Kodaikanal Observatory

BULLETIN No. CXXII.

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE YEAR 1943

PART I

SUMMARY OF PROMINENCE OBSERVATIONS FOR THE FIRST HALF OF 1943

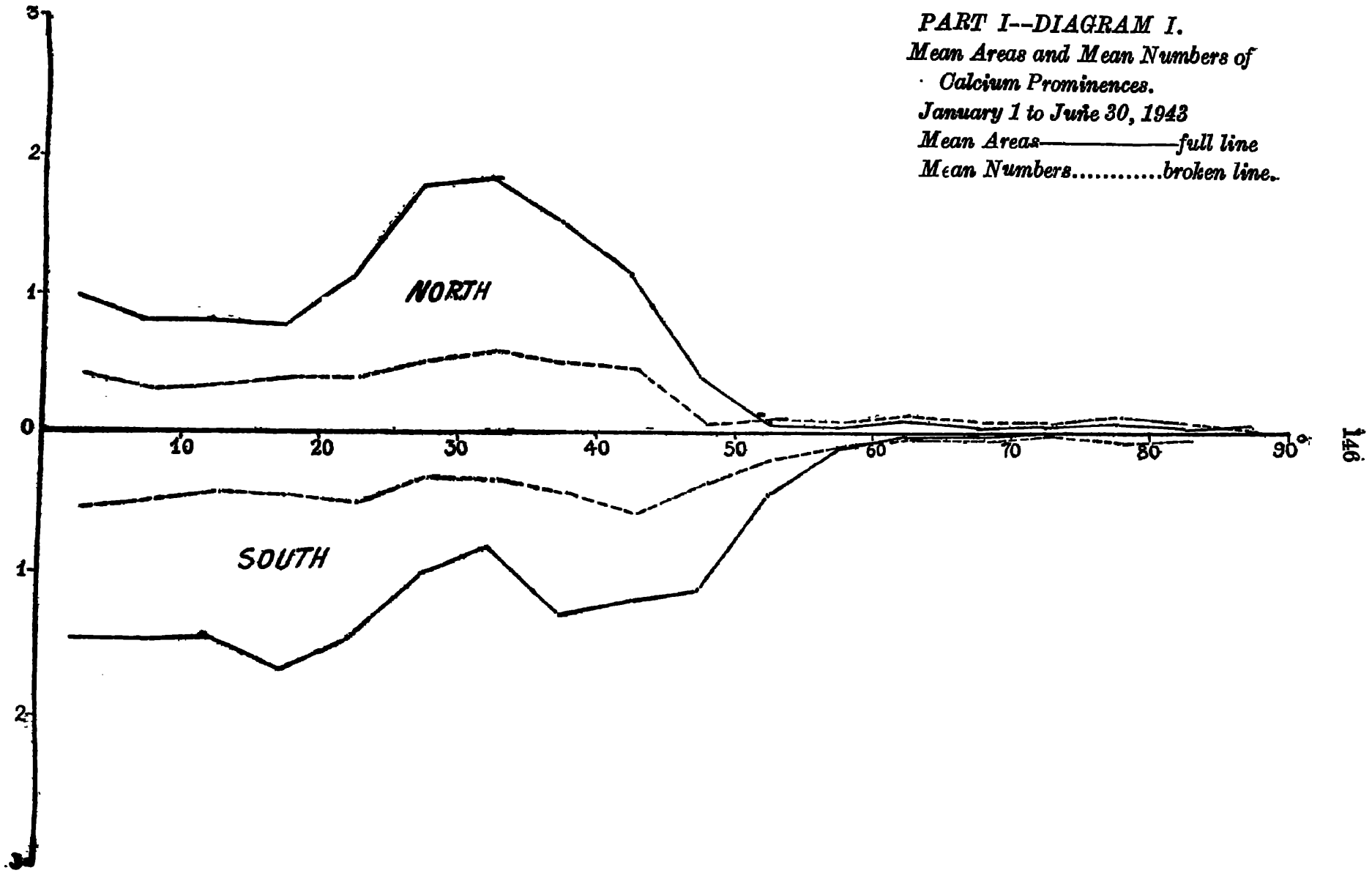
As in previous years, this summary is based on the observations made at Kodaikanal supplemented by the data from the photographs obtained from the co-operating observatories of Mount Wilson and Meudon for the days on which Kodaikanal had no or poor photographs. During this half year K-Prominence plates were secured on 145 days at Kodaikanal and Mount Wilson supplied photographs for 36 days. The data on the whole were available for 180 days which were counted as 153½ effective days after giving weightage to photographs of imperfect quality. The mean daily areas (in square minutes of arc) and the mean daily numbers of prominences computed from the above photographs are given below. The figures based on Kodaikanal photographs only are also given for comparison with bulletins issued prior to 1923 *i.e.* before the co-operation of other observatories came into force.

