Kodaikanal Observatory

BULLETIN No. CXXIII.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE YEAR 1944

PART I.

Summary of Prominence Observations for the first half of the year 1944

This bulletin embodies the summary of prominences from the observations made at Kodaikanal supplemented by the data derived from the photographs kindly supplied by Mount Wilson and Meudon Observatories for the days on which no or only incomplete observations were possible at Kodaikanal.

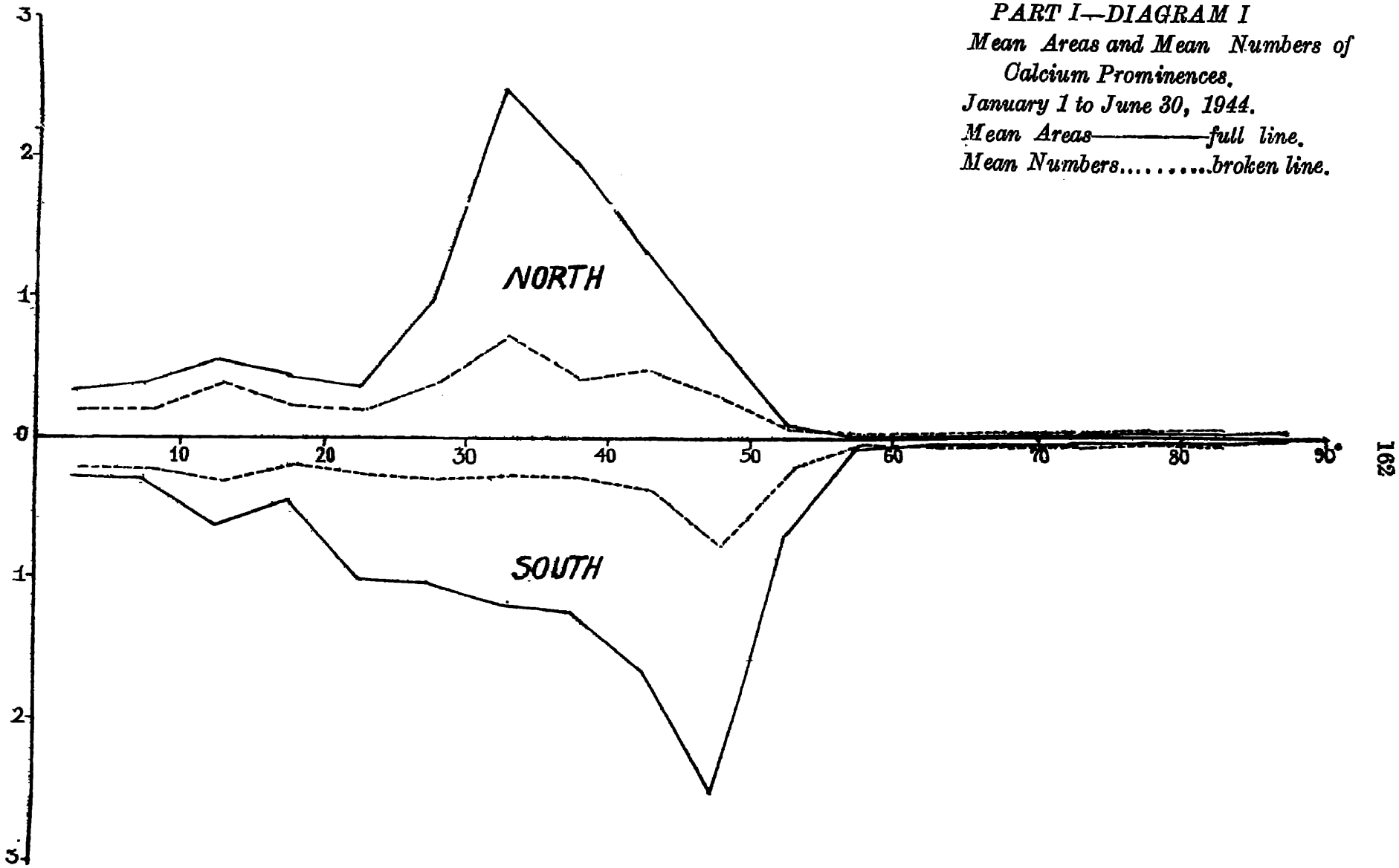
During the first half of the year calcium prominence photographs were taken at Kodaikanal on 154 days and these were supplemented by 17 photographs supplied by Mount Wilson. On the whole, the data were available for 167 days which were counted as 147½ days after giving due weightage to photographs of imperfect nature. The mean daily areas (in square minutes of arc) and the mean daily numbers as derived from the above data are given below ;—

