REPORT* OF THE KODAIKANAL OBSERVATORY FOR THE YEAR 1943.

The data of solar activity given in this report are based on observations made at this observatory only.

During the year 1943 there has been a marked decline in all forms of solar activity.

As usual, this Observatory supplied to the Solar Physics Observatory Cambridge, original calcium disc spectroheliograms for 150 days.

Daily character figures of solar activity according to Hα bright flocculi and absorption markings were communicated to Mr. Newton of the Royal Observatory, Greenwich for transmission to Prof. Brünner at Zürich, for inclusion in the Quarterly Bulletin on Solar Activity. Daily character figures from calcium flocculi are also being worked out from 1st July 1943 and sent for publication in the Quarterly Bulletins on Solar Activity, at the request of the Director, Solar Physics Observatory, Cambridge.

2. *Observing Conditions.*—On account of an unusually large number of cloudy days during the year, there has been a decrease in the number of days of observation. The observing conditions for solar observations were almost the same as in the previous year. The mean value of definition noted in the north dome before 11 A. M. was 2·5 on a scale in which 1 is the worst and 5 the best ; the number of days on which definition was estimated as 4 and above was 7 as against 9 in the previous year.

3. *Photoheliograph.*—Direct photographs of the sun on a scale of 8 inches to the sun's diameter were taken on 305 days with a 6-inch achromatic object glass and a green filter.

4. *Spectroheliographs.*—Photographs of the monochromatic images of the sun's disc in K light were obtained on 284 days, prominence plates in K light on 267 days and Hα disc plates on 250 days. The total number of spectroheliograms taken during the year was 1,557, as a reduction in the daily number of spectroheliograms has been effected on account of shortage of photographic plates.

5. *Six-inch Cooke Equatorial and Spectroscope.*—Work with this instrument was done as in previous years for the visual observations of solar phenomena which cannot be readily photographed.

6. *Spectrohelioscope.*—Observations with the Hale spectrohelioscope were made on all days of favourable weather except Sundays and public holidays. The details of the observations of chromospheric eruptions and the line of sight velocities in prominences and dark markings are summarised in the Bulletins of this observatory. A quarterly list of chromospheric eruptions together with the times when the sun was under observation, was communicated for inclusion in the Bulletin on Solar Activity.

*This report deals chiefly with the astronomical work of the Kodaikanal Observatory. The meteorological data will be published in the India Weather Review and the administrative details will be incorporated in the annual report of the India Meteorological Department.

7. *Research work.*—The photo-electric microphotometer has been redesigned and contours of the resonance lines of K and Na have been examined in absorption and relative 'f' values have been computed by the Director.

From a photometric study of the CN band at 3883 in the solar spectrum with the high dispersion Littrow Spectrograph of this observatory, Mr. K. N. Rao has derived temperatures of 5,000° and 4500° K at the centre and limb of the sun respectively. Further work on the C_2 and CH bands in the solar spectrum is in progress.

Mr. S. A. Rahamatullah has completed a statistical examination of variation in area of Hα absorption markings from centre to limb. These results are based on the spectroheliograms taken at Kodaikanal during the years 1926—39.

On account of the shortage of photographic plates and papers, experiments on the preparation of suitably sensitised bromide papers and plates were started by Mr. N. R. Rao and the results obtained so far are successful.

8. *Sun-spots.*—The following table gives the monthly numbers of new groups observed at Kodaikanal and their distribution in the northern and southern hemispheres, and also the mean daily numbers :—

1943	January	February	March	April	May	June	July	August	September	October	November	December	Total
New groups ..	6	12	9	4	3	5	5	9	5	4	5	7	74
North ..	3	8	5	3	2	3	3	3	3	1	3	4	41
South ..	3	4	4	1	1	2	2	6	2	3	2	3	33
Mean daily numbers	1·3	1·7	1·6	1·6	1·0	0·8	0·8	1·9	0·6	0·6	0·8	1.6	1·2