	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	1·15	4·78	1·24	4·99
South	1·36	4·91	1·38	4·85
Total	2·51	9·69	2·62	9·84

Compared with the corresponding figures for the previous half year the areas show a decrease of 10 per cent, the numbers remaining practically the same.

The distribution in latitude of the areas and numbers for each zone of 5° of latitude is shown in the following diagram in which the full lines indicate areas and broken lines the numbers. The ordinates represent tenths of square minutes of arc for the full lines and numbers for the broken lines.

80 G.P.obs.K.



PART I--DIAGRAM I.
Mean Areas and Mean Numbers of Calcium Prominences.
January 1 to June 30, 1943
Mean Areas——————full line
Mean Numbers.....broken line.

In the northern hemisphere the peak of activity shown in the previous half year in the zone 20° to 25° is shifted 10° towards the pole. In the southern hemisphere the activity in the zone 15° to 20° is still maintained but that in the zone 45° to 50° has shifted 10° towards the equator.

The monthly, quarterly and half yearly areas and numbers and the mean height and mean extent of the prominences are given in table I.

TABLE I

Months	Number of days (effective)	Areas (Sq. mts.)	Numbers	Daily means		Mean height	Mean extent
				Areas (Sq. mts.)	Numbers		
1943						"	°
January	27	76·2	295	2·82	10·92	34·91	4·00
February	23½	53·3	208	2·27	8·85	35·49	3·62
March	28½	82·5	301	2·87	10·47	34·22	4·09
April	25½	59·2	244	2·30	9·47	31·62	3·75
May	24½	64·7	236	2·61	9·54	31·25	3·56
June	23½	48 6	201	2·07	8·55	32·14	3·90
First Qr.	70½	212 0	804	2·68	10·15	34·87	3·90
Second Qr.	74	172·5	681	2·33	9·20	31·67	3·74
First half year	153½	384·5	1485	2·51	9·66	33·27	3·82

The distribution of the areas and numbers east and west of the sun's axis is shown below :—

	East	West	Percentage east
Total area (sq. minutes)	183·0	201·4	47·61
Total numbers	728	757	49·01

Both areas and numbers show an eastern defect.

Observations with Prominence Spectroscope.—Details of metallic prominences observed during this half year are given in table II.

TABLE II

Date	Time I. S. T. (G.M.T. +5h. 30m.)		Base	Latitude °		Limb	Height (seconds of arc)	Lines
				North	South			
February	H.	M.	°	°	°		"	
18	09	35	4	1	..	W	20	b_1 b_2 b_3, b_4 D_1 D_2
20	10	22	..	14	..	E	20	Do.

The distribution of metallic prominences was as follows :—

	1°—10°	11°—20°	21°—30°	31°—40°	Mean latitude	Extreme latitudes
North	1	1	..	..	7·5°	1° & 14°
South	..	..	..	..	..	..