	Combined data		Kodaikanal data only*	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	0·99	3·99	0·98	4·06
South	1·10	3·46	1·13	3·55
Total	2·09	7·45	2·11	7·61

*For comparison with Bulletins prior to 1923.

These figures show a decrease of 11 per cent and 10 per cent respectively for areas and numbers over those for the previous half year, in conformity with decreasing trend of solar activity.

The distribution in latitude of the prominence areas and numbers in 5° zones is shown in the following diagram in which the thick line curves represent the areas and broken line curves the numbers. The ordinate gives the areas in terms of square minutes for the thick line and numbers for the broken line.



PART I—DIAGRAM I
Mean Areas and Mean Numbers of Calcium Prominences.
January 1 to June 30, 1944.
Mean Areas————full line.
Mean Numbers.....broken line.

The well-marked peaks of activity shown in the previous half year in the zones 30° to 35° north and 45° to 50° south still exist, the one in the northern hemisphere having become pronounced.

The monthly, quarterly and half-yearly means of areas, numbers, heights and extents of the prominences are given in the following table :—

TABLE I

Months	Number of days (effective)	Areas (Sq. minutes)	Numbers	Daily means		Mean height	Mean extent
				Areas (Sq. minutes)	Numbers		
1944						"	°
January	26	39·4	194	1·52	7·46	32·11	3·24
February	21½	30·7	141	1·41	6·48	35·39	4·02
March	19	33·7	158	1·77	8·32	31·27	3·75
April	26½	72·9	191	2·77	7·28	37·18	5·15
May	28½	78·7	215	2·79	7·63	33·32	3·99
June	26	51·9	198	2·00	7·62	40·07	4·18
1st Qr.	66½	103·8	493	1·56	7·39	32·92	3·97
2nd Qr.	80½	203·5	604	2·53	7·50	36·86	4·44
First half year	147½	307·3	1097	2·09	7·45	34·89	4·20

The east-west distribution of the prominences is represented by the following figures :—

	East	West	Percentage East
Total areas	140·2	161·3	47·55
Total numbers	525	572	47·85

Both the areas and numbers show an eastern defect.

An eruptive prominence was photographed on April 15 on the east limb. It reached a maximum height of 4 minutes of arc.

Observations with Prominence Spectroscope.—No metallic prominences were observed during this half year.

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

TABLE III

Date 1944	Time I.S.T. (G.M.T. + 05h 30m)		Latitude		Limb	Displacements in A°			Remarks
			North °	South °		Red	Violet	Both ways	
	H.	M.							
January 25	09	30		27·5	W		0·5		In chromosphere.
February 26	09	20		3	E		0·5		Do.
March 27	09	35		30	W		1		At base.
April 5	10	50	28		E		Slight.		In chromosphere.
May 25	10	10	47		E		1		At base.
June 6	10	00		63	W	0·5			At base.

Six displacements were observed during the period as against 15 in the previous half-year and their distribution was as follows :—

Latitude	North	South
0°—30°	1	3
31°—60°	1	0
61°—90°	0	1
Total	2	4

East limb	3
West limb	3

Of these, one was towards the red and 5 towards the violet.

7 bright reversals of the Hα line and 6 dark reversals of D_3 were observed on the sun's disc during the half-year and the distribution of these was as follows :—

	North	South	East	West	Total
H_α in emission	1	6	5	2	7
D_3 in absorption	0	6	4	2	6

Observations with Spectrohelioscope.—Observations with the Hale Spectrohelioscope were made as usual ard the particulars of displacements observed in the prominences and the Hα-dark markings are summarised below. No displacements were observed during the half year over bright flocculi.

