decrease in the south compared with the previous half year. For numbers there is a general decrease amounting to 15 per cent. The excess of area in the south noted in 1918 has been maintained although numbers are nearly equally divided between north and south. The southern prominences were on the average slightly brighter than the northern.

The monthly, quarterly, and half-yearly areas and numbers, and the mean height and 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 1919.

Month	Number of days (effective)	Areas.	Numbers	Daily Means		Mean height. "	Mean extent. "
				Areas.	Numbers		
January	29	87.7	467	3.02	16.1	30.6	2.58
February	28	96.8	434	3.46	15.5	28.1	2.68
March	30	110.9	458	3.69	15.3	27.8	2.82
April	26	98.0	316	3.77	12.2	32.5	3.55
May	25	84.8	264	3.39	10.6	26.1	3.56
June	21	56.1	230	2.66	11.0	27.9	3.29
First quarter	87	295.4	1359	3.39	15.6	28.9	2.68
Second quarter	72	238.9	810	3.32	11.3	29.1	3.48
First half-year	159	534.3	2169	3.36	13.6	29.0	2.99

This table has been modified by the inclusion of prominence areas, and the suppression of a column giving the total number of days of observation. It is considered that the mean monthly areas will give a truer index of the prominence activity than the mean numbers. Although the mean areas of prominences show a very slight increase, there has been a general decrease in mean numbers, height, and extent on the limb compared with the last half of 1918.

A prominence remarkable for its size was photographed on May 28 and 29 extending over 40 degrees of the south-eastern limb, between latitude -10° and -50° , and covering an area of 12 square minutes. The prominence became partially separated from the limb on the 29th and the main portion ascended slowly and became dissipated in space between $16^{\text{h}} 33^{\text{m}}$ I.S.T. ($11^{\text{h}} 03^{\text{m}}$ G.C.T.), on the 29th and $7^{\text{h}} 44^{\text{m}}$ I.S.T. ($2^{\text{h}} 14^{\text{m}}$ G.C.T.), on the 30th. This was the final stage of an apparently stable prominence which had been recorded as an absorption marking early in the month, crossing the central meridian on May 9 and appearing on the western limb between latitude -15° and -43° on May 16.

Distribution east and west of the sun's axis.

The distribution of the prominences east and west of the sun's axis is similar to that observed in the previous half year, areas showing an eastern preponderance and numbers a western. The figures are given in the table below:—

1919 January to June	East.	West	Percentage east
Total number observed	1038	1131	47.85
Total areas in square minutes	233.9	250.5	53.13

There is no marked difference in the mean brightness of eastern or western prominences.

Metallic Prominences.

An unusual number of metallic prominences was recorded during the half year, the total being 121, whilst during the whole of 1918 only 65 were observed. This large increase may be in part due to increased vigilance in searching for bright lines in prominences, but there seems to be no doubt that the sun has been more active than usual in the eruption of metallic vapours characteristic of the lower chromosphere. The sodium magnesium and enhanced lines of iron have usually been observed but several other iron lines have also been noted together with a few lines of chromium and titanium, and the barium line 4934'2.

It may be noted that the occurrence of a large number of metallic prominences synchronises with a period of great magnetic activity as recorded by the Observatory magnetographs.

Details of the metallic prominences are given in the following table :—

TABLE II—LIST OF METALLIC PROMINENCES OBSERVED AT KODAIKANAL, JANUARY TO JUNE 1919.

Date	Hour I S T	Base	Latitude		Limb	Height	Lines.
			North.	South.			
1919.	h m.	°	°	°		"	
January	2	9 45	3		W	30	b ₁ , b ₂ , b ₁ , 5316'8.
	3	8 36	9		E	35	D ₁ , D ₂ , b ₁ , b ₂ .
	4	8 34	3	22'5	E	30	b ₁ , b ₂ , b ₁ , 5316'8.
	4	8 48		15	W	55	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	6	8 43		11'5	W	40	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	7	8 32	7	16'5	W		D ₁ , D ₂ , b ₁ , b ₂ , b ₁ , b ₁ , 5316'8, 4924'1, 6677.
	11	11 25	12	32	E	100	D ₁ , D ₂ , b ₁ , b ₂ , b ₁ , b ₁ . Whole prominence seen in these lines.
	12	10 5	2	13	E	30	4924'1, 5016, 5018'6, b ₁ , b ₂ , b ₃ , b ₁ , 5316'8, D ₁ , D ₂ , 6677 and 7065 very bright over whole height, 5197'7, 5234'8, 5276'2 slightly bright.
	12	10 29	17	28'5	E	95	D ₁ , D ₂ , b ₁ , b ₂ , b ₁ , b ₁ , bright over lower part (50').
	14	9 0	2	8	E	50	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316'8, 6677, 7065 very bright.
	14	8 46	3	14'5	W	40	D ₁ , D ₂ , b ₁ , b ₂ , b ₁ , b ₁ , 5316'8.
	14	8 41	11	11'5	W	100	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8, 5018'6, 4924'1 slightly bright.
	16	10 45		10	W	30	D ₁ , D ₂ , b ₁ , b ₂ , b ₄ , 5316'8.
	17	9 30		79'5	E		b ₁ , b ₂ , b ₁ , 5316'8.
	17	9 20		85	W		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8, 6677.
	17	9 0		72'5	W		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , 5316'8, 6677.
	17	10 20	2	7	W	60	6677, 7065, D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316'8, 4924'1, 4922, 5016, 5018'6. The whole prominence was seen in the first nine lines.
	17	10 52		17	W		D ₁ , D ₂ , b ₁ , b ₂ .
	17	10 53		18	W		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	18	9 30	1	15'5	W	60	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	18	9 15		27	W		b ₁ , b ₂ , b ₁ .
	19	8 50		17	W	35	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	19	9 21	3	12'5	W	60	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	20	9 30		Equator.	E	40	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ .
	25	9 58	4	32	W	50	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .
	25	8 46	6	1	W	45	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .
	26	9 50	15	34	W		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ .
	28	12 0		41	E	70	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	30	9 51		10	E	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316'8, 6677.
	30	9 40	7	4'5	E	80	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316'8, 6677.
	30	9 20	4	14	E	85	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .
	30	9 12		43'5	E		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₁ , 5316'8.
	30	8 54		80	W		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316'8.
	30	10 7	3	39	W	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .
	31	9 55	13	14'5	E	120	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .
	31	9 30	1	39	E	50	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .

