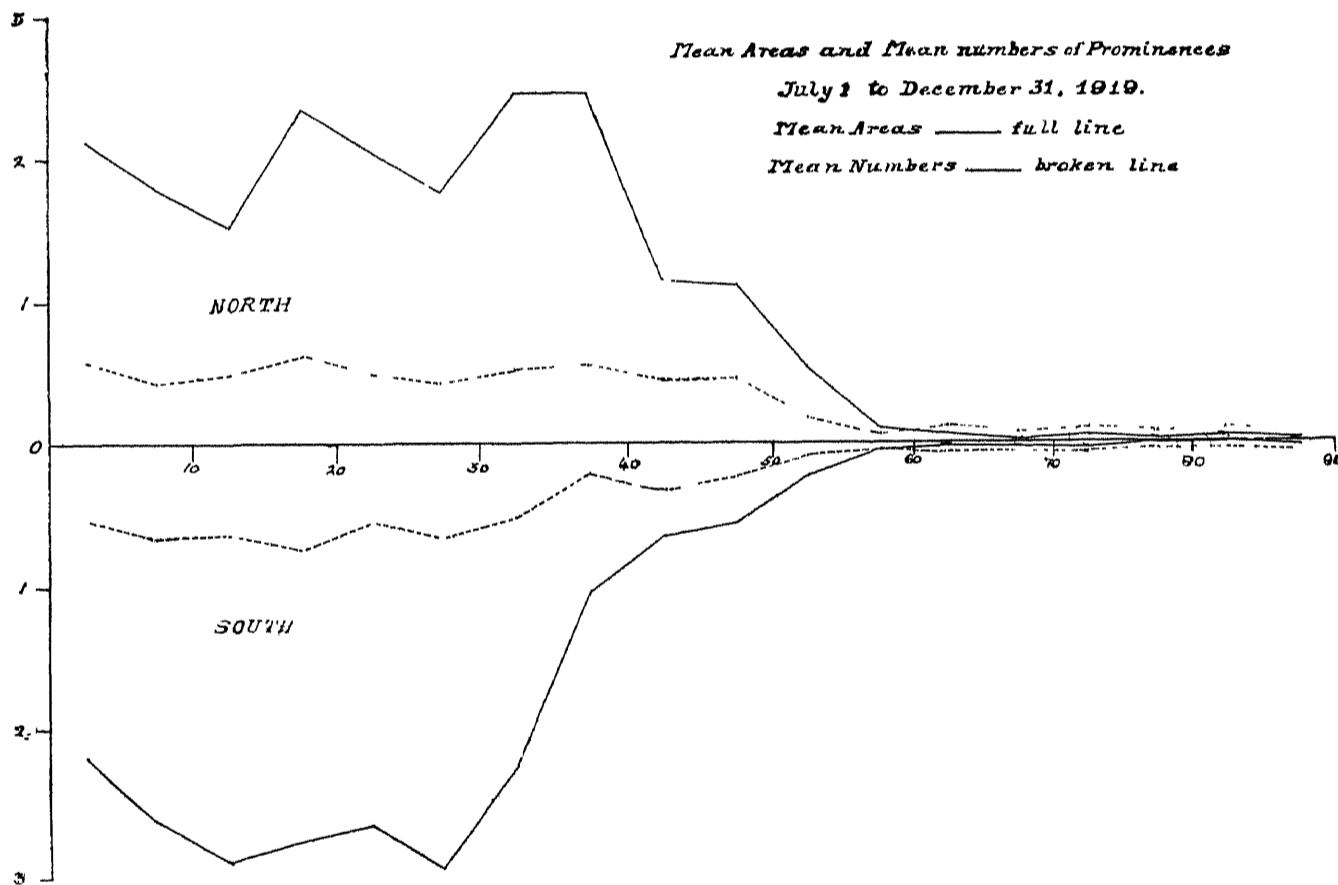


Kodaikanal Observatory.

BULLETIN No. LXII.