	North	South	East	West	Total
Prominences	11	6	7	10	17
Dark markings	3	6	8	1	9

	Displacements towards			
	Red	Violet	Both ways	Total
Prominences	10	7	..	17
H_α dark markings	7	2	..	9

The chromospheric eruptions observed with the spectrohelioscope during this half year are given in table IV.

TABLE IV.

Date 1944	Beginning	Time (I. S. T.) Maximum	End	Mean latitude	Mean longitude from C. M.	Intensity	Remarks
	H. M.	H. M.	H. M.	°	°		
January 25		08 09		+7	47E	1	From spectroheliogram.
27		08 17		+7	19E	1	Do.
March 21		07 48		—25	55E	2	Do.
22		08 25		—25	41E	2	Do.
26		10 38		—25	13W	2	From spectroheliogram at points.
May 11		08 02		—23	73W	1	From spectroheliogram.
28		09 25		+23	11E	1	Do.
28		09 25		—25	23E	1	Do.
28		09 25		—18	25E	1	Do.
31		11 33		—2	58W	2	Do.

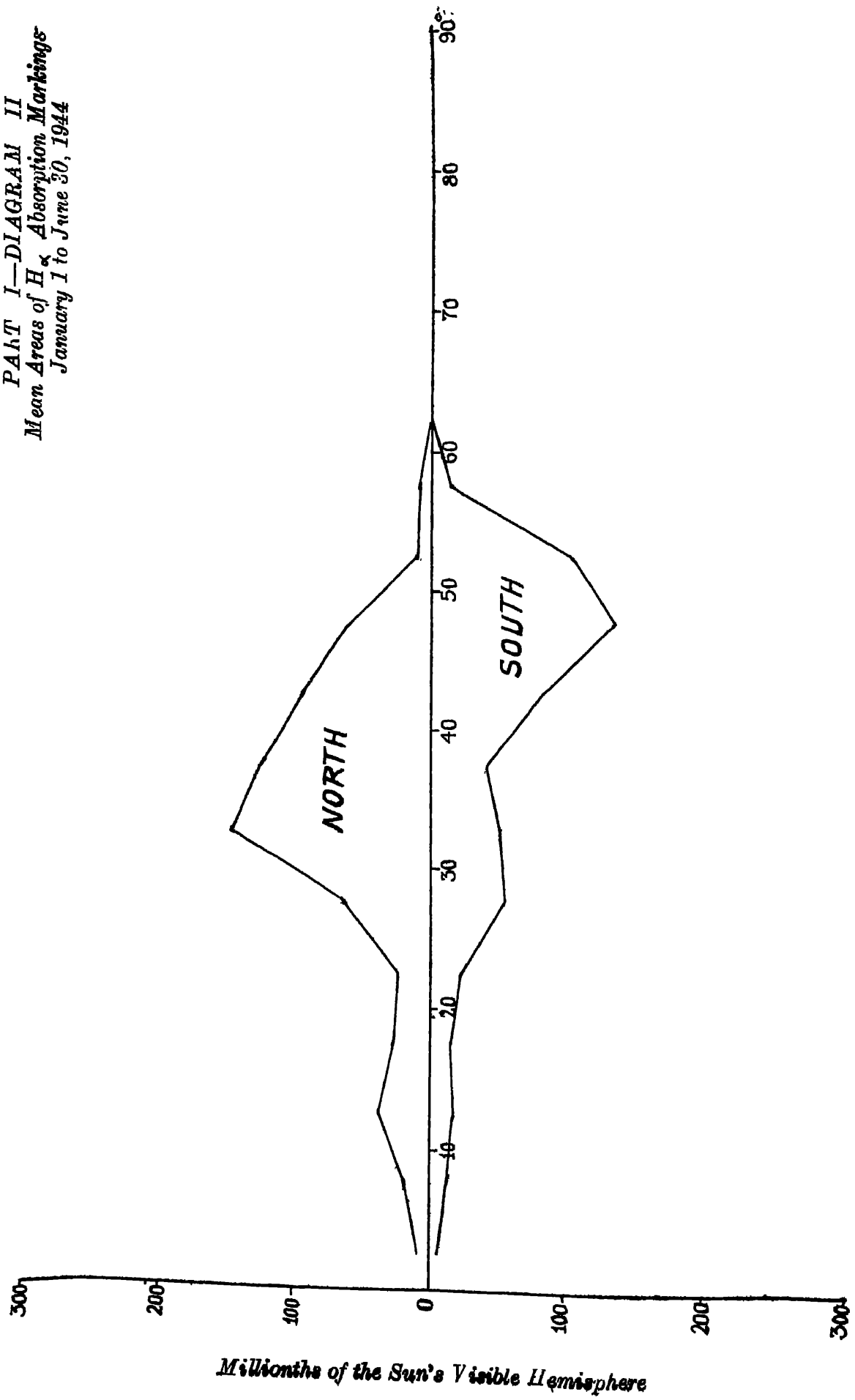
Prominences projected on the disc as Hα absorption markings.—Hα flocculus photographs were taken at Kodaikanal during this half year on 142 days and 33 photographs were kindly supplied by Mount Wilson and 13 by Meudon Observatories. On the whole the records were available for 177 days which were counted as 138½ effective days. The mean daily areas in millionths of the sun's visible hemisphere (without applying foreshortening correction) and the mean daily numbers computed as usual are given below :—

