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Formation and Observations of shadow bands

HARI OM VATS
Physical Research Laboratory
Ahmedabad 380009 INDIA

The phenomenon of shadow bands occurs just before and immediately after the total solar eclipse. The reason for this is the scattering of light from the thin solar arc by the air turbulence. The geometry of the solar eclipse plays a very important role in the duration and clear visibility of these bands. In most total solar eclipses this phenomenon last for a very brief period and it is also very faint. Thus the observations and recording of this have been very rare. Only experienced solar eclipse observers could see and make some observations as the recording of this is rather difficult. During total solar eclipse of 23 November 2003 wherein the totality was over the Antarctic region, using refractive-diffractive scattering approach (Booker and Vats, 1985), we predicted that this phenomenon will be very clear and last longer. The Indian team of solar eclipse recorded the phenomenon on a fast video camera at Maitri and surprisingly found that the shadow bands started being visible four minutes before the totality and lasted for seven minutes after the totality. It was an extremely exciting event to observe and investigate. The recording was done in full real colour by digital video camera, thus provided an opportunity to investigate shadow bands in R, G, and B bands. The cross-correlograms along the direction of motion showed a gradual fall with the increase of spatial lag and a sudden decrease in the transverse direction. The full correlation analysis has been used to derive scales of atmospheric turbulence as a function of time. The experimental values will be compared with the predictions of diffractive-refractive scattering theory. In this talk I propose to emphasize the circumstances of the phenomenon and high light the observed results.

Keywords: solar eclipse, total solar eclipse, shadow-bands, scintillation, atmospheric irregularities, turbulence, wave propagation.

References

[1] Booker H. G. and Hari Om Vats *Radio Science* **20**, 833 (1985).