

Kodaikanal Observatory, Kodaikanal

(Director, Dr A. K. Das)

General.—On 1956 February 17 news was received of the sudden and untimely death of Professor M. N. Saha on the previous day. The observatory was declared closed for the afternoon of February 17 as a mark of respect to his memory. On November 23 news was received of the death of Mr John Evershed who was Assistant Director of the Kodaikanal Observatory from 1907 to 1911 and Director from 1911 to 1922 ; as a mark of respect to his memory the Observatory was closed for the rest of the day.

On a request from the International Astronomical Union, the Observatory agreed to participate in the international study of the development of sunspot-groups and in the cooperative photographic flare patrol during 1957–58.

Information regarding the observations (optical, magnetic and ionospheric) of the great solar flare of 1956 February 23 made at the Observatory was supplied on request to several scientific institutions and individual scientists in the U.K. and the U.S.A. A brief account of these observations will be found in the *Indian Journal of Meteorology and Geophysics* (8, No. 1, 1957).

In connection with the international photographic and visual patrol of Mars during the 1956 opposition, observations were made with the 20-inch Grubb Reflector and the 8-inch Cooke Refractor whenever weather permitted.

Steps were taken for placing final orders with Messrs Recherches et Etudes d'Optique et de Sciences Connexes, Paris, for an 8-inch Coronagraph for the Observatory. The optical parts for the Coronagraph will be constructed at the Institut d'Optique Théorique et Appliquée of Paris.

Scientific co-operation.—Exchange of spectroheliograms with foreign observatories was continued. 284 K-disk spectroheliograms for the period 1955 October–1956 September were sent to the Cambridge University Observatories. For the period 1955 July–1956 June 52 H-alpha disk and 53 K disk spectroheliograms were received from the Meudon Observatory, France, and 67 H-alpha disk and 84 K prominence spectroheliograms from the Mt Wilson Observatory, U.S.A.

Copies of daily spectroheliograms (disk in H-alpha and K and limb in K) were supplied in fortnightly batches to the Fraunhofer Institute, Germany, for the preparation of daily solar charts.

Two photoheliograms together with the relevant zero plates for certain specified dates in 1955-56 were supplied to the Astronomer Royal, Royal Greenwich Observatory, England.

Quarterly statements relating to solar flares were sent, as in previous years, to the Meudon Observatory, France, and to the Royal Greenwich Observatory, England.

Periodical statements of data of solar flares, relative sunspot numbers, ionospheric parameters and S.I.D.'s, information relating to central meridian passage of prominent sunspots, and forecasts of expected magnetic and ionospheric disturbances were supplied to a number of interested institutions in India.

Monthly median values of F2 layer critical frequency and maximum usable frequency factor for 3000 km transmission were supplied, as in previous years, to the Central Radio Propagation Laboratory, National Bureau of Standards, U.S.A. Quarterly statements of monthly median values of all ionospheric parameters were also supplied to the above institution and to the Radio Research Station, Slough, England. Magnetic storm data were sent every quarter to Professor John A. Simpson of the University of Chicago. The practice of broadcasting URSIGRAMMES relating to solar and geomagnetic activity was continued.

Routine observations.—Photoheliograms were made on 309 days and visual observations were possible on 305 days as compared with 289 days each in 1955. H-alpha disk, K disk and K prominence spectroheliograms were taken on 301, 293 and 267 days as compared to 275, 264 and 258 days respectively in the previous year. Observations with the spectrohelioscope were made on 295 days.

The average definition of the Sun's image on a scale in which 1 is the worst and 5 the best was 2.3. There were 18 days on which the definition was 4 or better.