Date	Hour I.S.T		Base.	Latitude		Limb	Height	Lines
				North	South			
1919.	h	m	°	°	°		"	
February	1	9 44	8	14		E	65	7065, 6677, D ₁ , D ₂ , b ₁ , b ₂ , b ₁ , b ₁ , 5316 8, 5016, 5018 6, 4924 1
	1	9 13	5		17 5	E	90	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	1	9 0	1		42	E	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	4	9 37			20	E		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	4	9 24	2		37	E		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	6	10 0		15		E	25	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 4924 1, 5316 8, 6677, 7065.
	7	10 20	5	15		E	40	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 6677, 7065.
	8	8 32	11	8 5		E	35	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 6677, 7065.
	9	9 37	12	5		E	80	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8.
	10	9 4		16		W	40	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .
	13	10 35		5 5		W	80	4924-1 b ₁ , b ₂ , b ₃ , b ₄ , 5016, 5316 8, 5276 2, D ₁ , D ₂ , 6677, 7065 Whole prominence seen in Na and Mg
	14	8 55		71 5		E		D ₁ , D ₂ , b ₁ , b ₂ , b ₃
	14	9 30	8	15		W	180	7065 6677, D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 5276 2, 5018 6, 5016, 4924 1
	15	8 46	12	13		W	85	4924 1, 5018 6, b ₁ , b ₂ , b ₃ , b ₄ , 5234 8, 5316 8, D ₁ , D ₂ , 6677, 7065
	16	9 45	2	61		E	15	4924-1, b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, D ₁ , D ₂
	16	11 0		16		E	30	4924 1, b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, D ₁ , D ₂
	17	8 56	2		21	W	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	20	10 2	17	38		E	120	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄
	20	9 15			38 5	E		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , 5316 8
	23	9 5	3	43		E	55	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	23	9 40	12	11		W	60	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8.
	24	8 49	2	11		E	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677
	24	8 34	28	7		W	80	4924 1, 4934 2, 5016, 5018 6, b ₁ , b ₂ , b ₃ , b ₄ , 5197 7, 5204 8, 5206 2, 5208 8, 5215 3, 5218 2, 5269 7, 5270 5, 5276 2, 5316 8, 5324 3, 5328 1, 5363 0, 5535 1, D ₁ , D ₂ , 6677, 7065
	25	9 31	15		30	E	120	D ₁ , D ₂ , slightly bright.
	26	9 40		10		E	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677, 7065.
	26	9 46			7	E	35	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	26	8 55			64	W		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 4924 1, 5016, 5316 8.
	27	8 38	3	18 5		E	25	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677, 7065.
March	2	9 22	2		55 5	W	25	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5197 7, 5276 2, 5316 8.
	2	9 28	2		45 5	W	50	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5276 2, 5316 8.
	5	9 30		28 5		W	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8.
	6	9 45	5	5 5		E	60	4924 1, 5018 6, 5316 8, b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂ , 6677, 7065
	7	9 50	3	20 5		E	90	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677, 7065.
	7	10 0		13		E	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677, 7065.
	8	8 36	8		6	W	70	4924 1, 5016 5018 6, b ₁ , b ₂ , b ₃ , b ₄ , 5197 7, 5234 8, 5276 2, 5284 2, 5316 8, 5363 0, 5535 1, D ₁ , D ₂ , 6677, 7065
	9	9 10			20	E	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8.
	10	8 38	20	10 5		E	60	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677, 7065
	10	8 46			20	E	40	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	11	9 0	11	8 5		W	125	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , 5316 8
	13	10 2	5		30	W	40	4924-1, 5016, 5018 6, b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, D ₁ , D ₂ , 6677, 7065.
	13	9 48		19		W	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 4924-1, 5016, 5316 8, 6677
	19	10 11	7	11 5		W	35	4924-1, 5016, 5018 6, b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677
	23	10 15			13	E	75	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 6677, 7065
	23	10 25			30	E	35	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8
	24	8 49		6		E	80	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, 5016, 6677, 7065
	25	9 48	19	4 5		E	95	D ₁ , D ₂ , b ₁ , b ₂ , b ₃
	25	10 0	13		27 5	E	85	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 6677
	26	8 34	2		20	E	10	4924-1, 5016, 5018 6, 5316 8, b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂ , 6677
	26	8 30	4		29	E	60	D ₁ , D ₂ , b ₁ , b ₂
	27	9 55	4	20		E	20	4924-1, 5016, 5018 6, b ₁ , b ₂ , b ₃ , b ₄ , 5316 8, D ₁ , D ₂ , 6677, 7065