	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	628	5·77	521	4·83
South	557	4·93	505	4·73
Total	1185	10·70	1026	9·56

These figures show a large decrease of 28 per cent and 34 per cent respectively for areas and numbers as compared with those for the last half year.

The distribution in latitude of the markings is illustrated in the following diagram. The ordinate represents areas in millionths of the sun's visible hemisphere for every 5° zone of latitude.

PART I—DIAGRAM II
Mean Areas of H_α Absorption Markings
January 1 to June 30, 1944



Millionths of the Sun's Visible Hemisphere

When compared with the diagram for the previous half year, it is seen that a peak of activity has developed in the northern hemisphere in the zone 30° to 35°. In the southern hemisphere the peak of activity in the zone 45° to 50° is still maintained. Unlike in the case of prominences, the areas of Hα markings show an eastern preponderance, the percentage east being 51·8. The numbers of the markings are almost equally divided between the east and west of the sun's axis.

PART II

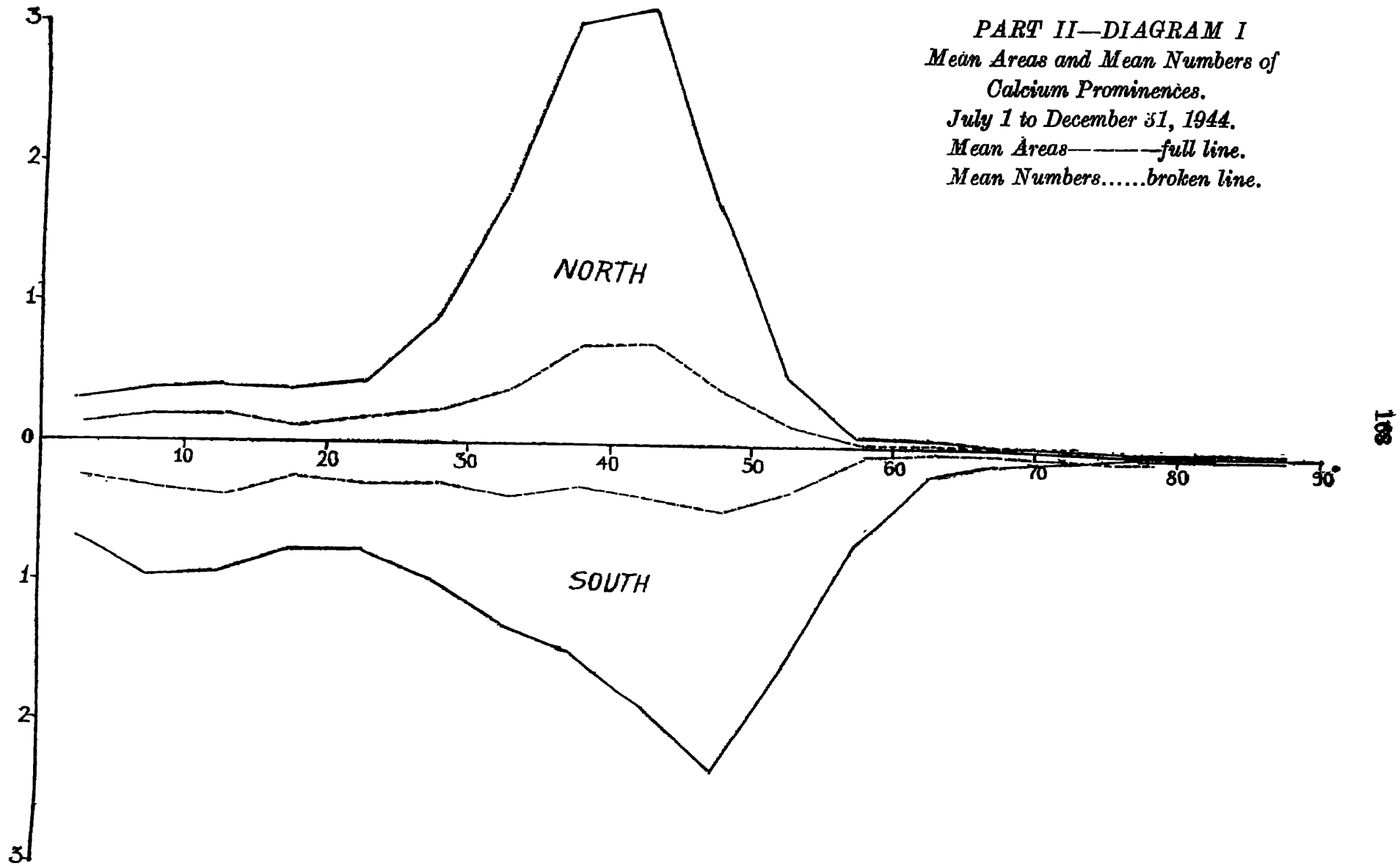
Summary of Prominence Observations during the second half of the year 1944

During the second half of the year 1944 it was possible to take prominence photographs at Kodaikanal on only 110 days ; 65 photographs were kindly supplied by Mount Wilson Observatory making the data available for 175 days which were counted as 150½ effective days. The mean daily areas (in square minutes of arc) and the mean daily numbers as derived from the above photographs are given below :—

	Combined data -		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	1·33	3·57	1·07	3·68
South	1·47	3·78	1·14	3·95