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

TABLE III

Date 1943	Time I. S. T.	Latitude		Limb	Displacements in A°			Remarks
		North	South		Red	Violet	Both wa s	
January	H. M.	°	°					
9 . .	09 47		12	E	0·5			At base.
12 . .	09 50		31	E	0.5			At base.
15 . .	09 45		8	E	1			At base.
16 . .	09 46		7	E	1			At base.
17 . .	09 40		14	E	1			At base.
17 . .	09 40		22	E	0·5			At base.
22 . .	09 40		5	W	1	1		To red at top & violet at base.
23 . .	09 37	17		E	0·5			At base.
70 . .	09 32	31		E	0·5			At base.
February								
17 . .	10 40	2·5		W		2		At base.
17 . .	10 40	8·5		W	3			At top.
18 . .	09 23	1		W	3			
18 . .	09 30		8	W	2	0·5		To red at top and to violet at base.
19 . .	10 50	9		E		0·5		At base.
20 . .	10 22	14		E	2	2		To red at top and to violet at base.
21 . .	09 35	5		W	1			
21 . .	09 25	42		W	0·5			
23 . .	09 42	63		W	0·5			At top.
28 . .	09 58		1	W	0·5			At top.
March								
8 . .	10 15	3		W	0·5			At top.
21 . .	09 15	53		W		1		At top.
29 . .	09 20	11		W		0·5		
April								
28 . .	09 25	6·5		W	1			At top ; from 5° to 8°.
28 . .	09 20	9·5		W	0·5	2		To red at top and to violet at base ; from 8° to 11°.
May								
23 . .	09 05		16	W	0·5			At top.
June								
6 . .	09 32		52	E		0·5		At top.
30 .	09 00	9		E	0·5	0·5		To red at top and to violet at base ; from 8° to 10°.

The total number of displacements was 32 as against 39 in the previous half year. The distribution is given below :—

Latitude	North	South
0°—30°	15	11
31°—60°	3	2
61°—90°	1	..
Total	19	13

East limb	14
West limb	18
Total	32

Of these, 22 were towards the red and 10 towards the violet.

79 bright reversals of the Hα line, 59 dark reversals of the D_3 line and 4 displacements of the Hα line were observed with the spectroscope on the sun's disc. Their distribution was as follows :—

	North	South	East	West	Total
Bright reversals of Hα	66	13	44	35	79
Dark reversals of D_3	51	8	31	28	59
Displacements of Hα	2	2	2	2	4

Observations with spectrohelioscope.—Doppler displacements of the Hα line over prominences, dark markings and bright flocculi observed with the spectrohelioscope during this half year are detailed below :—

	North	South	East	West	Total
Displacements in prominences	37	45	41	41	82
Displacements in dark markings	50	45	57	38	95
Displacements in bright flocculi	..	—	—	..	—

In the prominences 47 displacements were towards the red and 35 towards the violet. In the dark markings 46 displacements were towards the red and 49 towards the violet. The largest displacement observed during this year was 4·5A° to red in an eruptive prominence on March 17. An eruptive prominence on the west limb on February 18 reached a maximum height of 5 minutes of arc.

Details of chromospheric eruptions observed are given in table IV :—

TABLE IV

Date	Beginning	Time (I. S. T.) Maximum	End	Mean latitude	Mean longitude from C.M.	Intensity	Remarks
January	H. M.	H. M.	H. M.	°	°		
9		07 58		—4	50E	1	From spectroheliogram.
18		08 14		—8	73E	1	Do.
19		08 00		—8	60E	1	Do.
February							
9		08 37		+6	37E	1	Do.
10	07 59	08 14		+6	22E	1	From spectrohelioscope.

TABLE IV (*Contd.*)

Date	Time (I. S. T.) Beginning.	Time (I. S. T.) Maximum	Time (I. S. T.) End	Mean latitude	Mean longitude from C. M.	Intensity	Remarks
February							
20		08 46		+10	85E	1	From spectroheliogram.
21		10 22		+11	68E	1	Do.
22	07 50	08 00	08 15	+10	53E	1	From spectroheliogram & spectrohelioscope.
24		08 17		+10	16E	1	Do.
27		07 45		+9	15W	2	From spectroheliogram.
28		08 39		+10	30W	1	Do.
March							
3		08 17		+10	70W	1	Do.
6		07 53		+5	64E	1	Do.
9		07 52		+6	23E	1	Do. at points.
30		07 53		—9	34E	1	Do.
April							
5		07 46		+3	21E	2	Do.
6		07 41		+3	7E	2	Do.
7		07 51		+2	6W	1	Do.
8		07 42		Equator	21W	1	Do.
17		07 52		+10	55E	1	Do.
19		07 52		+8	29E	1	Do.
20		07 55		+8	15E	2	Do.
22		07 54		+7	10W	2	Do. and spectrohelioscope.
23		07 51		+7	23W	2	From spectroheliogram.
24		07 48		+8	37W	1	Do.

