

Study of aerosol optical depth and Angstrom parameters over a high altitude station above 2 km msl

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Extensive spectral extinction measurements of directly transmitted solar radiation for evaluating the spectral behavior of aerosol optical depth from a high altitude station located in the Shivalik ranges of central Himalayas were carried out at Manora Peak, Nainital (29.4°N, 79.5°E; altitude ~ 2.0 km above mean sea level). This station is one of the various ground based networks of Multiwavelength Radiometer (MWR) all over India and is a part of collaborative endeavor under ISRO Geosphere Biosphere Programme (I-GBP). The aerosol spectral optical depth $(\tau_{\rho\lambda})$ at ten narrow wavelength bands in the visible and near infrared ranges were estimated by applying the Langley plot techniques between the measured solar flux with the help of ground based MWR and air mass encountered by the transmitted solar radiation. These data were investigated for a period of three years to examine the temporal spectral aerosol optical depth and consequently the aerosol characteristics over this region. It has been found that the evaluated AODs showed extremely low values over the pristine environment of this high altitude station. Angstrom parameters (α and β) were deduced utilizing the estimated values of AODs over the three years. These parameters have been supplemented by simultaneously collected relative aerosol concentration obtained by the GRIMM aerosol spectrometer data since September 2004 as it has recently been acquired by ARIES. In general α was found to be well associated with the relative abundance of accumulation mode aerosols estimated from the simultaneous accumulation measurements by using GRIMM. The temporal variation shows the summer high and winter low values of AOD, which have largely influenced by the forenoon and afternoon signatures in the columnar AOD measurement. This anomaly in the forenoon / afternoon asymmetries over a high altitude station has been discussed on the line of its geographical location and boundary layer condition of the place.