

REPORT* OF THE KODAIKANAL OBSERVATORY FOR THE YEAR 1942,

The data of solar activity given in this report are based on Kodai-kanal observations only.

During the year 1942, there has been a further decrease in all forms of solar activity. It is fairly probable that the minimum will be reached in 1944.

As usual this observatory supplied to the Solar Physics Observatory, Cambridge, original calcium disc spectroheliograms for 300 days.

Daily character figures of solar activity according to $H\alpha$ bright flocculi and $H\alpha$ absorption markings were communicated to Mr. H. W. 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 as derived from calcium flocculi from Kodaikanal photographs were communicated for publication by the Solar Physics Observatory, Cambridge combined with their own.

2. *Observing conditions.*—Observing conditions for solar observations were nearly the same as during the previous year. The mean value of the definition in the north dome before 11 A.M. (present I. S. T. [G.M.T. + 0630 hrs.] was 2.3 on a scale in which 1 is the worst and 5 the best; the number of days on which definition was estimated as 4 or above was 9 as against 3 during the previous year.

3. *Photoheliograph.*—Direct photographs of the sun on a scale of 8 inches to the sun's diameter were taken on 325 days using 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 300 days, prominence plates in K light on 288 days and $H\alpha$ disc plates on 272 days. The total number of spectroheliograms taken during the year was 1828.

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

6. *Spectrohelioscope.*—Observations were made on all days of favourable weather except Sundays and public holidays. The details of the observations of chromospheric eruptions and the radial velocities in the prominences and in dark and bright markings are summarised in the Bulletins of this observatory. Quarterly lists of chromospheric eruptions together with the times when the sun was under observation were communicated for inclusion in the "Bulletins of Solar Activity".

7. *Research work.*—The photoelectric spectrophotometer mentioned in last year's report is now in efficient working order. The work on the intensities and contours of the Fraunhofer lines with this instrument has been continued.

The results of the observations of magnesium b group on the sun made with the Direct-Reading Spectrophotometer have been published.

* The 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.

A further examination of the coincidences of lines in the OD band with those in the solar spectrum indicates the probable absence of the OD molecule in the sun.

From a study of coincidences of lines in the two strong bands (8, 27) and (9, 28) of phosphorus with solar lines of intensity zero and less, it is concluded that the molecule of phosphorus exists in the solar atmosphere. Further work is in progress.

A statistical study of Doppler displacements observed at the spectrohelioscope in prominences and dark markings from 1935 to 1942 has revealed a maximum frequency at 36 km/sec, irrespective of association with sunspots.

8. *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:—

1942.	January	February	March	April	May	June	July	August	September	October	November	December	Year.
New groups ..	10	15	15	22	5	5	10	6	9	15	12	6	130
North ..	4	9	10	12	3	3	3	5	3	5	3	4	64
South ..	6	6	5	10	2	2	7	1	6	10	9	2	66
Mean daily numbers	2.4	3.3	3.0	3.8	2.0	0.8	1.6	1.6	1.5	1.5	2.0	1.8	2.4

The number of new groups showed a decrease of 25% and the mean daily numbers a decrease of 34% compared with the previous year. The sun's disc was free from spots on 24 days. The approximate mean latitude of spots was $9^{\circ} \cdot 7$ in the northern hemisphere and $8^{\circ} \cdot 5$ in the southern. Bright reversals of H α line in the neighbourhood of sunspots were observed with the spectroscope on 295 occasions as against 364 in the previous year. The displacements observed in the neighbourhood of sunspots numbered 9 as against 7 during the previous year. Of these, 6 were towards red and 3 towards red and violet simultaneously. D $_3$ was observed as a dark line on 185 occasions as against 276 during 1941.

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

Areas.

	North.	South.	Total.	
Jan.—June	1.79	1.88	3.67	(Sq. minutes).
July—Decr.	1.04	1.56	2.60	(Sq. minutes).
<i>Numbers.</i>				
Jan.—June	6.21	6.68	12.29	
July—Decr.	4.61	6.01	10.62	

There has been a decrease of 16% in areas and 10% in numbers when compared with the figures for the previous year. Both the areas and numbers show a preponderance in the southern hemisphere. The distribution in areas shows maximum activity between 20° and 35° in both the hemispheres. The distribution of numbers is nearly uniform from equator to latitudes 40° and 50° in the northern and southern hemispheres respectively.

Twenty six metallic prominences were observed during the year being the same as in the previous year. Of these 15 were in the northern hemisphere and 11 in the southern; all of them were situated from equator to latitude 30°. Displacements of the 'C' line in the chromosphere and prominences observed during the year with the spectroscope numbered 84 as against 54 in 1941. Of these, 41 were towards the red, 39 to violet and 4 both ways simultaneously.

The displacements observed in prominences with the spectrohelioscope numbered 210 as against 64 in 1941. Of these, 104 were in the northern hemisphere and 106 in the southern while 107 were on the east limb and 103 on the west. The largest displacements observed during the year were 5.5 A° to red and 5.5 A° to violet in an eruptive prominence.

An eruptive prominence photographed on May 1 on the east limb of the sun reached a maximum height of nearly 8½ minutes.

The mean daily area of hydrogen absorption markings (without forestripping correction) was 2888 millionths of the sun's visible hemisphere as against 3117 during the previous year, showing a decrease of 7%. The distribution of areas in latitude showed maximum activity between equator and latitude 20° in both hemispheres. The largest hydrogen absorption marking of the year photographed on February 2 covered an area of about 5162 millionths of the sun's visible hemisphere, stretching over a length of nearly 150° in both the hemispheres.

10. *Time*.—The error of the standard clock of this observatory was determined as in former years by reference to the 16-hours signal* distributed from Alipore Observatory, Calcutta. The signal was received accurately on most days and all failures were reported to the Postmaster-General, Madras.

11. *Seismology*.—The Milne-Shaw seismograph recorded 131 earthquakes during the year. The details of records are incorporated in the Quarterly Seismological Bulletins published by the India Meteorological Department.

12. *Publications*.—The Annual Report for 1941 was published during the year. The printing of Kodaikanal Observatory Bulletins and Annual Reports has been suspended for the duration of war on account of paper shortage. The research work carried out is indicated by the following publications contributed by the staff during the year :—

* The reception of the signal is rendered possible by the courtesy of the Telegraph Department which permits the telegraph line to be joined through to this Observatory.

1. Photometric Studies of Some Strong Fraunhofer Lines in the Solar Spectrum, Part I. Mg b group : by Y. P. Rao and C. K. Anantasubrahmanyam—Indian Journal of Physics, Vol. XVI Part IV.

2. The Motion of Gases in the Sun's Atmosphere, Part IV : On the Occurrence of Highly Stripped Atoms in the Corona : by A. K. Das and Y. P. Rao—Indian Journal of Physics, Vol. XVI Part V.

3. The Presence of the Heavy Isotope of Hydrogen in the Solar Atmosphere : by Y. P. Rao—Science and Culture, Vol. VII No. 12.

4. The Structure of Band Spectrum of Phosphorus and Nuclear Spin : by K. N. Rao—Current Science—September 1942.

5. The Band Spectrum of Phosphorus—Part I : Rotational Structure: by K. N. Rao (in press).

6. The Band Spectrum of Phosphorus—Part II :—Alternating Intensities and Nuclear Spin : by K. N. Rao (in press).

KODAIKANAL ;
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