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Letters to the Editor

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STUDY OF SOLAR RADIO FLUX IN 10 GHz BAND DURING PARTIAL SOLAR ECLIPSE OF 16 FEBRUARY 1980

Solar radio emission in the 10 GHz band was studied at Delhi during the partial solar eclipse on 16 February 1980. The equipment used is a sensitive X-band radar normally used for meteorological purposes. The experiment was conducted to study the variation of received radio emission with the progress of eclipse. The characteristics of the radar used are given below :

Frequency — 9.375 GHz

Antenna — 2 metres diameter

Beam width — 1.2 deg.

Gain — about 38 db

Polarization — Linear

2. *Method of observation* — As the radar is primarily designed for meteorological purposes, automatic tracking of the sun is not possible. Howeper, it is possible to precisely position the antenna for both elevation and azimuth to an accuracy of 0.1 deg. The elevation and azimuth angles of sun from 1400 to 1700 IST on 16 February 1980 were calculated at 5 minutes interval. Observations of the received solar radiation were taken every 5 minutes. Observational procedure consisted of pointing the antenna output of the receiver using an electronic voltmeter at the specified times. After every observation the antenna was moved away from the sun by about 50 deg. and a measurement which corresponds to noise in the radar receiver was measured. The difference between the two readings corresponds to the radio flux from the sun. As the receiver does not have a low noise pre-amplifier, the accuracy of the measurement is comparatively low. The estimated accuracy of the observations, is primarily limited by the system noise and measurement accuracy of the voltmeter readings. It is estimated that the accuracy is of the order of $\pm$ 5 per cent of the total quiet sun radio emission. The observations were taken every 5 minutes till the end of the eclipse.

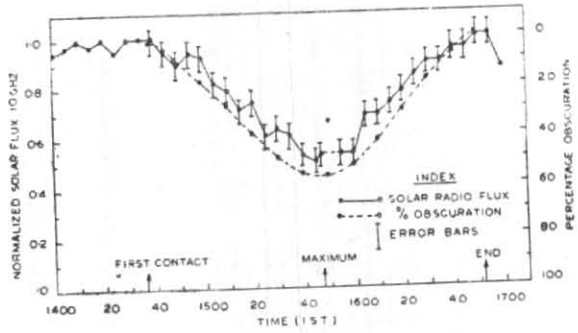

Fig. 1. Observed variation of solar radio flux at 10 GHz band and percentage obscuration for partial solar eclipse over New Delhi on 16 February 1980

3. *Results of observations* — The solar radio flux observed at each point is normalised with respect to the flux received from the sun before the eclipse. Fig. 1 shows the variation of received solar radio emission with time during the eclipse. On the same figure the variation of percentage of obscuration of the sun's disk with time is also plotted. The normalised radio emission decreases gradually starting from the first contact reaching the minimum value about 2 to 3 minutes before the maximum phase of the eclipse at Delhi.

The maximum decrease in the solar flux corresponding to the maximum obscuration of the sun's disk (56 per cent) is 50 per cent.

4. *Conclusions* — The observational results reported above are consistent with the previously known characteristics of the solar radio emission in the 10 GHz band (Kundu 1965). The radio emission of quiet sun in the 10 GHz band is uniform over the sun's disk (with a small limb brightening) and is expected to decrease uniformly with the progress of the eclipse in the absence of any isolated strong regions of radio emission. Present observations support this within the accuracy of measurement. The observational results are in contrast with observation of a Raghavan *et al.* (1980) who have reported a rapid fall in the received radio emission at 3 GHz starting about 24 minutes before the maximum phase. They have reported that the received radio emission remained more or less constant almost for one hour after the first

contact. However, the present observations are in fair agreement with the results reported by Bhonsle *et al.* (1981) who have observed the same total solar eclipse at a number of frequencies in the microwave region.

Efforts to identify any changes in the intensity with covering or uncovering of solar active regions were not successful primarily because of the low sensitivity of the equipment used.

5. The authors are thankful to Shri R. K. Jain and Shri N. H. Vijay Raghavan for helping in the observations.

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