Prominences projected on the disc as Hα dark markings.—During this half year Hα flocculus plates were taken at Kodaikanal on 138 days ; 42 plates were received from Mount Wilson and 4 from Meudon Observatories. The photographs were available on the whole for 180 days which were counted as 148 effective days. The mean daily areas (without applying foreshortening correction) in millionths of the sun's visible hemisphere and the mean daily numbers computed from the above photographs are given below :—

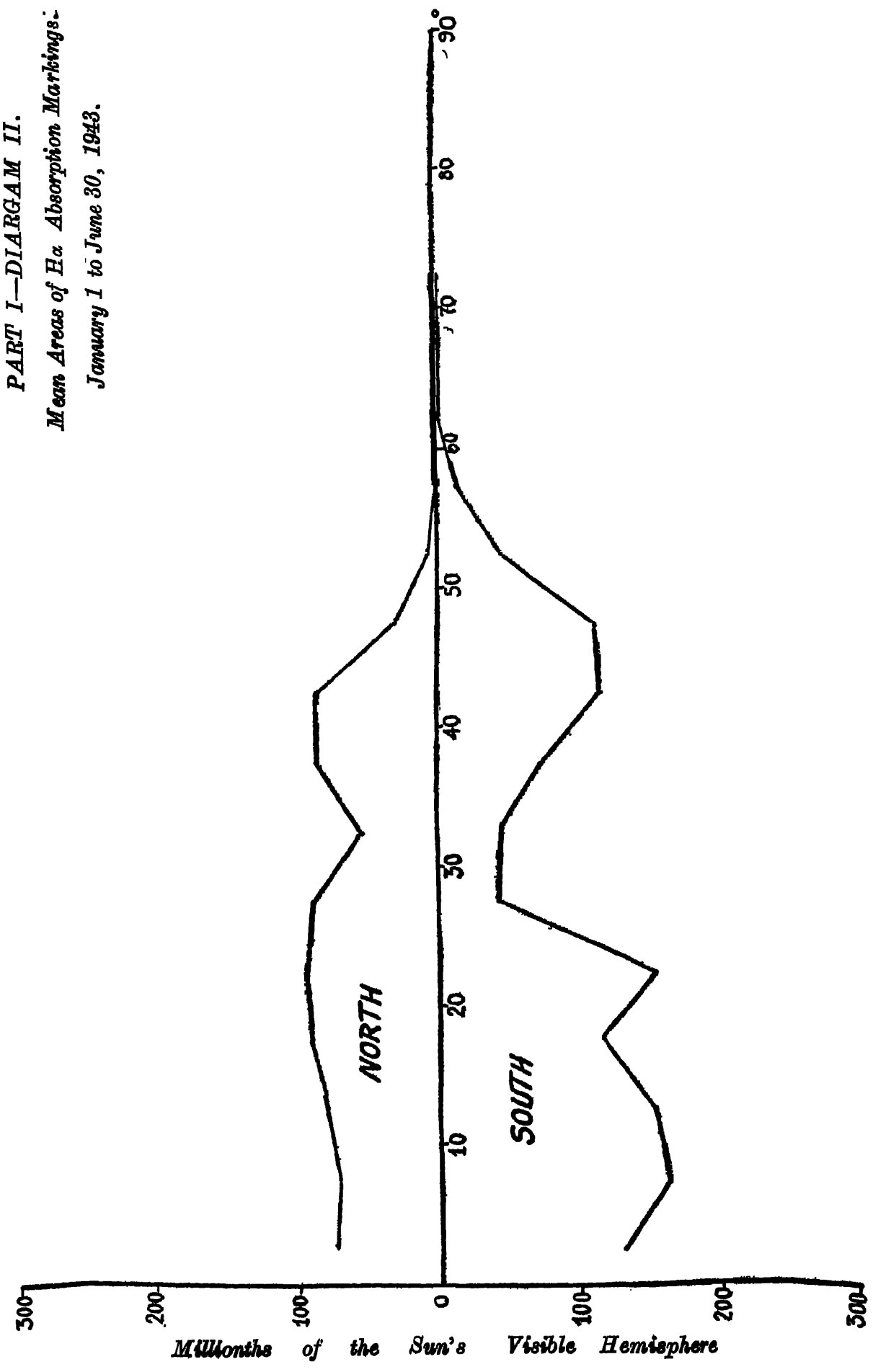
	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	776	8·36	683	7.31
South	1179	9·85	1128	8·94
Total	1955	18·21	1811	16·25