Date	Hour		Base.	Latitude.		Lamb.	Height.	Lines.
	I	S T		North.	South.			
March 1919	28	8 37	13	28.5		E	30	D ₁ , D ₂ , b ₁ , b ₂
	29	9 15		32		E	30	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8
	30	9 45	2	9		E	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
	31	8 46		10		E	60	4924.1, 5016, 5018.6, b ₁ , b ₂ , b ₃ , b ₄ , 5197.7, 5234.8, 5276.2, 5316.8, 5363.0, 5535.1, D ₁ , D ₂ , 6677, 7065
April	1	9 16	4		10	W	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃
	3	9 51		17		E	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 6677, 7065
	3	9 25	1		9.5	W	30	6677, 7065, bright over top.
	4	8 28		8		W	25	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
	5	9 50		25		E	50	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 6677, 7065, 4924.1
	14	8 53		10		W	15	4924.1, 5016, 5018.6, b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, D ₁ , D ₂ , 6677, 7065.
	16	8 33	7		26.5	W	40	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 5018.6, 4924.1.
	17	9 5		9.5		W	20	4924.1, 4922.0, 5016, 5018.6, b ₁ , b ₂ , b ₃ , b ₄ , 5197.7, 5204.8, 5206.3, 5208.5, 5226.7, 5234.8, 5266.8, 5270.6, 5316.8, 5328.2, D ₁ , D ₂ , 6677, 7065.
	20	8 21	8		20	E	25	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
	23	8 18		19		E	45	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
	23	8 33	10		7	W	55	4922.0, 4924.1, 4934.2, 5016, 5018.6, b ₁ , b ₂ , b ₃ , b ₄ , 5197.7, 5234.8, 5276.2, 5284.2, 5316.8, 5363.0, 5535.1, D ₁ , D ₂ , 6677, 7065
	24	8 38		[24]			E	90	D_{1}, D_{2}, b_{1}, b_{2}, b_{3}, b_{4}, 5316.8.
	24	8 41	2	[19]		E	25	4924.1, 5016, 5018.6, b ₁ , b ₂ , b ₃ , b ₄ , 5197.7, 5204.8, 5206.3, 5208.5, 5222.1, 5234.8, 5269.8, 5276.2, 5284.2, 5316.8, 5328.1, 5363.0, 5371.6, 5397.3, 5404.4, 5405.9, 5424.3, 5429.9, 5447.1, 5535.1, D ₁ , D ₂ , 6677, 7065.
	28	9 45		10			E	30	D_{1}, D_{2}, b_{1}, b_{2}, b_{3}, b_{4}, 5316.8.
	29	9 26	15			W	60	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 6677.
May	1	9 15		2	15		E	25	D_{1}, D_{2}, b_{1}, b_{2}, b_{3}, b_{4}, 5316.8.
	3	10 20	16			E	15±	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
	8	9 14	2		17	W	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8
	12	7 56		20		E	10	7065, 6677, D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 4924.1.
	14	9 0	2		21	E	30	7065, D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 4924.1
	15	9 52		3		E	25	7065, 6677, D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 4924.1.
	15	9 30	7	17.5		W	30	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
	16	11 0		12	26		W	20	D_{1}, D_{2}, b_{1}, b_{2}, b_{3}, b_{4}.
21	9 8	8	19		E	45	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ .	
28	8 50		35	4.5		E	50	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
28	8 56	16			W		D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.	
June	1	8 33	5		18	E	25	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8.
	8	8 51		13		E	10	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 6677.
	8	8 58	11	7.5		W	25	4924.1, 5016, b ₁ , b ₂ , b ₃ , b ₄ , 5197.7, 5234.8, 5276.2, 5284.2, 5316.8, D ₁ , D ₂ , 6677.
	23	9 33		26.5		W	20	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8, 5016, 6677, 7065
	23	9 34	4		15	W	15	D ₁ , D ₂ , b ₁ , b ₂ , b ₃ , b ₄ , 5316.8

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

	1° to 30°.	31° to 60°	61° to 90°	Mean latitude.	Extreme latitudes.
North	58	3	2	16.6	1, 71.5
South	40	11	6	27.6	1, 85
Equator	1	...	.	.	.

Sixty-nine were in the eastern limb or 57 per cent of the whole.

