Diurnal and Seasonal Aerosol Characteristics and Their Impact on Atmospheric Forcing

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

Long term diurnal and seasonal variations of aerosol optical depth are studied using data from a Multiwavelength Solar Radiometer for 2001 to 2010 over Dibrugarh (27.3°N, 94.6°E) and results are presented in this study. The seasonal mean AOD for full day observation 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. The obserservation of more than 5 hours on all clear and partly clear days have been seperated into forenoon and afternoon data sets. Simillar seasonal variation is observed in all the years. The peak AOD in the forenoon is observed in winter and pre monsoon and the minimum in monsoon and retreating monsoon. Simillarly, the maximum in afternoon AOD changes from pre-monsoon to monsoon. Thus a change in the seasonal pattern has been observed in different years of observation. Columnar size distribution analysis retrieved from AOD shows multimodal, unimodal, bimodal and unimodal plus power law characteristics in the retreating monsoon, winter, premonsoon and monsoon respectively in the forenoon. On the other hand in the afternoon, bimodal distribution is predominent except in pre-monsoon, which indicates that the sources which contribute to total AOD varies with season and also during the day. Analyses of airmass backtrajectory using NOAA HYSPLIT shows that aerosols from west Asia, Mainland of India, Bay of Bengal, east and south-east Asia and local sources contribute in different proportions to the total aerosol loading over Dibrugarh in different seasons and also during forenoon and afternoon hours of the same day. The impact of these variations in aerosol properties on the atmosphere is investigated by estimating the aerosol radiative forcing of the atmosphere using OPAC outputs as inputs for SBDART model. Diurnal and seasonal forcing is negative at the surface while the top of the atmosphere forcing is mostly positive resulting in positive forcing in the atmosphere. However, the magnitude of forcing has been found to be different in the fornoon hours comapared to that in the afternoon hours.