Compared with last half year's figures both areas and numbers show a decrease of 22 per cent and 11 per cent respectively.

The distribution in latitude of the areas is represented by the following diagram :—

PART I—DIARGAM II.

Mean Areas of Hα Absorption Markings:
January 1 to June 30, 1943.



The curves show that in the northern hemisphere the areas are almost uniformly distributed from the equator to latitude 45° excepting in the zone 30° to 35° where the activity is slightly less. In the southern hemisphere the activity is mainly confined to the two zones 0° to 25° and 40° to 50°.

Unlike in the case of prominences, the areas and numbers of Hα dark markings show a slight eastern preponderance during the half year, the percentage east being 50·45 and 50·63 for areas and numbers respectively.

PART II

Summary of Prominence Observations for the Second Half of 1943

During this half year K-Prominence photographs could be taken at Kodaikanal only on 124 days and 68 photographs were received from Mount Wilson making the records available for 175 days which were counted as 143½ effective days. The mean daily areas (in square minutes of arc) and the mean daily numbers 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	1·03	3·76	1·13	4·30
South	1·33	4·51	1·43	4·75
Total	2·36	8·27	2·56	9·05

The areas and numbers show a further decrease of 6 per cent and 15 per cent respectively over the figures of the last half year.

The distribution in latitude of areas and numbers in 5° ranges of latitude is shown in the following diagram as in Part I.