Total . . .	2·80	7·35	2·21	7·63

Compared with figures for the first half of the year, the areas show a sudden increase of 34 per cent indicating that the minimum of prominence activity passed sometime during the previous half year. The numbers, however, remain almost the same as during the last half year.

The distribution in latitude of the areas and numbers is illustrated in the following diagram :—



PART II—DIAGRAM I
Mean Areas and Mean Numbers of Calcium Prominences.
July 1 to December 31, 1944.
Mean Areas———full line.
Mean Numbers.....broken line.

Compared with the first half of the year, the peak of activity in the northern hemisphere has shifted 10° towards the pole and has become still more prominent. The activity in the southern hemisphere in the zone 45° to 50° has also considerably increased.

The monthly, quarterly and half-yearly means of areas, numbers, heights and extents of the prominences are given in the following table :—

TABLE I

Months	Number of days (effective)	Areas (Sq. Mts.)	Numbers	Daily Means		Mean height	Mean extent
				Areas (Sq. Mts.)	Numbers		
1944						"	°
July	26	64·3	168	2·47	6·46	44·35	5·81
August	28½	58·5	202	2·05	7·09	44·00	5·19
September	27½	68·1	187	2·48	6·80	47·35	6·05
October	27½	81·2	239	2·93	8·61	45·86	5·92
November	18½	78·4	141	4·18	7·52	52·66	10·21
December	22	69·9	172	3·18	7·82	54·45	8·00
3rd Qr.	82	190·9	557	2·32	6·79	45·23	5·68
4th Qr.	68½	229·5	552	3·35	8·06	50·99	8·06
Second half year	150½	420·4	1109	2·79	7·37	48·11	6·87

The distribution of the prominences east and west of the sun's axis was as follows :—

	East	West	Percentage East
Total areas	207·6	212·8	49·38
Total numbers	539	568	48·69

The above figures show an eastern defect as in the first half of the year.