Sunspot activity.—With the approach of the maximum of the solar cycle there was a marked increase in sunspot activity during the year. The yearly mean latitude of all the observed spotgroups in the northern and southern hemispheres was $24^{\circ}6$ and $21^{\circ}0$ respectively as against $25^{\circ}1$ and $25^{\circ}5$ for the previous year. Details of sunspot observations are given in the following table :

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
No. of new spot-groups { N	6	11	16	14	16	11	14	11	18	18	11	12	158
{ S	9	12	10	18	15	9	8	13	12	16	12	15	149
Mean daily no. of spot-groups	3.54	5.00	6.83	7.33	6.00	4.78	6.62	6.40	7.90	6.72	6.88	6.89	6.24
Kodaikanal daily relative sunspot number	62.6	88.3	107.9	115.0	102.7	81.1	99.6	116.6	132.5	110.9	129.3	126.5	106.1

Solar flares.—54 solar flares were observed during the year : 46 of intensity 1, 7 of intensity 2 and 1 of intensity 3.

Radio astronomy.—A receiver for 10 cm radiation specially constructed for Kodaikanal Observatory by the Division of Radio Physics, Commonwealth Scientific and Industrial Research Organization, Australia, was received.

Preliminary tests of its performance were made ; the antenna system of the Radio Telescope was under construction in the observatory workshop.

Geomagnetic observations.—Continuous photographic recording of H , Z and D with Watson and La Cour Magnetographs and visible recording of H with an Askania Field Balance were continued. Values of H , D and Z were determined weekly with QHM Nos. 254, 255 and 256 and a BMZ. Absolute measurements of H and D with the Kew Magnetometer and of the vertical force with an Earth-inductor were also made once every month.

One set of Eschenhagen variometers made by Askania Werke, Germany, was received, tested, and kept ready for installation at one of the field stations to be set up in South India during the coming International Geophysical Year.

During the year under review, 33 storms including 18 of sudden commencement type were recorded with ranges in H between 468 γ and 128 γ .

Ionospheric observations.—Round-the-clock ionospheric observations with the C.R.P.L. type C-3 Ionosphere Recorder were continued.

Regular field-intensity measurements were made on two frequencies.

Cosmic ray.—The Kolhörster Cosmic Ray Recorder, which had not been functioning for some time past, was again put into regular operation.

Seismology.—The Milne-Shaw Seismograph (E-W) component recorded 145 earthquakes.

Meteorology.—Meteorological observations with all the visual and self-recording instruments were carried out as usual.

Library.—53 books and 1899 periodicals were added to the library.

Research work.—Under the Research Training Scheme sponsored by the Ministry of Education, Government of India, one Senior and two Junior Research Scholars were working in the Observatory in 1956. The two Junior Research Scholars were released from the scheme in 1956 October after completion of their training.

The following problems in astrophysics and geophysics were under investigation :

1. The solar flare of 1956 February 23 and related geomagnetic and magnetic effects.
2. Study of contours of solar Fraunhofer lines, especially their variation from the centre of the disk to the extreme limb.
3. Study of variation of continuous absorption in the near ultraviolet solar spectrum.
4. Study of the red-shift of solar spectrum lines and its relation to the theory of relativity.
5. The distribution of calcium flocculi on the Sun's disk.
6. Study of magnetic fields of Venus, Mercury and the Moon.
7. Analysis of ionospheric and geomagnetic data collected in connection with the partial solar eclipse of 1955 December 14.
8. Scattering in F layer over Kodaikanal.
9. Total electron content per unit area of the ionosphere over Kodaikanal.
10. Lunar daily variation of magnetic field at Kodaikanal.

Publications.—The following papers and notes were either published or prepared for publication :

- (1) " The Solar Flare of 1956 February 23 ", *Indian J. of Met. and Geophys.*
- (2) " The Magnetic Field of Venus ", presented at the Indian Science Congress, 1957.
- (3) " Effect of Lightning Discharges on Magnetographs ", *Nature*.

- (4) "Quarterly synopses of results of solar, magnetic and ionospheric observations"
Indian J. of Met. and Geophys.
- (5) Annual Report of the Kodaikanal Observatory for the year 1955.
- (6) *Kodaikanal Observatory Bulletins Nos. 142 and 143*, giving summary of results of solar and magnetic observations.
- (7) Reports to the Society on (a) the work of the Kodaikanal Observatory, and (b) the prominence activity for the year 1955.