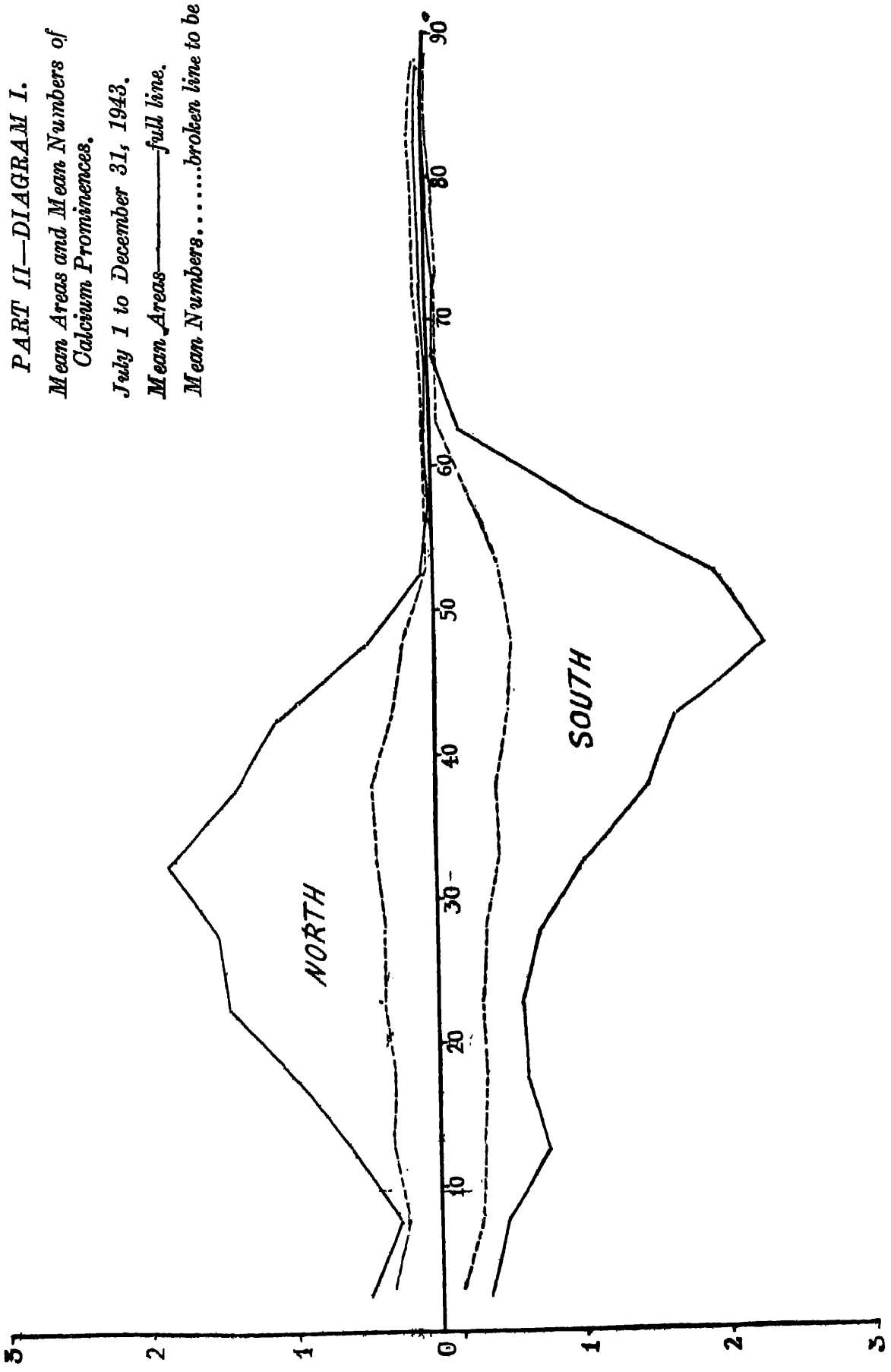
PART II—DIAGRAM I.

Mean Areas and Mean Numbers of Calcium Prominences.

July 1 to December 31, 1943.

Mean Areas——————*full line.*

Mean Numbers.....*broken line to be*



The areas show a peak of activity in the zone 30° to 35° in the northern hemisphere as in the previous half year. In the southern hemisphere a pronounced single peak has developed in the zone 45° to 50°.

The monthly, quarterly and half-yearly means of areas, numbers, heights and extents calculated as usual are shown in table I.

TABLE I

Months	Number of days (effective)	Areas (sq. mts.)	Numbers	Daily means		Mean height	Mean extent
				Areas (sq. mts.)	Numbers		
1943						″	°
July	23½	85·4	172	3·67	7·40	43·81	5·36
August	27	67·2	199	2·49	7·37	36·67	4·37
September	24½	53·5	212	2·16	8·57	40·00	3·86
October	24½	42·9	198	1·73	8·00	36·86	3·31
November	22½	39·9	201	1·77	8·93	35·05	3·03
December	21½	49·1	205	2·31	9·65	32·43	3·88
3rd Qr.	75	206·1	583	2·75	7·77	40·16	4·53
4th Qr.	68½	131·9	604	1·93	8·82	34·78	3·41
Second half year	143½	338·0	1187	2·36	8·28	37·47	3·97

The distribution of areas and numbers east and west of the sun's axis is given below :—

	East	West	Percentage East
Total Areas	152·7	185·3	45·18
Total Numbers	566	621	47·68

Both the areas and the numbers show an eastern defect as in the previous half year.

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

The details of displacements observed in the chromosphere and the prominences with the spectroscope are given below :—

TABLE III

Date 1943	Time I. S. T.	Latitude		Limb	Displacements in A°			Remarks
		North °	South °		Red	Violet	Both ways	
July	H. M.							
3	09 28		57·5	E	0·5			At base.
August								
23	09 35		25·5	W		0·5		At top.