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 L S T		Latitude		Limb.	Displacement			Remarks
			North	South		Red	Violet.	Both ways	
1919	h	m	°	'		A	A	A	
January 2	9	34	2		E		Slight		At top
2	9	38	22.5		W	Slight			Do
3	8	36		3	E		0.5		At base.
3	8	36		12	E	1			At top
3	8	22	66		W		1.5		
4	8	42	66		E	Slight			
4	8	35	24		E		Slight		
4	8	31		15	E	1			No prominence
4	8	48		15	W		0.5		
6	8	43		11.5	W	0.5			At top
9	10	15	67		E		0.5		At base.
9	11	31		35	E		Slight		
9	11	0	27.5		W	Slight			At top
10	9	28		39	W	2			
10	9	22		32	W	Slight			
11	10	24	6		E	Do	3		
11	11	6		47	E		2		
11	10	15		78	W	Slight	3		To red at base, to violet at top.
11	9	58	4		W	Slight	Slight		
11	9	45	64.5		W	0.5			No prominence.
12	9	54	74.5		E		Slight		
12	10	55	13		E	2			At base
13	8	25		24	E		Slight		No prominence
13	8	20		78	E	Slight			
13	8	35		37	W		Slight		
14	8	33	81		E		Do.		
14	9	1		33	E	0.5			
15	10	37		9.5	E		2		
15	10	14		64	W		1		
15	11	12		36.5	W	1			
15	11	15		16.5	W	3			
15	11	22		5.5	W	1			
15	11	27	10		W	1			
16	11	10	84		E		Slight		
16	11	13	74.5		E	Slight			
16	11	15	64.5		E	Do			
16	11	17	55.5		E	Do	Slight		
16	11	34	4		E	Do			
16	11	40	1.5		E		1		
16	11	40		2	E	1			
16	12	0		55.5	E	Slight	Slight		
16	8	18		57	W	Do			
16	9	53	10		W	1	0.5		
17	10	2		32	E	Slight			
17	9	27		42	E			Slight	
17	9	47		58.5	E		Slight		
17	9	20		85	W			Slight	
17	9	0		72.5	W		1		
17	10	56	4		W	Slight			At top
17	10	5	7		W	3	2		At 10 ^h 20 ^m C was displaced 4 A to red and 2 A to violet, and D ₃ was displaced 4 A to red but only 1 A to violet
17	11	56	45		W		Slight		
18	10	34		34	E		1		
18	9	55		44	W	Slight			
18	9	45		22	W	Do			
18	9	30	15.5		W			Slight	
18	9	15	27		W	2			
19	8	48		25	W	Slight			
20	9	30	Equator		E		2		

Date	Hour LST		Latitude		Lmb	Displacements			Remarks
			North	South		Red	Violet	Both ways	
1919	H	M	°	°		A	A	A	
January	20	9 42		9 5	E		1		
	20	9 42		13	E			1	
	21	10 33		11 5	E	Slight	Slight		To red at base , to violet at top.
	21	10 45		30 5	E	Do			
	21	10 11		85	W	Do.			At base
	21	10 3		34	W	Do			
	21	9 45	39		W		Slight		
	21	9 40	47		W	Slight			
	21	9 19	78		W		Slight		
	23	9 18	84		E	2			
	23	9 13	80		E	Slight	1 5		To red at top , to violet at base
	23	9 50		29	W		Slight		
	23	9 38		5	W	1 5			At top.
	23	9 32	16		W	Slight			Do
	23	9 21	44 5		W	1			
	24	10 39	81		E	Slight			
	24	10 13		14	E		Slight		
	24	9 58		73	E	Slight			
	24	9 58		75	E	Do			
	24	9 53		76 5	W	Do			
	24	11 4		21 5	W		1		
	24	10 55		17	W	3	1		To red at top , to violet at base.
	25	10 5	12		E	Slight			
	25	9 48		13	W	Do			
	25	9 34	11		W	0 5			
	25	9 22	2		W	1			
	25	9 13	46 5		W	1 5			
	25	9 4	71		W		2		
	25	9 57	77 5		W	2			
	26	10 5	81		E	Slight			
	26	8 54	71 5		E		Slight		
	26	9 39		11	W	Do			
	26	9 10	25		W	1			
	26	9 5	42		W	Slight			At top
	26	9 5	35 5		W	1			Do.
	27	8 36		80 5	W		Slight		At top ; not seen at 8 ^h 45 ^m .
	28	12 0		41	E		Do.		
	28	11 18	33		W	1			
	28	10 58	77		W	Slight			
	30	9 10		4 5	E	2			At top
	30	9 1		83 5	E		Slight		
	30	8 54		80	W	Slight	1 5		To red at base , to violet at top.
	30	8 52		73	W		Slight		
	30	11 26	5		W	2			
	31	9 4	10 5		E	2			
February	1	8 50		76 5	E	Slight			
	1	10 45	5		W		Slight		
	3	8 54	69		E		1 5		Slight over lower part and 1 5 at top.
	3	9 15	79 5		W	3			Whole prominence displaced.
	4	9 40		11	E	1 5			
	4	10 35		36	W		Slight		
	5	9 14	83 5		Axis				
	5	9 11	52 5		E		0 5		
	5	9 34		21	E	4			
	5	9 45		59 5	W	Slight			
	5	9 26		24	W	0 5			
	5	9 21	8		W	0 5			
	5	9 21	7		W		Slight		
	5	9 17	50		W	0 5			
	5	9 15	75 5		W	Slight			
	6	9 11	68		E	Do.			
	6	10 0	15		E	1 5			
	6	9 34		46 5	W	Slight			
	6	9 30	26		W	Do			At top.
	6	9 18	81		W	Do.			
	7	10 0	9		E	Do.			
	7	10 37		57 5	W	1 5			