Both the number of new groups and the mean daily numbers show a decrease of 43% compared with the previous year. The sun's disc was free from spots on 61 days. The approximate mean latitude of spots was 9° and 8° in the northern and southern hemispheres respectively. The high latitude spot of May 16, in the southern hemisphere, the precursor of the new cycle of solar activity could not be observed on account of cloudy skies ; but the attendant faculae reappeared on the east limb of June 5. From this, it can be presumed that the spot minimum is likely to occur about the middle of 1944. Bright reversals of the Hα line in the neighbourhood of sunspots were observed with the spectroscope on 122 occasions, compared to 295 in 1942. The displacements in the neighbourhood of sunspots were only 4 as against 9 during the previous year. D_3 was observed as a dark line on 94 occasions as against 185 during 1942.

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

Areas.

1943	North	South	Total	
Jan.—June	1·24	1·38	2·62	(Sq. minutes.)
July—December	1·13	1·43	2·56	(Sq. minutes).
		Numbers.		
Jan.—June	4·99	4·85	9·84	
July—December	4·30	4·75	9·05	

There has been a decrease of 19% in areas and 18% in numbers when compared with the figures for the previous year. Both the areas and numbers show a preponderance in the southern hemisphere as in 1942. The distribution in areas shows maximum activity at 30° to 35° and 45° to 50° in the northern and southern hemispheres respectively. The distribution of numbers is maximum between 35° to 40° in the northern and 45° to 50° in the southern hemispheres.

Only two metallic prominences were observed during the year as against 26 during the previous year. Both were in the northern hemisphere between equator and 14° latitude. Displacements of the 'C' line in the chromosphere and in prominences observed during the year with the spectroscope numbered 47, compared to 54 in 1942. Of these, 27 were towards red and 20 towards violet.

The displacements observed in prominences with the spectrohelioscope numbered 86 as against 210 during the previous year. Of these, 38 were in the northern hemisphere and 48 in the southern, while 45 were on the east limb and 41 on the west. The largest displacement observed during the year was 4·5A° to red in an eruptive prominence on March 17.

An eruptive prominence photographed on the west limb of the sun on February 18 reached a maximum height of nearly 5 minutes.

The mean daily area of hydrogen absorption markings (without foreshortening correction) was 1704 millionths of the sun's visible hemisphere as against 2888 millionths during 1942, showing a marked decrease of 41%. The distribution of areas in latitude shows maximum activity between 15° and 20° and between 45° and 50° in the northern and southern hemispheres respectively.

10. *Time.*—The error of the standard clock of this observatory was determined mainly by reference to the 8—45 and 13—30 hours I. S. T. wireless time signals from Bombay and Greenwich respectively and by occasional observations at the Transit Instrument.

11. *Seismology.*—The Milne-Shaw seismograph recorded 136 earthquakes during the year and the details of the records are incorporated in the Quarterly Seismological Bulletins published by the India Meteorological Department.

12. *Publications.*—The following papers were contributed by the staff during the year for publication :

1. " On the Presence of Phosphorous in the Solar Atmosphere ": by K. N. Rao, Indian Journal of Physics, Vol. 17 Pt. 4, *p* 197.
2. " On the Band Spectrum of Phosphorus "—Part I Rotational Structure : by K. N. Rao, Indian Journal of Physics, Vol. 17 Pt. 3, *p.* 135.
3. " On the Band Spectrum of Phosphorus"—Part II Alternating Intensities and Nuclear Spin : by K. N. Rao, Indian Journal of Physics, Vol. 17 Pt. 3 *p.* 149.
4. Two notes, one on " The Temperature of the Solar Reversing Layer ", and the other on " A Comparison of Limb and Disc Spectra " : by K. N. Rao—(in press) Science and Culture.
5. " On the Temperature of the Solar Reversing Layer " : by K. N. Rao, (in press) Indian Journal of Physics.

KODAIKANAL,
January, 1943.

A. L. NARAYAN,
Director,
Kodaikanal Observatory.

M86DGOb—820—5-11-48—GIPS