

I. PHYSICS

Astrophysics (Solar Radiations and Atmospheric Lower Layers)

STUDY OF EARTH'S ATMOSPHERIC EMISSIONS

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SOLAR radiations influence earth's atmosphere in many ways. By producing excitation, dissociation and ionisation of atmospheric species, solar radiation controls their density and temperature distribution. Molecular OH and O₂ species were selected for study during the total solar eclipse because they yield important information on atmospheric ozone.

Keywords : Atmospheric Emissions; Solar Radiations; Atmospheric Ozone; Photometers.

EXPERIMENT

Being in an excited state, OH and O₂ molecules emit a characteristic faint glow. Hence, these species can be conveniently monitored through photometric observations at specific wavelenths. Details of these emissions are listed in the following Table :

TABLE I

Emitting species	Wavelength nm	Altitude of emission km
O ₂ ($a'_{\Delta_g} \rightarrow X^3\Sigma_g^-$)	(0.0) 1270	50-85
OH ($X^2\pi$)	(7.2) 694	80-100

Equipment

Two atmospheric photometers were built for carrying out these experiments. Wavelength selection of the emission was ensured by using narrow band optical interference filters. Continuum background emission was also simultaneously monitored in the selected wavelength regions. Since the observations were to be carried out in the near infrared region, PbS detector was used as the sensitive element in the O₂ photometer and a photo-conductive cell was used in the OH photometer. Electronics involving phase sensitive detection was employed to achieve higher signal/noise. Further improvement in the signal was obtained by cooling the detectors. Output of the electronic system was recorded on servotype recorders.

OBSERVATIONS

During the total solar eclipse it was observed that the intensities of these bands continuously decrease and beginning with the first contact.

LOCATION

Gadag. Latitude $75^{\circ} 37'E$; Longitude $15^{\circ} 25'N$.