TABLE III—*contd.*

Date 1943	Time I. S. T.	Latitude North °	Latitude South °	Limb	Displacements in A° Red	Displacements in A° Violet	Displacements in A° Both ways	Remarks
September								
12 . . .	09 20	11		W	0·5			At top.
12 . . .	09 20	18		W	0·5			Do
17 . . .	09 30	82		W		1		In the middle.
18 . .	09 05	48		E		0·5		At top.
24 . .	10 20	58·5		W		0·5		In the chromosphere.
October								
28 . . .	09 10	47		W		0.5		Do
30 . . .	09 25		41	E	0·5			At top.
30 . . .	09 25		44	E		0·5		At base.
November								
19 . . .	10 20	56		E		0·5		
19 . . .	10 20	20		E		1		At top.
December								
19 . . .	09 55		49	E		0·5		
20 . . .	10 10		51	E		0·5		
30 . . .	09 05		40	W	0·5			At top.

The distribution of these displacements was as follows :—

Latitude	North	South
0°—30°	8	1
31°—60°	4	6
61°—90°	1	..
Total .	8	7
East limb	8	
West limb	7	
Total .	15	

Of these, 5 were towards the red and 10 towards the violet.

43 bright reversals of the Hα line and 35 dark reversals of the D_3 line were observed with the spectroscope during the half year. Their distribution was as follows :—

	North	South	East	West	Total
Bright reversals of H α	38	7	24	19	43
Dark reversals of D_3	30	5	18	17	35

Observations with Spectrohelioscope.—The displacements observed with the Halo spectrohelioscope during the period are summarised below :—

	North	South	East	West	Total
Displacements in prominences	1	3	4	..	4
Displacements in dark markings	5	3	2	6	1

	Displacements toward :	
	Red	Violet
Prominences	3	1
Hcc Dark markings	3	5

The details of chromospheric eruptions observed during this half year are given below :—

TABLE IV

Date	Time (I. S. T.) Beginnin	Maxim m	End	Mean latitude	Mean longitude from C.M.	Intensity	Remarks
July	H. M.	H. M.	H. M.				
8		10 00		+13	73E	1	From spectroheliogram & spectrohelioscope.
28		10 12		—1	62W	1	Do.
September							
18		07 49		—6	3E	1	From spectro' eliogram.
19		07 48		—7	12W		Do.
30		10 19		+18	43E	1	Do.
October							
2		09 09		+18	18E	1	Do.
4		09 4		+18	10W	1	Do.
5		09 (		+18	3W	1	Do.
19		07 4		—3	3E	1	Do.
November							
17		08 18		+"	80W	1	Do. and spe·tro-helios ope.
25		14 53		—7	8W	1	From spe. trohcliogram.
2'		14 53		+1	7E	1	Do.
27		07 56		+12	0	1	Do.
29		08 02		+7	62E	1	Do.
30		07 53		+7	47E	1	Do.
December							
7		08 28		+7	78E	1	Do.
8		12 25		+7	59E	1	Do.
9		08 45		+7	45E	1	Do.
14		10 00		—21	80E	1	Do.
15		08 13		—22	66E	1	Do.
21		11 25		—24	20W	1	Do.
25		08 38		—23	67W	1	Do.

Prominences projected on the disc as Hα absorption markings.—During the half year Hα flocculus photographs could be taken only on 112 days at Kodaikanal. 68 photographs were supplied by Mount Wilson and 3 by Meudon. On the whole photographs were available for 175 days, which were counted as 133¾ 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 photographs are given below :—

	Combined data		Kodaikanal data only	
	Mean daily areas	Mean daily numbers	Mean daily areas	Mean daily numbers
North	709	8·43	694	7·22
South	927	7·83	867	7·04
Total .	1636	16·26	1561	14·26