Date.	Hour I.S.T.		Latitude		Limb	Displacements			Remarks.
			North.	South.		Red	Violet.	Born ways	
1919. February	7	9 35	16 5		W	A 1 5	A Slight	A	To red at top, to violet at base
	7	9 16	69		W	Slight			
	8	8 32	8 5		E	Do.			
	8	11 32	12		W		Slight		
	9	9 37	5		E	1	2		To red at base, to violet at top
	9	9 8		35	E	1			
	9	8 56		80 5	E	Slight			
	9	8 53		74 5	W		Slight		
	9	8 51		69 5	W		Do.		
	9	10 10	44 5		W		1		
	9	10 13	79 5		W		Slight		
	10	9 16		10	E	2			No prominence.
	10	9 20		61 5	W	Slight			
	10	9 4	16		W		Slight		
	11	9 0		45 5	W	0 5			
	13	9 38		20	E	1			
	13	9 22		77 5	W		1		
	13	10 35	16		W		0 5		
	13	10 44	38 5		W	1			
	14	8 48	69		E	Slight			
	14	10 27		76	W		Slight		
	14	9 3	2		W		Do.		
	14	9 3	6		W	Slight			
	14	9 55	15		W	3			
	15	8 42		3	W		Slight		At base.
	15	8 46	19		W		1		
	16	9 35	61		E		Slight		
	16	10 18	44 5		E	Slight			
	16	10 20	34 5		E		1		
	16	10 28	20		E	1			
	16	10 50		8 5	E	1			
	16	10 55		30	E	2			
	17	8 42		36 5	E	Slight			
	17	8 40		58 5	E	Do.			
	17	8 38		80	E		Slight		
	17	8 43		81 5	E	Slight			
	17	8 58	8 5		W		2		No prominence
	18	9 28		58 5	E		Slight		
	18	9 20	25		W	Slight			
	19	9 5	35 5		E	2			
	19	9 13	63		W	Slight			
	19	9 10	82 5		W		Slight		
	20	10 2	38		E	2			
	20	9 15		38 5	E	Slight	1		To red at top, to violet at base. Not seen at 9 ^h 25 ^m .
	20	8 53		59 5	W	1			
	20	9 55		54 5	W		Slight		
	20	9 40	10		W		2		
	21	9 38	69		W	Slight			
	23	9 20	76		E		Slight		
	23	9 17	72 5		E		Do.		
	23	8 56	62		E		Do.		
	23	9 40	17		W	1 5	1		To red at top; to violet at base. Displacements 2 A to violet and slightly to red at 8 ^h 50 ^m .
	24	8 49	11		E			Slight	
	25	8 54	66		E		Slight		
	25	8 54	65		E	Slight			
	25	8 52	41 5		E	0 5	Slight		To red at top, to violet at base.
	25	9 8	12		E	2			
	25	9 9		2	E		Slight		
	25	9 31		30	E	1			At top
	26	9 40	10		E	Slight			To red at base, to violet at top.
	26	9 12		32	E	Do.			At base.
	26	9 10		35	E		Slight		
	26	9 0		81	E		Do.		
	26	8 50		64	W	1 5	1		To red at base; to violet at top.
	26	10 10	40 5		W		Slight		
	26	10 11	80		W				
	27	8 43	52 5		E	Slight	Slight		

Date	Hour		Latitude		Lamb	Displacements			Remarks
	IS	T	North	South		Red	Violet.	Both ways.	
1919.						A	A	A	
February	27	8 50	47.5		E	Slight			
	27	8 48	37.5		E		1		
	27	9 38	18.5		E	Slight	2		To red at base, to violet at top. The displacement was 2 A to red and 5 A to violet at 9 ^h 44 ^m .
	27	9 27		39	W	Slight			At top.
	27	9 18	35.5		W	Do.			
	27	9 9	49.5		W	3	2		To red at base, to violet at top.
	28	8 38		44.5	W		0.5		
	28	8 44	41.5		W		Slight		
March	1	8 47		6	E	Slight			No prominence.
	1	8 51		53.5	E	Do.			Do.
	1	8 42		48.5	W		Slight		
	1	8 34	54.5		W		1		
	2	10 7		9	E	Slight			
	2	10 0		38.5	E	Do.			
	2	9 45		65	E	Do.			
	2	9 40		82.5	W	Do.			
	2	9 5		65	W		Slight		
	2	9 22		55.5	W		2		At top.
	2	9 28		45.5	W	Slight			At base.
	3	8 25	81		E	Do.			
	3	8 39	37		E	Do.			At base.
	4	9 8	70.5		E	1			
	4	9 6	60		E	Slight			
	4	9 27	13.5		E		0.5		Not seen at 9 ^h 28 ^m .
	4	9 40		24	E	0.5	1		Extends from -22° to -26°.
	4	9 46		77	E	1			
	4	9 23		51.5	W	0.5			
	4	9 12	70.5		W	1			
	4	9 12	74.5		W	0.5			
	5	11 3		21	E	2			
	5	11 3		23	E	1.5			
	5	9 21		64	E	Slight			
	5	9 18		81.5	E	1			
	5	9 15		83	E		Slight		
	5	8 55		38.5	W	1			At top.
	5	11 15		16.5	W		Slight		
	5	9 30	28.5		W	1	2		To red at top; to violet at base.
	5	11 38	57.5		W	1			
	6	8 50	67		E		Slight		
	6	8 56	47.5		E	Slight			
	6	9 31	38.5		E	2	1		To violet at base; to red at top.
	6	9 33	19		E	Slight			
	6	9 45	5.5		E	1	Slight		To red at top; to violet at base.
	6	9 23		60	W		Do.		
	6	9 16	8.5		W	1			At top.
	6	9 10	30		W	0.5			
	6	9 6	58.5		W		0.5		
	6	9 4	73.5		W		Slight		
	6	9 2	82		W		Do.		
	7	9 50	19		E	1			
	7	10 0	13		E	1.5			
	7	9 30		31	E	Slight			At base.
	7	9 24		37.5	E	1.5			
	7	9 15		75.5	E				
	7	8 58		72.5	W		Slight		
	7	8 52		55	W	Slight			
	7	10 10		5	W	2			
	7	10 20	70		W		Slight		
	8	8 45	39		E	Slight			
	8	8 36		6	W			Slight	
	9	9 25	16		E	Slight			
	9	9 25	11		E	1			
	9	9 10		20	E		1		
	9	9 4		44.5	E	Slight			
	9	9 0		61	E	Do.			
	9	8 44		67	W		Slight		

