# REPORT

OF THE

# KODAIKANAL OBSERVATORY

FOR THE YEAR

# 1928

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# REPORT OF THE KODAIKANAL OBSERVATORY FOR THE YEAR 1928.

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. *Preliminary* :—There has been but slight increase of solar activity over the previous year, the mean daily number of spots showing an increase of only 2 per cent, the mean daily areas of prominences on the limb and those seen on the disc by absorption showing an increase of 8 per cent and prominence numbers a slight decrease.

The collection of spectroheliograms from other observatories for those days on which 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.

Copies of 230 spectroheliograms for the years 1922–25 were sent by request to the Meudon Observatory.

Commencing from January 1st, 1928 daily character figures for solar activity as regards H$\alpha$ bright flocculi and H$\alpha$ dark markings were communicated to the International Astronomical Union. The character figures for K bright flocculi from Kodaikanal plates are communicated by the Cambridge Observatory, combined with their own.

3. *Weather conditions* :—Weather conditions obtaining in the morning were on the whole slightly less favourable for solar observations than the previous year. The mean value of the definition in the north dome before 10 a.m. was 2·8 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.

4. *Photoheliograph* :—Photographs on a scale of 8 inches to the sun's diameter were taken on 333 days using a 6 inch achromatic object glass and a green colour screen.

5. *Spectroheliographs* :—Monochromatic images of the sun's disc in K light were obtained on 329 days, prominence plates on 297 days and H$\alpha$ disc plates on 302 days. During the year a total of 2,474 spectroheliograms were obtained.

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

7. The remodelled H$\alpha$ spectroheliograph has been in operation throughout the year and has shown greatly improved stability over the previous arrangement. The value of the new occulting disc holder for prominence photographs mentioned in the last report has been exemplified in the recording on November 19th, 1928 of the highest

prominence ever photographed at Kodaikanal. The successful photography of rapidly moving prominences largely depends on not losing time unnecessarily. With this new disc holder the time lost in moving the sun and disc holder so as to accommodate the great height of a prominence need only be a few seconds, whatever may be the position angle of the prominence. The same disc holder is now used for the H$\alpha$ prominences also.

8. In consequence of the increase of speed in modern panchromatic plates it has been found possible to obtain spectroheliograms of prominences in hydrogen light in addition to those of calcium. Prominences were photographed in hydrogen light only occasionally in 1928 commencing from the month of November but experience seems to warrant the inclusion of hydrogen prominences in the daily programme from January 1st 1929.

9. At the request of the Joint Eclipse Committee, the Director carried out tests for the best working conditions for neocyanine plates in Madras where the temperature and humidity are similar to those obtaining in Siam at the 1929 May eclipse where these plates are to be used. It was found that even without the use of ice or fans the speed was not markedly less than in temperate climates and that the commercial plates worked more cleanly than dyed plates although the speed was not greater. The director wishes to express his thanks to Prof. H. Parameswaran, D.Sc., for placing the facilities of the laboratory of the Presidency College at his disposal for the purpose of this investigation.

10. A Dobson's spectrograph for the determination of the amount of ozone in the atmosphere has been loaned to the observatory and since September 12th 1928 plates have been exposed daily whenever weather conditions permitted.

11. At the request of the British Research Association for the Woollen and Worsted Industries, Leeds, a number of samples of dyed fabrics were exposed to sunlight to test their fading.

*Summary of sunspots and prominence observations.*

12. *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 of spots visible are also given:—

| 1928. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New groups ... | 26 | 22 | 24 | 21 | 19 | 19 | 23 | 22 | 17 | 30 | 16 | 28 | 267 |
| North ... ... | 12 | 10 | 9 | 9 | 7 | 14 | 11 | 12 | 8 | 15 | 9 | 15 | 131 |
| South ... ... | 14 | 12 | 15 | 12 | 12 | 5 | 12 | 10 | 9 | 15 | 7 | 13 | 136 |
| Mean daily numbers. | 5·0 | 4·1 | 4·7 | 5·6 | 4·5 | 5·5 | 5·5 | 5·7 | 4·5 | 4·5 | 4·4 | 5·3 | 4·9 |

While the actual number of new groups observed has fallen by 5 per cent, the mean daily number shows a slight increase of 2 per cent compared with the previous year. The preponderance in the southern hemisphere has become much reduced during the year.