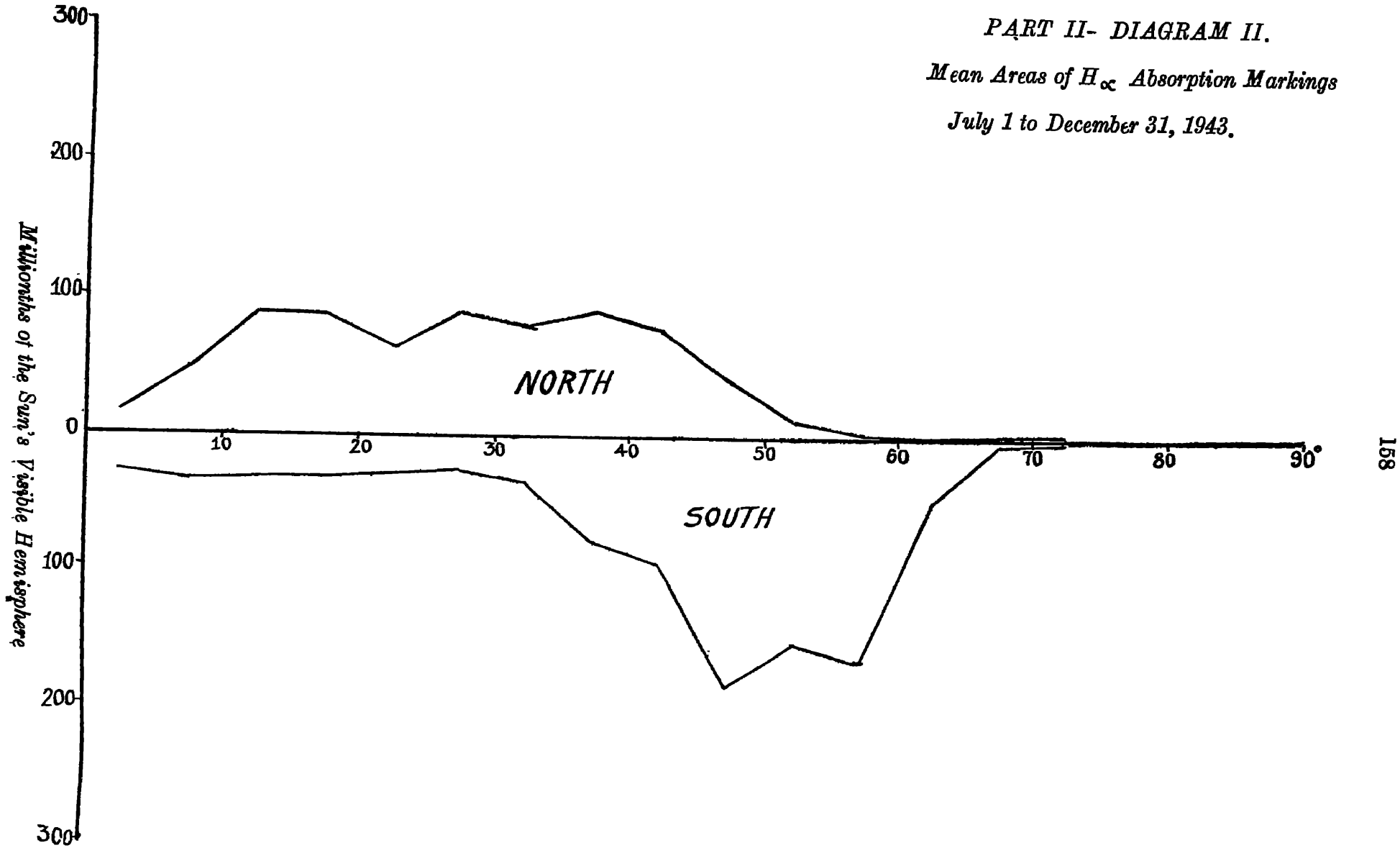
The areas and numbers of these markings also show a decrease of 16 per cent. and 11 per cent. over the figures for the previous half year.

The distribution in latitude is shown in the following diagram :—

PART II- DIAGRAM II.

Mean Areas of H_α Absorption Markings

July 1 to December 31, 1943.



Unlike the prominence areas and numbers, the Hα areas and numbers show an eastern preponderance the percentage east being 51 for both.

In the northern hemisphere the activity is spread over the region 10° to 45° with practically uniform distribution of areas, whereas in the southern hemisphere the activity is mainly confined to the zone 40° to 60°.

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

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KODAIKANAL,

August '49.