Date.	Hour L.S.T		Latitude		Lamb	Displacements.			Remarks
			North	South		Red	Violet	Both ways	
1919	h.	m.	°	°		A	A	A	
March	9	8 42		63	W		Slight		
	9	9 50		31.5	W	2			
	9	10 8	6		W	2	3		
	9	10 11	62		W		Slight		
	10	8 37	18		E	Slight			
	10	8 38	10.5		E	4	0.5		To red at top, to violet at base
	10	8 46		20	E			Slight	
	10	8 31		30	W	Slight			At top
	10	8 29		10	W	Do			Do.
	11	8 42	50.5		E	1			
	11	8 42	47.5		E		Slight		
	11	9 24	18		E	0.5	Do.		
	11	8 19	3		E			0.5	
	11	9 17		23	W			0.5	
	11	9 17		27	W		1		
	11	9 17		32	W	1			
	11	9 0	10		W		1		
	11	9 0	2		W	1			
	12	10 0	70		E	Slight			
	12	10 35		81	E	Do			
	12	10 37		70	W	Do			
	12	9 4		43.5	W		Slight		
	12	9 7		34.5	W	2	1		
	12	11 0		10	W	Slight			
	13	9 6	77		E	1			
	13	8 52	65		E		Slight		
	13	8 54	59.5		E	1			
	13	9 0	43.5		E	1	Slight		
	13	10 33		54	W	1			
	13	10 2		20	W	1	1.5		To red at top, to violet at base.
	13	9 14	73.5		W	1			
	14	9 40	73.5		E	Slight			
	14	9 20		13	E	1.5			
	14	9 12		45	E		Slight		
	14	9 4		82.5	W		Do		
	14	8 56		59.5	W		2		
	14	9 45		33.5	W	Slight			
	15	8 39	78		E		1		No prominence.
	16	9 12		81	W	1.5			No prominence.
	16	9 8		66.5	W	Slight			
	16	9 0		60	W	Do			
	16	10 10	11.5		W		Slight		
	16	10 15	36.5		W	2			
	16	10 17	64		W		Slight		
	18	9 10	68		E		Do		
	18	8 50	59.5		E		Do.		
	18	8 56	54.5		E	Slight			
	18	9 3	44		E	Do	1		To red at top, to violet at base
	18	9 13	83		W	1			
	19	10 11	14		W			1.5	
	19	10 6	69		W		1		
	21	9 8	11.5		E		1		
	21	9 7	5		E		2		
	21	9 3		45	E		Slight		No prominence
	21	9 18	44.5		W	4			Only 1.5 A at 9h 32m
	22	8 48	81		E		Slight		
	22	{ 9 10 } { 9 35 }		18	E	3	6		Eruptive (C was displaced at many places the maximum amount being 3 A to red and 4 A to violet near base and 2 A to red and 2 A to violet over top at 9h 10m. The maximum amount near base was 6 A to violet at 9h 25m. At 9h 35m the displacements were 3 A to red and 3 A to violet near base and 3 A to red and 4 A to violet near top)
	22	8 55	12		W		Slight		
	23	9 7	82		E	Slight			

Date	Hour L.S.T		Latitude		Lamb	Displacement			Remarks
			North	South		Red.	Violet	Both ways	
1919	h	m	°	'		A	A	A	
March	23	9 2	69		E		Slight		
	23	8 52	57.5		E		1		
	23	9 50	19.5		E	1			
	23	10 0	Equator		E	1.5			At base
	23	10 15		13	E	2	1.5		To red at base, to violet at top
	23	10 25		23	E	2			At base
	23	10 10		25	E	3			Do.
	23	9 24		27.5	W		1		
	23	9 22		17	W		0.5		
	23	9 20		11	W		0.5		At base
	23	9 15	7		W	Slight			
	21	8 49	1.5		E	Do			
	24	8 44		69	E	Do			
	24	8 33		57.5	W	6	2		To red at top, to violet at base D _s displaced only 4 A to red and 2 A to violet.
	25	8 50	43.5		E		1		
	25	9 40	4.5		E	Slight			
	25	9 2	40.5		W		Slight		
	26	8 34		20	E	Slight			
	26	8 25		38.5	W		Slight		
	27	9 13	65		E		Do.		
	27	9 5	51.5		E		Do.		
	27	9 55	17		E		1		At top
	27	10 2		49.5	E	Slight			
	28	8 30		22	W			Slight	
	28	8 47	6		W			Do.	
	29	8 50	63		E		Slight		
	29	8 52	54.5		E	Slight			
	29	8 56	49		E	0.5	1		To red at top, to violet at base
	30	9 10	16		E		5		
	30	9 30	14		E		2		
	30	9 15	9		E	1			
	30	8 51		62	W	Slight			
	30	8 55		47.5	W		1		
	30	8 58		42.5	W	Slight			
	30	9 2		31.5	W		1.5		
	31	8 52	80		E		0.5		No prominence.
	31	8 46	8		E	Slight			
April	1	9 5	70		E		Slight		
	1	8 55	44		E		2		At base.
	1	8 55	41		E	1.5			At top.
	1	9 25		31	E		1.5		
	1	9 16		10	W		0.5		
	3	9 3	73		E	Slight			
	3	9 45	22		E		Slight		
	3	9 25		11	W	Slight	1		To red at top; to violet at base.
	3	9 12	19		W	Do			No prominence
	3	9 8	79		W		Slight		
	4	8 18		62.5	E	1			
	4	8 27		12	W		1		Over lower half of prominence.
	5	9 2	83		E		Slight		
	5	9 6	29		W		Do.		
	6	8 52		10	E	Slight			
	6	8 45	7		W		1		
	6	8 38	83		W	Slight			
	7	10 15	24.5		E	0.5	1		To red at base; to violet at top.
	7	10 10		76	E		Slight		
	8	9 28	77		E			0.5	
	8	9 39	52.5		E		0.5		
	9	8 27		64.5	E		Slight		At top
	9	8 35		42.5	W		Do		No prominence
	10	8 35		34	W			Slight	
	12	9 5		2.5	W		Slight		
	14	9 12		76	W	Slight			No prominence.
	14	8 54	3		W		Slight		