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

The distribution of prominences observed and photographed during the half-year ending December 31st, 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 144 days being reduced to 115 effective days.



The distribution indicates, as compared with the previous half-year, a considerable increase of activity in the southern equatorial region. In the north, three zones of activity have developed with maxima as shown in the diagram.

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

		Mean daily areas (square minutes)	Mean daily numbers
North	1'96	5'78
South	2'09	5'54
Total	.	4'05	11'32

Areas show an increase of about 20 per cent over the previous half-year. This increase is somewhat greater for the northern hemisphere than for the southern. For numbers there is a general decrease amounting to 17 per cent. The excess of areas in the southern hemisphere is still maintained but numbers show a slight northern preponderance. The southern prominences were 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 SECOND HALF OF 1919.

Month	Number of days (effective)	Areas.	Numbers.	Daily Means		Mean height.	Mean extent
				Areas	Numbers.		
July	15	56.4	163	3.76	10.9	31.4	3.02
August	22	79.8	185	3.63	8.4	37.6	3.85
September	15	57.3	169	3.82	11.2	32.9	3.63
October	22	99.1	289	4.51	13.1	34.0	3.26
November	17	70.8	213	4.15	12.5	34.0	2.96
December	24	102.5	283	4.27	11.8	36.1	3.15
Third quarter	52	193.5	577	3.72	9.9	34.0	3.50
Fourth quarter	63	272.4	785	4.32	12.5	34.7	3.14
Second half-year	115	465.9	1302	4.05	11.3	34.4	3.28

Although the mean numbers have diminished, the mean height and extent have increased resulting in an increase of the mean area.

Distribution east and west of the sun's axis.

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

1919 July to December	East.	West.	Percentage east.
Total number observed	596	706	45.77
Total areas in square minutes	221.9	244.0	47.63

The eastern prominences were on the average slightly brighter than the western.

Metallic Prominences.

The following metallic prominences were observed in the half-year —

TABLE II.—LIST OF METALLIC PROMINENCES OBSERVED AT KODAIKANAL, JULY TO DECEMBER 1919.

Date	Hour I S T	Base	Latitude		Limb.	Height	Lines.
			North.	South			
1919.	h m.	°	°	°		"	
July	4			4	W	75	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677
	8			9	W	25	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065
August	4	1		6·5	E	30	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677
	13	6	6		E	90	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677
September	12			15	E	50	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
	12			3	W	25	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
	22	12		15	E	45	4924·1, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, 5535·1, D ₁ , D ₂ , 6677, 7065
October	5	8		11	W	40	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677
	6	9		14	W	160	5016, 5018·6, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065
	7	9			E	110	4924·1, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065
	8	9		13	W	10	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065
	10	8	2	30	E	35	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
	10	8	2	15	W	20	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂
	12	9	3	31·5	W	30	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
	21	8	7	16·5	W	15	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
	27	8		10	W	15	5016, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.
	November	7	10		20	W	35
15		8	14	25	E	75	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂ bright over whole height.
17		8	10	22	E	75	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂
18		8	4	22	E	130	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
19		8		26	E	60	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
20		8	5	47·5	E	15	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
21		9	1	5·5	W	40	4924·1, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
22	8	2	19	E	100	4924·1, 5016, b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ , 6677, 7065.	
December	10			16	E	50	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂
	11			23	E	45	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
	11		3	19	W	25	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂
	13		10	8	E	40	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂
	13		1	23·5	E	35	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂
	13			23	W	15	b ₁ , b ₂ , b ₃ , b ₄ , 5316·8, D ₁ , D ₂ bright over whole height
	14			15	E	40	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂
21		12		W	60	b ₁ , b ₂ , b ₃ , b ₄ , D ₁ , D ₂	

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

	Numbers.	Mean latitude.	Extreme latitudes.
North	8	16°·9	6° and 31°·5
South	24	17°·0	3° and 47°·5
Total	32		

17 were observed on the east limb and 15 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.

