REPORT OF THE KODAIKANAL OBSERVATORY FOR THE YEAR 1936.

This report is concerned with the astronomical and seismological work of the Kodaikanal Observatory. The meteorological data will be published in the "India Weather Review" and administrative details will be incorporated in the annual report of the India Meteorological Department.

2. All forms of solar activity have shown a further increase in the year 1936. The mean daily number of spots showed an increase of 79 per cent, the mean daily areas of calcium prominences an increase of 50 per cent, the mean daily numbers of calcium prominences an increase of 9 per cent, and Hα absorption markings an increase of 102 per cent.

The collection of spectroheliograms from other observatories for those days on which complete records could not be obtained at Kodaikanal was continued as part of the programme of the International Astronomical Union. The data of solar activity given in this report are, however, based on Kodaikanal photographs only, as photographs from other observatories will not be available until a considerable time after the end of the year.

Daily character figures of solar activity as regards Hα bright flocculi and Hα dark markings for the year 1936 were communicated to the Observatoire Fédéral, Zurich, under the auspices of the International Astronomical Union. The character figures for K bright flocculi from Kodaikanal plates are communicated by the Cambridge Observatory combined with their own. Twenty-two original photoheliograms were supplied to the Greenwich Observatory and 301 original calcium disc spectroheliograms to the Cambridge Observatory.

3. *Weather Conditions.*—Weather conditions were slightly more favourable for solar observations than during the previous year. The mean value of the definition in the north dome before 10 A.M. was 2·4 on a scale in which 1 is the worst and 5 the best whilst the number of days on which the definition was estimated as 4 or above was 32 as against 31 in the previous year.

4. *Photoheliograph.*—Photographs of the sun on a scale of 8 inches to the sun's diameter were taken on 329 days using a 6-inch achromatic object glass and green colour screen.

5. *Spectroheliographs.*—Monochromatic images of the sun's disc in K light were obtained on 315 days, prominence plates in K light on 304 days and Hα disc plates on 276 days. The total number of spectroheliograms obtained during the year was 2482.

6. *Six-inch Cooke Equatorial and Spectroscope.*—Work with this instrument has been continued on the same lines as formerly for the visual observations of solar phenomena which cannot be readily photographed.

7. *Spectrohelioscope.*—Observations with the Hale spectrohelioscope were made on all days except Sundays and holidays whenever the weather permitted. A list of bright eruptions observed was sent quarterly to the Meudon Observatory, Paris, for inclusion in the International Astronomical Union Bulletin of Character Figures.

8. *Research Work.*—Kodaikanal Observatory Bulletin No. CIX containing the results obtained by the Director and Assistant Director of a photometric study of the lines of calcium and hydrogen in different parts of the sun's disc, was sent to the press in December 1936. The values deduced for the number of atoms per cm^3 at different levels in the reversing layer are given in the following table :—

Number of atoms per cm^3 in Reversing Layer.

Heights above photosphere.	Number of atoms per cm^3.		
	Ca	Ca×	H (2 quantum).
0—136 kms.	$11\cdot3\times10^8$	$3\cdot68\times10^{11}$	$6\cdot13\times10^8$
0—287 kms.	$9\cdot05\times10^8$	$3\cdot40\times10^{11}$	$3\cdot61\times10^8$
136—287 kms.	$6\cdot95\times10^8$	$2\cdot55\times10^{11}$	$2\cdot01\times10^8$
0—600 kms.	$5\cdot2\times10^8$	$1\cdot7\times10^{11}$	$2\cdot0\times10^8$
287—600 kms.	$1\cdot6\times10^8$	$0\cdot4\times10^{11}$	$0\cdot2\times10^8$

The Director was deputed by the Government of India to observe the total solar eclipse of June 19, 1936, in Japan in order to study the effect of scattering by the earth's atmosphere on the wave length of Fraunhofer lines. The weather conditions prevailing at the eclipse permitted the programme of observations to be carried through almost completely. The measurement of the plates is in progress and some comparison plates will be obtained at Kodaikanal when the sky conditions are suitable.

Mr. M. Salaruddin and the Director have measured a progressive change in the inclination of dark markings to the sun's meridian as the life of the markings continues. The work was not completed at the end of the year.

Mr. B. G. Narayan has been comparing the heights of individual dark markings with the height of the corresponding prominence at the limb of the sun.