Date	Hour L S T		Latitude		Lamb	Displacements			Remarks.
			North.	South		Red	Violet	Both ways	
1919		H	M	'	°	A	A	A	
April	14	8	52	16					At top
	16	8	35	11		Slight	Slight		
	17	8	38	21			1		
	17	9	5		10	2		3	In different places.
	18	9	20		83.5			0.5	
	20	8	21		20	Slight			
	22	8	31	3		Do			At top.
	22	8	25	1				Slight	
	23	8	33	4		0.5		1.5	
	24	8	38	14				0.5	
	24	8	41		12				1
	24	8	29		3			Slight	
	28	9	13	76.5				Do	
	28	9	26	42		Slight			No prominence
28	9	52		69.5	Do				
29	9	26	6.5				1		
30	9	7	16.5		Slight				
May	1	9	18	44		Slight			
	1	8	4	16		Do			
	1	9	0		1.5				
	1	8	41		67			Slight	
	2	8	25	55				Do	
	2	9	24		65.5			1	
	2	8	40	4.5		3		1	To violet at base ; to red at top.
	2	8	35	45		Slight			At base.
	2	7	56	66.5				Slight	
	3	9	49		11			1	
	5	8	55	65.5				Slight	
	6	9	40	20				Do.	
	8	8	52	64				1	At base.
	8	9	0	45		1			Do
	9	9	57	83				Slight	
	9	9	10	67				Do.	
	9	9	20		36				At base
	10	9	8		26			3	
	11	11	12		37			2	
	11	9	35	14.5		Slight			
	12	9	32	11				1	To red at base , to violet at top.
	12	9	23		46			1	Do.
	12	9	22		70	Slight			
	12	9	20		77.5			Slight	
	13	9	42	2		Slight		2	No prominence.
	14	9	12	19				1.5	To red at base , to violet at top.
	14	9	5		2				At top
	14	8	51		27			Slight	At base
	14	8	42	60		Slight			
	14	8	44	46		Do.			
	14	9	27	66				Slight	
15	9	50		3			4	To red at base ; to violet at top.	
15	9	5	31		Slight				
15	8	58	75				Slight	No prominence.	
16	9	12	3.5				1.5		
18	8	58	73				Slight	No prominence	
18	8	44	27.5				2	To red at top , to violet at base.	
21	9	6		17			Slight		
21	9	12		38			Do.	To red at base , to violet at top.	
22	8	42	71				Do		
22	8	51	24.5		Slight				
24	9	7		70			Slight		
27	10	28		85			1		
27	10	12	1		Slight				
27	10	9	31.5					At top	
28	8	52	64				0.5		
29	9	21		84					
30	7	44	73				Slight		
30	8	53		18			2	To red at base , to violet at top.	
31	9	45		7					

Date	Hour I S T	Latitude.		Limb.	Displacements.			Remarks	
		North.	South		Red.	Violet.	Both ways.		
May 1919	31	11 M	0	0	E	A	A	A	At top
	31	9 36		20	E	Slight			
	31	9 34		25	W		Slight		
	31	9 22		42	W	Slight			
	31	9 57		28	W	2			
June	6	10 48		12	W	Slight			At top. At south end. No prominence. No prominence
	8	8 58	7		W	Do			
	9	8 49	14		E	2			
	9	8 46	7		W	Slight			
	13	8 33		19	E	Do			
	14	9 25		6.5	W	Do			
	15	9 42		15	W		3		
	15	9 38	64		W		Slight		
	16	8 38		15	W		Do.		
	17	9 17	21		W		Do		
	18	9 7		70	E	1			
	22	10 45	56		E	Slight			
	22	10 53	12.5		W		Slight		
	23	9 26		64	E	Slight			
	24	10 4	83.5		W	Do			
	28	9 43	14		W	Do			
29	9 54		21.5	E		Slight			
29	9 52		86	W	Slight				
29	8 29		2.5	W			Slight		
30	8 27		64	E		Slight			
30	8 27	61		W		Do.			

The total number of displacements was 473, of which 2 were on the equator, and the rest were distributed as follows:—

Latitude	North.	South.
1° to 30°	110	87
31° to 60°	60	71
61° to 90°	83	60
	Total	253
East limb	238	
West limb	231	
Pole	1	

There were 276 displacements towards red and 227 towards violet. These include 49 occasions in which the displacement was to red and to violet in different parts of the same prominence. 19 of the displacements were both ways simultaneously.