Date	Time I.S.T.		Latitude		Limb	Displacement			Remarks
			North	South		Red.	Violet	Both ways	
1919. July	3	8 42	°	46	W	A	A	A	No prominence. In two or three places At top in different places
	3	8 40		7	W		2		
	3	8 38	28.5		W	Slight	1		
	4	8 29		6	W			Slight	
	6	11 5		14	W	1			
	8	9 8	71.5		E	2			
	8	9 45		7.5	E		1		
	8	9 14	55		W	Slight			
	12	9 2		77.5	E		Slight		
	15	9 25	85		W		0.5		
	16	9 46		10	E	3			
	16	9 26	39		W		Slight		
	16	9 23	68.5		W	Slight			
	16	9 20	72.5		W		Slight		
	19	9 15		2.5	W	2			
	20	8 55		9	W	1.5			
21	9 27		6	W	3	2			
23	8 50	18		W		Slight			
24	10 50		8.5	W	1				
August	4	8 37		6.5	E		0.5		
	4	8 35		16.5	E			Slight	
	7	9 40		14	E	1.5			
	7	9 20		18	W			Slight	
	11	9 30	5		E	Slight			
	11	9 35		13.5	E			Slight	
	11	9 14	32.5		W	Slight			
	12	9 25		10	E		2		
	13	8 55	6		E		Slight		
	13	8 41	38.5		W		Do.		
	14	9 50	9.5		E	2	Do.		
	15	8 45		13	E		1		
	15	8 32	60.5		W		0.5		
	16	9 5		4.5	W	Slight			
17	9 58		4	W		Slight			
21	8 50		16.5	E		Do.			
23	9 0	15		W	1.5				
23	8 56	25.5		W	1				
24	11 25		5	W	2	4			
27	8 54	83		E	Slight				
27	9 6		15	W		1			
29	8 36	28		W	Slight				
September	4	8 36	82.5		E	Do.			
	4	8 42	71.5		W		1		
	8	8 26	71.5		E	1			
	9	8 51	19		E	Slight			
	9	8 42		14	E	Do.			
	10	8 45	2		W		2		
	10	8 48	14.5		W		1		
	10	8 35	66		W	Slight			
	11	9 40		8	W	1			
	11	9 38		2	W		Slight		
	11	8 56	60		W		Do.		
	12	10 16		4.5	E	0.5			
	12	10 3		8.5	W	0.5			
	14	9 12	22		E	1			
14	8 52	72.5		W		Slight			