Observations with Prominence Spectroscope.—No metallic prominence was observed during this half year also.

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

TABLE II

Date 1944	Time I. S. T.	Latitude		Limb	Displacements in A°			Remarks
		North	South		Red	Violet	Both ways	
	H. M.	°	°					
July 16	11 00		86	E		0·5		In chromosphere.
18	10 30		17	E		1·0		Do.
18	10 35		47	E		0·5		Do.
August 8	09 30	33		E		0·5		At base.
December 8	09 20		29	E		0·5		At base.
19	09 40		80	W	0·5			
19	09 40		83	W	0·5			
20	09 20	35		W		0·5		In chromosphere.
23	11 00		36	W	0·25			
25	09 15	28		W	0·25			
26	09 30	40		E	1·0			Do.
28	09 30	45		E	2·0			Do.

Their distribution in latitude was as follows :—

Latitude.	North	South
0°—30°	1	2
31°—60°	3	2
61°—90°	1	3
Total	5	7
East limb	.	7
West limb	.	5

Of these, 6 were towards the red and 6 wards the violet. The largest displacement observed was 2 A° to red over a prominence on the east limb on December 26.

On bright reversal of Hα line and one dark reversal of the D_2 line were observed during the half year over an active spot centre on the NW quadrant of the sun's disc.

Observations with Spectrohelioscope.—The displacements observed with the Hale Spectrohelioscope in the prominences and the Hα bright flocculi are summarised below. No. displacements were observed in Hα dark markings.

	North	South	East	West	Total
Prominences	9	3	6	2	8
Bright flocculi	2	..	..	2	2

	Displacements towards		
	Red	Violet	Both ways
Prominences	3	5	
Hα dark markings	2	..	

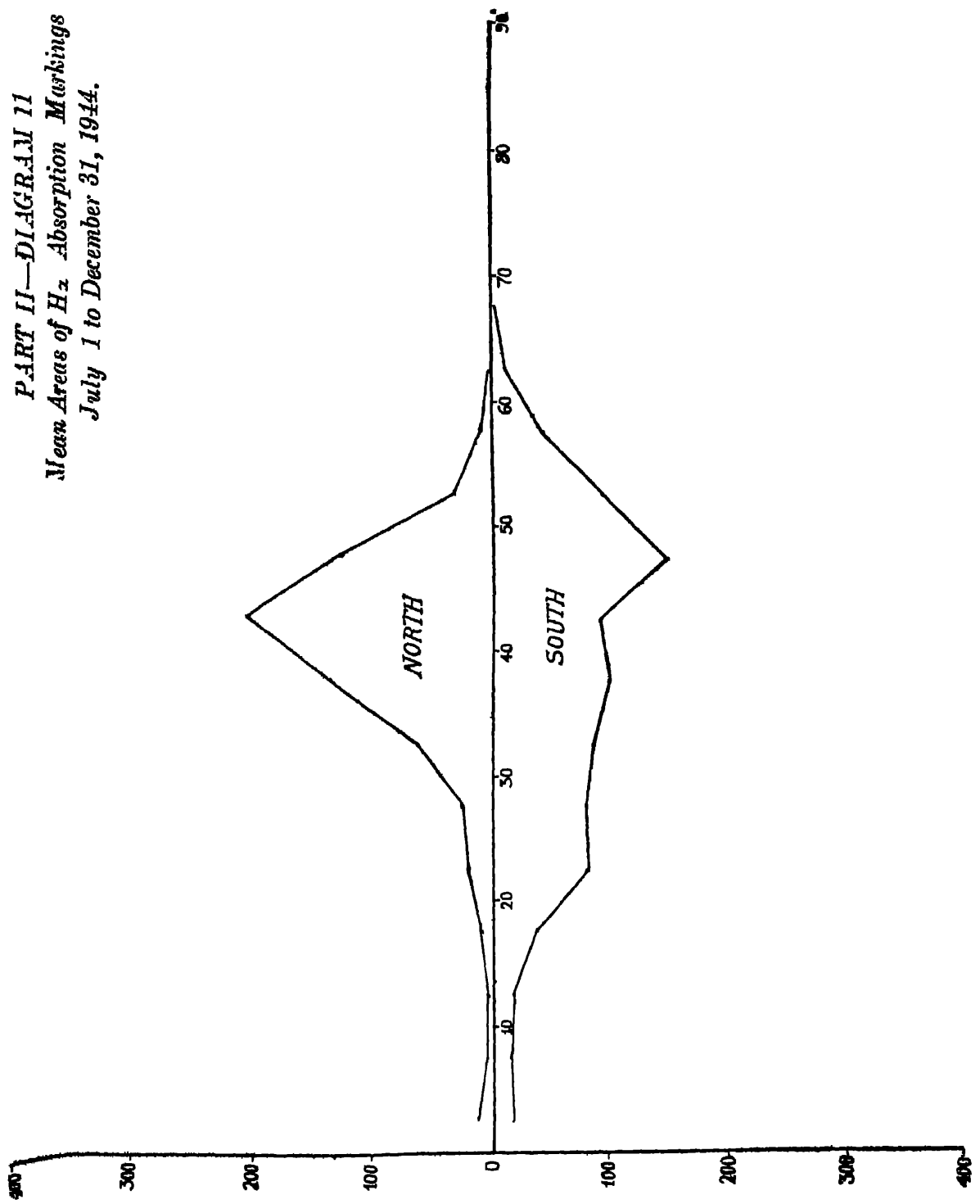
The chromospheric eruptions observed with the spectrohelioscope during this half year are detailed below :—

