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- Aerosol Fundamentals: Physics and Chemistry
- Aerosol Instrumentation
- Aerosol Remote Sensing
- Aerosol Climate Effects
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AEROSOL OPTICAL AND RADIATIVE PROPERTIES OVER NORTH-EAST INDIA DERIVED FROM MODIS AND CERES

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INTRODUCTION

The surface reaching solar radiation is a key component of the net radiation balance at the surface determining the regional climate. Since the middle of the twentieth century surface reaching solar radiation has undergone decadal variations in many parts of the world leading to global dimming up to 1990 (Liu, *et al.*, 2004; Stanhill and Cohen, 2001) and brightening after 1990 (e.g., Wild *et al.*, 2005). However, at few regions continuous dimming is observed (Che *et al.*, 2005; Padma Kumari, *et al.*, 2007). It is believed that solar dimming is caused by the aerosols through their direct and indirect effects. Aerosols participate in the Earth's energy budget directly by scattering and absorbing solar radiation (e.g., McCormick and Ludwig, 1967) and indirectly by acting as cloud condensation nuclei and thereby affecting cloud microphysical and radiative properties (e.g., Gunn and Phillips, 1957), with feedbacks to the hydrological cycle (e.g., Lohmann and Feichter, 1997). A significant continued dimming has also been observed over India under all sky conditions (Padma Kumari, *et al.*, 2007; Ramanathan, *et al.*, 2005), where aerosols and clouds together contributed to the annual trend. Decrease in surface solar radiation may lead to decrease in evaporation and slowdown of the monsoon hydrological cycle (Wild, *et al.*, 2005; Ramanathan, *et al.*, 2005). This observation of significant decreasing trend of surface reaching solar radiation has important implications on the role of aerosols relative to that of green house gases on the regional monsoon climate especially in the context of observed increasing trend of surface temperatures over the region (Kothawale and Rupa Kumar, 2005). Current global radiative balance estimates attribute to the atmospheric aerosols a negative forcing comparable and opposite to the one of greenhouse gases (e.g. Penner, *et al.*, 2001). Due to large uncertainty in global distribution and mixing states of aerosols, knowledge on its direct radiative forcing is limited to a large extent. This is also due to large heterogeneity in aerosol properties and inadequate data from regions of interest. For example, high population density and resultant anthropogenic action in the South and South-east Asia including the Indian subcontinent might greatly contribute to the alteration of earth's radiation budget. As such characterization of atmospheric aerosols from the location like north-eastern part of India, which is unique owing to its unique topography (Gogoi, *et al.*, 2011, Pathak, *et al.*, 2012) would add up to the knowledge of regional picture of aerosol radiative forcing. Earlier Pathak, *et al.*, (2010) have estimated the aerosol radiative forcing over Dibrugarh, but information from only one location is not enough to provide the regional ARF and impact of aerosols on climate.

The present work aims to study the optical properties and hence to assess the radiative impacts of the complex aerosol system over the north-east Indian region using MODIS and CERES satellite observations.

STUDY LOCATION AND DATA

The North Eastern (NE) region stretches between 22°N and 30°N latitude and 88°E and 98°E longitude. The region comprises of the states of Arunachal Pradesh, Assam, Manipur, Nagaland,