Date	Hour L S T		Latitude		Limb.	Displacement			Remarks.
			North	South		Red.	Violet	Both ways.	
1919.	h	m	°	'		A	A	A	
September	15	8 51	16.5		E	Slight			
	15	8 44		11	W	Do.			At top
	19	9 38	12		E	1			
	19	9 30		13	W		1		
	21	8 40	2		W		0.5		At south end.
October	2	8 56	35.5		W		1		
	2	8 52	82.5		W		Slight		
	4	11 50		69	E		Do.		
	5	8 26	21		W		Do.		
	6	11 10		14	W	5	6		To red at top, to violet at base.
	6	8 55	14		W	2.5			
	6	8 45	42.5		W	Slight			
	6	8 31	59.5		W		Slight		
	7	9 30	14		E		1		At base.
	7	9 36		10	E	0.5	Slight		To red at top, to violet at base
	7	9 8		18.5	W		Do.		At base
	7	9 0	35		W		Do.		Do.
	8	9 22		76.5	W		Do.		
	8	9 16		13.5	W	4			
	8	9 16		7.5	W	2.5	2		To red at top over .3° and to violet at base.
	9	8 50	20.5		W	Slight			
	10	8 35	30.5		E		Slight		
	10	8 37	6		E		Do.		
	11	8 28		61.5	E	Slight			
	12	9 20	31.5		W	1			
	13	8 34	45.5		W	2			At top.
	15	9 15		44.5	E		Slight		
	15	8 52	75.5		W	Slight			
	21	8 45	16.5		W	2	1.5		To red at top; to violet at base.
	24	8 59		22	E	Slight			
	26	8 50	82		W	1			
	27	8 31	39		E		3		
	27	8 23		12.5	E	Slight			
	27	8 45	10		W		2		
November	7	10 0		20	W	0.5			
	7	9 58	9		W		0.5		
	9	9 4	24		W		1		At base.
	11	8 30	65		W		Slight		
	11	8 28	72.5		W		Do.		At base.
	15	8 11		86.5	W	Slight			
	15	8 28		7	W	Do.			At top
	17	8 32		73.5	E	1.5			
	20	8 35		65	W	Slight			
	21	9 48		5.5	W	2			
	22	8 14		85.5	W		1.5		
	25	8 40	80		E	1.5			
	26	8 35		3	W	0.5			
	26	8 34	1		W	0.5			
	27	8 54	39		E		1		
	27	8 43	17		W		Slight		
December	1	10 35		17	W		Do.		
	4	9 2	15		W	1.5			At base.
	4	8 52	81		W		Slight		
	7	8 35	70		W	3			At top.
	9	9 3	8		E		0.5		Do.
	10	8 48		16	W		Slight		At base.
	10	8 48		11	W	Slight			
	11	8 30	42		W		Slight		At base.
	12	8 31		73.5	W		1		No prominence.
	17	11 18	69		W		Slight		At base.
	17	9 3	16		E	1			
	21	8 56	13		W		1		At base.
	22	8 39		82	W		Slight		

Date	Hour I S T		Latitude		Limb.	Displacement.			Remarks
			North	South		Red	Violet	Both ways	
1919	H	M	°	°		A	A	A	
December 22	8	36	Equator		W			Slight	
25	8	42	6		E	2			At top.
25	8	44	17		E		Slight		
25	8	36	15		W				At base
27	8	32	18		E	0.5			
27	8	29	42		E	Slight			

The total number of displacements was 125 of which one was on the equator and the rest were distributed as follows :—

Latitude	North	South
1° to 30°	31	45
31° to 60°	15	4
61° to 90°	20	9
Total	66	58
East limb	42	
West limb	83	
Total	125	

63 displacements were towards the red and 65 towards violet. These include eight occasions in which the displacements were to red and to violet in different parts of the same prominence. 5 displacements were both ways simultaneously.

The large decrease in the number of displacements observed at the limb, as also in the number of metallic prominences, is in part due to the unsatisfactory observing conditions during the period under review.

Reversals and displacements on the disc.

111 bright reversals of the H α line, 14 dark reversals of the D $_3$ line and 84 displacements of the H α line were recorded during the half-year. All these are in defect compared with the previous half-year. Their distribution is shown below :—

	North	South	East.	West
Bright reversals of H α	39	72	53	58
Dark reversals of D $_3$	6	8	7	7
Displacements of H α	29	55	42	42

65 of the displacements were towards red, 16 towards violet and three both ways simultaneously

