Contribution of Near Surface Aerosols to Total Columnar Loading Over Dibrugarh in North East India

BINITA PATHAK, P K BHUYAN, K BHUYAN and GAYATRY KALITA
Department of Physics, Dibrugarh University, Dibrugarh 786004 Assam, India

Optical and physical properties of columnar and near surface aerosols studied using measurements made with a Multi Wavelength Radiometer and a QCM Impactor respectively over Dibrugarh (27.27°N, 94.54°E) for the period October 2007 to November 2009 are presented in this study. Results indicate that the seasonal mean AOD is highest during the pre monsoon season and lowest in retreating monsoon. The Ångström exponents α that indicaes abundance of fine mode particles is higher in monsoon and winter while β which is representative of coarse mode aerosols is predominant in pre monsoon season. Columnar size distribution analysis mostly shows bimodal characteristics with the primary mode at accumulation regime and the secondary mode at coarse regime while unimodal and unimodal plus power law distributions are also observed. The high columnar mass loading and higher effective radius of the aerosols during the pre monsoon season may be attributed to significant abundance of coarse aerosols. Accumulation and nucleation mode aerosols contribute more to the composite near surface aerosol mass concentration compared to that of coarse aerosols. Mass size distribution retrieved from near surface aerosol mass concentration is mostly bimodal with one mode at accumulation regime and the other at coarse mode regime. The number size distribution shows the possibility of a fine mode <0.05 μm and it monotonically decreases towards larger size particles in all seasons. The size index which is indicative of fine aerosol abundance varies oppositely with effective radius, the later being associated with coarse aerosols. Association between AOD and alpha with composite aerosol mass and accumulation aerosol mass respectively is not prominent. Black carbon mass concencentration shows peak in winter season and then decreases through premonsoon to reach the lowest level in monsoon. Fraction of BC to composite aerosol mass is highest in retreating monsoon and lowest in monsoon.BC mass concentration shows better association with AOD at 380nm than with alpha retrieved from columnar AOD. Vertical profile of aerosols retrieved from CALIPSO satellite indicates presence of an elevated aerosol layer around an altitude of 2 Km. This may the possible cause of lack of correlation between the columnar and near surface aerosols.