9. *Sunspots.*—The following table gives the monthly numbers of new groups observed at Kodaikanal and their distribution between the northern and southern hemispheres. The mean daily numbers are also given.

1936.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
New groups	13	21	23	26	26	19	15	29	28	31	22	29	282
North .	7	9	12	15	15	12	9	17	18	11	8	14	147
South .	6	12	11	11	11	7	6	12	10	20	14	15	135
Mean daily numbers.	4·0	5·6	4·9	5·1	3·6	3·7	3·0	5·4	4·7	6·0	5·9	7·3	4·9

Compared with the previous year, the number of new groups observed was 77 per cent. in excess of that of last year and the mean daily numbers

showed an increase of 79 per cent. There were no days on which the sun was found to be free from spots during the year, whereas there were 20 days with no spots in the previous year. The approximate mean latitude of spots was 19°·0 in the northern hemisphere and 19°·6 in the southern hemisphere. Bright reversals and displacements of the Hα line observed with the spectroscope on the disc in the neighbourhood of sunspots also showed a great increase over the previous year. Bright reversals numbered 745 as against 369 in 1935. The displacements observed numbered 99 as against 28 in the previous year. Of these, 49 were towards the red, 22 towards the violet and 28 both ways simultaneously. D_3 was observed as a dark line on 734 occasions as against 303 in the previous year.

10. *Prominences.*—The mean daily areas and numbers of calcium prominences as derived from Kodaikanal spectroheliograms are as follows :—

Areas.

	North.	South.	Total.
1936—			
January to June	3·44	3·57	7·01 sq. mins.
July to December	3·86	3·50	7·36 Do.

Numbers.

	North.	South.	Total.
1936—			
January to June	6·91	7·03	13·94
July to December	7·96	7·76	15·72

The activity is almost equally divided between the northern and southern hemispheres. The distribution of areas and numbers in latitude is irregular except for a well marked peak near 60°. This peak has advanced nearly 10° towards the poles than its position in 1935, and the peak in the southern hemisphere is 5° nearer the pole than in the northern hemisphere. Greater activity than in 1935 was observed in the equatorial belts, *i.e.*, from 0° to 20° latitude.

Sixty-four metallic prominences were observed during 1936 as against 20 in the previous year. Of these, 22 were observed in the northern hemisphere and 42 in the southern hemisphere between the latitudes 6° and 60°. Displacements of the hydrogen line in the chromosphere and prominences observed during the year with the spectroscope numbered 407 as against 174 in 1935. Of these, 204 were towards the red, 175 towards the violet, and 28 both ways simultaneously.

Using the Hale spectrohelioscope, 197 displacements were observed in prominences, almost equally divided between the northern and southern hemispheres. Of these, 105 were observed on the east limb and 92 on the west. Displacements to the red numbered 101 and those to the violet numbered 96. The largest displacement in prominences observed in 1936 amounted to 2·6 A.

The mean daily areas of prominences projected on the disc as hydrogen absorption markings amounted to 8973 millionths of the sun's visible hemisphere as against 4447 in the previous year, showing an increase of 102 per cent. Their distribution in latitude is similar to that of calcium prominences, but the peaks of activity are more emphasised in the case of $H\alpha$ areas than in calcium prominences, so that the activity in absorption markings is confined to a broad belt near 30° and a narrow belt near 60°.

11. *Time.*—The error of the standard clock is usually determined by reference to the 16-hour signal distributed from the Alipore Observatory, Calcutta. The reception of the signal at Kodaikanal is rendered possible by the courtesy of the Telegraph Department which permits the time signals to be joined through to this observatory. The signal was received accurately on most days and all failures were reported to the Postmaster General, Madras. In addition wireless time signals were received from Colombo, Calcutta and Rugby.

12. *Seismology.*—The Milne Shaw seismograph recorded 196 earthquakes during the year. For details of records, reference may be made to the " India Weather Review ".

13. *Publications.*—The annual report for the year 1935 and the following bulletins were published during the year.

1. Bulletin No. 108. " Summary of Prominence Observations for the first half of the year 1935."
2. Bulletin No. 109. " Photometric Study of the lines of hydrogen and of calcium in the Fraunhofer spectrum at different points of the sun's disc " by Drs. T. Royds and A. L. Narayan. A short note on this was also sent to Current Science, Bangalore, for publication.
3. Bulletin No. 110. " Summary of Prominence Observations for the second half of the year 1935 ".

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KODAIKANAL;

28th January 1937.

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