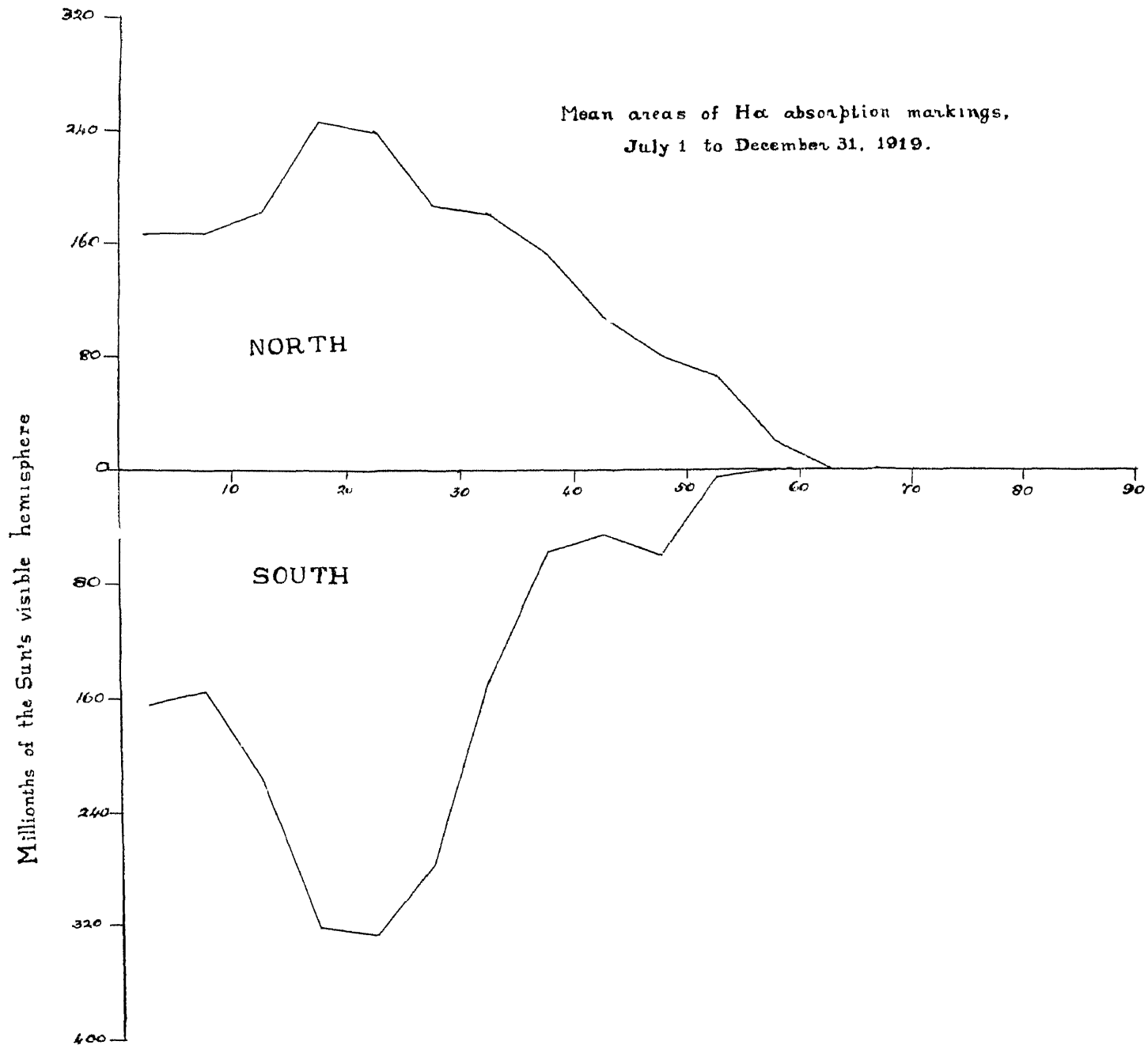
Prominences projected on the disc as absorption markings.

Photographs of the sun's disc in H α light were obtained on 116 days counted as 109 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	1798	9.9
South	1791	9.5
Total	3589	19.4

As in the case of prominences at the limb, the mean areas show an increase and numbers a decrease in both hemispheres.

The distribution in latitude is represented in the accompanying diagram



The absorption markings representing the denser prominences are distributed between the equator and latitude 60° north and south as in the case of prominences at the limb but with much more pronounced maxima at about latitude 20° north and south than is shown in the prominence diagram. The distribution is almost the same as in the previous half-year but the southern maximum has moved nearly 10° towards the equator and the region of slight activity previously shown between 50° and 60° south has also decreased ten degrees in latitude.

Unlike prominences at the limb, both areas and numbers show an eastern excess, the percentage east being 51.98 for areas and 51.56 for numbers.

KODAIKANAL OBSERVATORY,
16th March 1920

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