TABLE IV

Date 1944	Time. I.S.T. Beginning	Time. I.S.T. Maximum	Time. I.S.T. End	Mean latitude	Mean longitude from C.M.	Intensity	Remarks
	H. M.	H. M.	H. M.	*	*		
August 7		09 45	11 15	—10	55E	1	Spectrohelioscope.
September 2		08 05		− 27	65W	1	Do. and Spectroheliogram.
16		08 00	09 30	+7	47E	1	Spectrohelioscope.
October 10		08 01		+28	45E	1	Spectroheliogram.
19		07 56		+18	8W	1	Do.
20		09 30		—25	15E	1	Do.
December 11		08 51		—15	45E	1	Do.
13		09 49		—22	11E	1	At point Do.
16		08 17		—15	27W	1	Do.
25		08 16		+25	30E	1	From Spectroheliogram.
26		08 26		+28	55E	1	Do.

Prominences projected on the disc as Hα absorption markings—Hα flocculus photographs could be taken at Kodaikanal only on 101 days during this half year. Mount Wilson Observatory kindly supplied 79 photographs.

PART II—DIAGRAM 11
Mean Areas of H_2 Absorption Markings
July 1 to December 31, 1944.



and Meudon Observatory 7. The photographs thus collected were available for 179 days which were counted as 136½ effective days The mean daily areas in millionths of the sun's visible hemisphere without applying foreshortening correction) and the mean daily numbers derived from the above photographes were as follows:—

	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	649	6·53	430	4·19
South	845	8·48	607	6·50
Total . . .	1494	15·01	10·37	10·69

Compared with figures for the first half of the year, the markings also show a sharp turn towards increasing activity, the areas increasing by 26 per cent and numbers by 40 per cent.

The distribution in latitude of the areas of the Hα markings is illustrated in the diagram on page 171.

The diagram shows that the distribution of Hα areas is similar to that of prominence areas with the peak of activity in the zones 40° to 45° north and 45° to 50° south.

Both the areas and numbers of the markings show an eastern preponderance, the percentage east being 52·8 and 50·7 for the areas and the numbers respectively.

Thanks are due to the co-operating observatories for the photographs supplied by them.

A. K. DAS,

KODAIKANAL OBSERVATORY,

August '49.

Director, Kodaikanal Observatory.

C1PD—M—80Dir. of S I Obs. K.Kanal—29-2-52—385.