Longterm Climatology of Aerosols Over Dibrugarh - a Rural Continental site in NE India

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Characteristics of columnar aerosols measured using a Multiwavelength Solar Radiometer from period 2001 to 2010 and that of near surface aerosols measured using a Quartz Crystal Microbalance Impactor for the period 2007- 2010 and an Aethalometer for 2008- 2010 over Dibrugarh (27.27°N, 94.54°E) have been investigated and results are presented in this study. The seasonal mean AOD is highest during the pre monsoon season and lowest in the retreating monsoon for about all the ten discrete wavelengths within the 380-1025 nm. Simillar seasonal variation is observed in all the years. The Ångström exponents retrieved from spectral AODs indicate high abundance of fine mode particles in winter and monsoon seasons while coarse mode is predominant in pre monsoon. Cluster analysis of air back trajectories indicate advection of mineral dust from west Asia and Indian mainland and marine aerosols from Bay of Bengal which contributes significantly to coarse mode aerosols particularly in pre-monsoon. Columnar size distribution analysis mostly shows bimodal characteristics, the broad primary mode being at the accumulation regime and the prominent secondary mode at the coarse regime. Unimodal and unimodal plus power law type size distributions are also observed in some seasons. The high 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 compared to coarse aerosols to the composite near surface aerosol mass concentration throughout the year. Mass size distributions retrieved from near surface aerosol mass concentration is mostly bimodal with one mode at the accumulation regime and the other at the coarse regime. Multimodal characteristics are also observed in pre-monsoon season. The number size distribution shows the possibility of a fine mode < 0.05 μm and monotonically decreases towards larger size particles in all seasons. Black carbon mass concencentration peaks in winter and is lowest in monsoon. Fraction of BC to composite aerosol mass is highest in retreating monsoon and lowest in monsoon. Maximum and minimum value of absorption co-efficient of BC is observed in winter and monsoon respectively. The aerosol radiative forcing of the atmosphere has been estimated using OPAC outputs as inputs for SBDART. Seasonal forcing is negative at the surface while the top of the atmosphere forcing (TOA) is mostly positive resulting in positive forcing in the atmosphere.