The approximate mean latitude of the spots was 13°·0 in the northern and 13°·9 in the southern hemisphere.

Bright reversals of the H*α* line in the neighbourhood of sunspots numbered 915, as against 803 in 1927. Displacements of the H*α* line on the disc totalled 352, an increase of 14 per cent over those of the previous year. Of these displacements 252 were towards the red, 96 towards the violet and 4 both ways simultaneously. $D_3$ was observed as a dark line on 841 occasions, as against 643 during 1927.

13. *Prominences* :—The mean daily areas in square minutes of arc derived from the Kodaikanal photographic records are as follows :—

| —— | North. | South. | Total. |
|---|---|---|---|
| 1928—January to June ... ... ... | 3·80 | 3·50 | 7·30 |
| July to December ... ... ... | 3·66 | 3·47 | 7·13 |

The mean daily numbers were 19·6 and 18·4 for the first and second half-years respectively. Compared with the year 1927, areas show an increase of 8 per cent and numbers a slight decrease.

A minimum of prominence areas near 50° is common to both hemispheres. There are peaks near 30° and 70° in the northern hemisphere, and at 15°, 35° and 60° in the southern. The activity near the poles is practically confined to the northern hemisphere.

The highest prominence ever recorded at Kodaikanal was photographed on the 19th November 1928 and had reached a height of 20′·9, or 910,000 km., when clouds intervened.

Prominences exhibiting metallic lines numbered 79 as against 81 in the year 1927. None of these were in high latitudes and only two between 31° and 40° in the first half of the year; all the rest were below 30°. Displacements of the hydrogen line in the chromosphere and prominences observed during the year numbered 1061 as against 787 in 1927. Of the displacements 593 were towards the red, 449 towards the violet and 19 both ways simultaneously.

The mean daily area of prominences projected on the disc as absorption markings in hydrogen light was 4088 millionths of the sun's visible disc, an increase of 8 per cent on the previous year. Of these, 64 per cent occurred in the southern hemisphere an unusually large predominance especially in view of the fact that prominences at the limb show a slight predominance in the northern hemisphere. The distribution in latitude is similar to that of prominences at the limb except that north of 50° the activity is very small.

14. *Time* :—The error of the standard clock is usually determined by reference to the 16 hour signal from the Madras Observatory. This is rendered possible by the courtesy of the Telegraph Department which

permits the Madras time signals to be joined through to this Observatory. The signal is received with accuracy on most days and all failures are at once reported to the Postmaster-General, Madras.

In addition a 4 valve wireless receiving set has been installed, and wireless time signals from Colombo, Calcutta, Bordeaux, Rugby and Nauen can be received daily on this set.

15. *Workshop*:—The equipment of the workshop has improved by the addition of a new 5 inch lathe, a drilling machine and a shaping machine.

16. *Seismology*:—The Milne horizontal pendulum recorded 102 earthquakes during the year. For details of the records reference may be made to the "India Weather Review".

17. *Library*:—One hundred and three volumes were bound during the year.

18. *Publications*:—The annual report for the year 1927 and the following bulletins were published and distributed during the year :—

LXXXII. A Brilliant Daylight Comet observed at Kodaikanal, by P. R. Chidambara Ayyar, B.A., F.R.A.S.

LXXXIII. Summary of Prominence observations for the first half of the year 1927, by T. Royds, D.Sc, F.R.A.S.

LXXXIV. Summary of Prominence observations for the second half of the year 1927, by T. Royds, D.Sc., F.R.A.S.

In addition, the Director has contributed an article on "A very high prominence on November 19th, 1928" to be read before the meeting of the Royal Astronomical Society.

Mr. P. R. Chidambara Ayyar has contributed a paper "Note on Prof. Perrine's Paper on Stellar Variability" on the subject of the external cause of solar phenomena, Astr. Nachrichten, Band 231, No. 5544.

KODAIKANAL,
*8th February* 1929.

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