Reversals and displacements on the disc.

185 bright reversals of the H α line, 43 dark reversals of the D $_3$ line and 96 displacements of the H α line were recorded. They were distributed as follows:—

	North.	South.	East.	West
Bright reversals of H α	110	75	102	83
Dark reversals of D $_3$	22	21	28	15
Displacements of H α	57	39	41	55

All these figures are in excess as compared with the previous half year. 71 of the displacements were towards red, 19 towards violet and 6 both ways simultaneously.

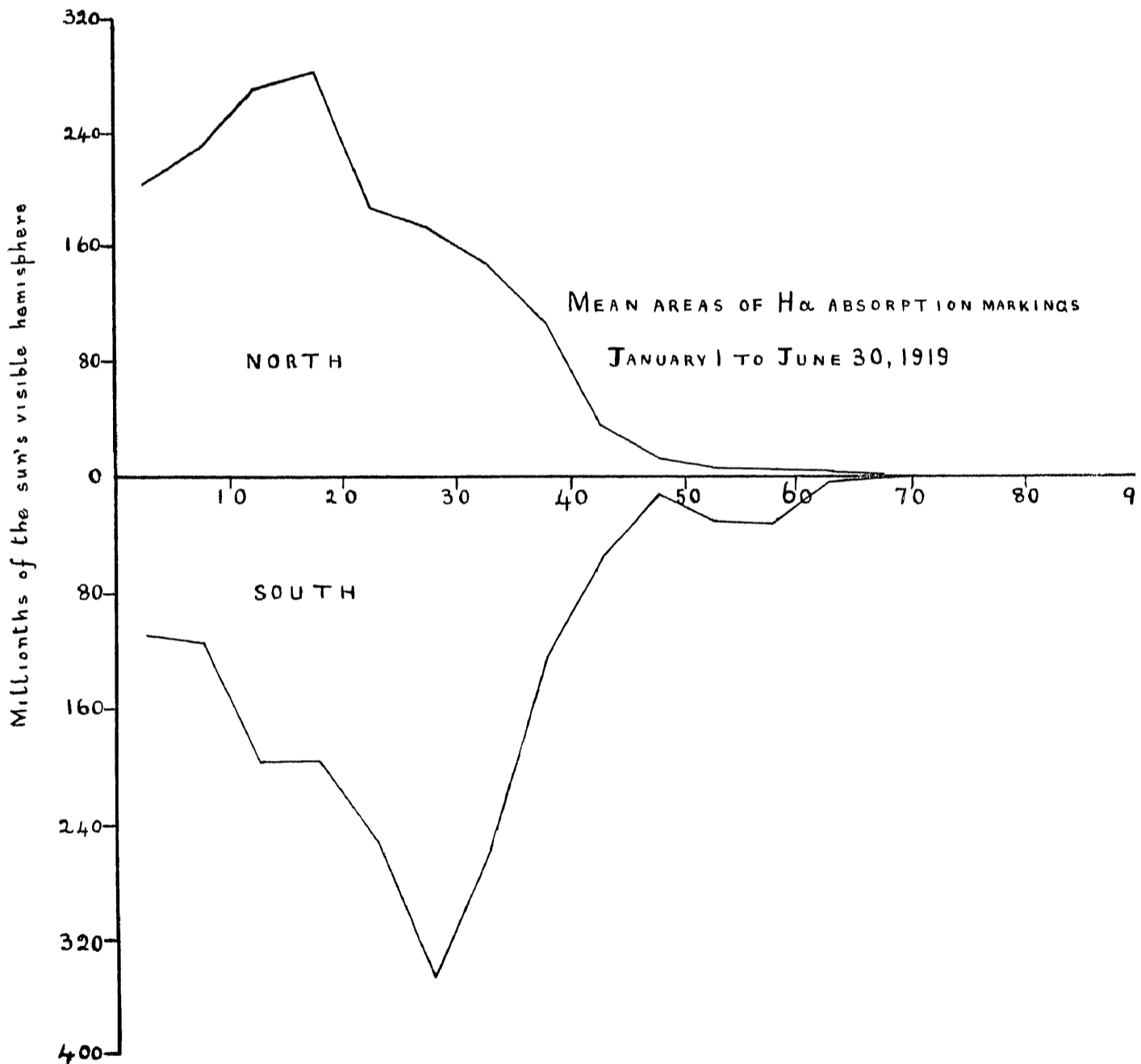
Prominences projected on the disc as absorption markings.

Photographs of the sun's disc in H α light were obtained on 141 days counted as 132 effective days. 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	1668	10'0
South	1734	10'8
Total ..	3402	20'8

Both areas and numbers show an increase in the northern hemisphere, and a decrease in the south compared with 1918, as is shown also by the prominences at the limb. The total areas are slightly greater and numbers slightly less than were obtained for the previous half year ; this also is in agreement with the results for prominences at the limb.

The distribution of the absorption markings in latitude is shown in the accompanying diagram.



As in the case of prominences at the limb, the region of maximum activity shows a tendency to move towards the equator, more rapidly in the northern hemisphere than in the southern.

For the first time since 1916 the percentage of areas in the eastern hemisphere (49.25 per cent) is less than in the western. In the case of numbers the eastern percentage is 50.29.

KODAIKANAL OBSERVATORY,
12th August 1919.

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Director, Kodaikanal and Madras Observatories.