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TEMPORAL CHARACTERISTICS OF BOUNDARY LAYER AEROSOLS OVER DIBRUGARH

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Abstract

The mass concentration and size distribution of ambient aerosols (particulate matter, PM) within the boundary layer have been measured by a Quartz Crystal Microbalance over Dibrugarh. The PM mass concentration shows systematic seasonal variation. It is highest in winter (December-February) due to favorable weather condition with scanty rain and then decreasing through pre-monsoon (March-May) reaches its minimum value in monsoon (June-September) due to removal from atmosphere by rain. The seasonal variation of the other two PM categories viz. PM_{10} (size < $10 \mu m$) and $PM_{2.5}$ (size < $2.5 \mu m$) is similar to the composite aerosol mass concentration (PM). The PM_{10} and $PM_{2.5}$ mass concentrations are further used for assessment of the air quality over the place.

Keywords: Aerosols, Particulate matter, Boundary layer, QCM, Radiative forcing, Air quality

1. Introduction

Atmospheric aerosols also called particulate matter (PM) residing near the earth surface i.e., within the boundary layer are very much important from the Geosphere and Biosphere perspective as they have strong direct and indirect influence on the environment, air quality, visibility, human health and climate. The aerosol abundance is highest near the surface as most of the aerosols sources (both natural and anthropogenic) are situated there. Also the near surface aerosols are strongly related to the sources. On account of this they exhibit a very high degree of spatio-temporal variability in both microphysical and chemical properties at short scales. The major sectors which contribute to PM_{10} (particulate matter less than $10 \mu m$ in size) are traffic, industry, agriculture and forestry, households and electric power plants. The mass concentration and mass size distribution of composite aerosols near the surface are one of the vital inputs in developing aerosol models especially for estimation of radiative forcing and to infer different environmental effects and air quality. In addition, the study of submicron range aerosols is important because of their longer residence times and also because these aerosols contribute more to the scattering and indirect radiative forcing through clouds (Toon, 2000). The fine or $PM_{2.5}$ (particulate matter less than $2.5 \mu m$ in size) aerosols have the largest effect on short wave radiative transfer (Nesub et al., 2000). The epidemiological studies conducted around the world have revealed associations between ambient particle concentrations and excesses in daily mortality and morbidity (Dockery et al., 1992). These findings have underlined the importance of ambient particles and the need for monitoring PM_{10} and its fractions $PM_{2.5}$.