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LONG TERM SATELLITE BASED STUDY ON AEROSOL AND TRACE GASES OVER THE CAPITAL CITY OF ASSAM, GUWAHATI

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Abstract:

The variability and trend in aerosol optical depth (AOD) by using the Moderate Resolution Imaging Spectroradiometer (MODIS) level 3 Collection 6 data at 550 nm for the period January, 2004 to December, 2016 and tropospheric columns of nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) data by using Ozone Monitoring Instrument (OMI) has been studied for the period October, 2004 to December, 2016 over capital city of Assam, Guwahati. The monthly average AOD value varies from its highest value (0.63±0.09) in March to its lowest value (0.23±0.05) in October for the study period over Guwahati. The seasonally averaged AOD reached its maximum in pre-monsoon (0.61 ± 0.06), followed by winter (0.47 ± 0.07) and monsoon (0.41 ± 0.04), with the minimum occurring in post-monsoon (0.25 ± 0.06) season. The observed Ångström exponent value varies from its minimum value (1.18 ± 0.05) in monsoon season to its maximum value (1.35 ± 0.09) in post-monsoon season. Considerable long-term annual increasing trends in AOD, Ångström exponent and tropospheric NO_2 column are observed over the study location. Increasing trend of number of vehicles along with their emissions degrades the air quality and thereby contributing to the increasing trend of AOD over Guwahati. Significant correlation between long term averaged MODIS AOD and OMI NO_2 tropospheric columns with same

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seasonality indicating their same source of origination. Long term increasing trend in Ångström exponents (~0.008 per year) signify the contribution of smaller size aerosols attributed to urbanisation and human activity over Guwahati.

Keywords: Aerosol Optical Depth, Air Quality, Remote Sensing, Biomass Burning

1. INTRODUCTION

Trace gases, in turn, act recursors

Satellite remote sensing technique provides a primary tool to understand the role of atmospheric aerosol particles in Earth system science as well as climate [1]. A measurement-based characterization of atmospheric aerosols on a global scale can only be realized through satellite remote sensing, because of short lifetime of aerosols, complex chemical composition and interaction in the atmosphere that result in large spatial and temporal heterogeneities [2]. Satellite data of pollutants in the atmosphere are becoming more extensively used in the decision-making as well as environmental management activities of public, private sector and non-profit organization [3]. Remote sensing techniques are a very helpful tool for understanding Earth processes as well as evaluating performances of model predictions on weather and climate change. Atmospheric aerosols and trace gases are highly variable in both space and time due to their limited lifetime in the atmosphere. The uncertainty in global climate models is generally caused by a lack of knowledge on the occurrence and concentration of aerosols on a global scale [4]. To explain the past and present climate and predict the future climate change, accurate knowledge is necessary on the complex relation between the aerosol composition and the source of emissions of both aerosols and precursor gases. Instruments mounted on satellites can provide the spatial distribution of atmospheric aerosol, trace gases etc. on regional as well as global scale. In field experiments, data are usually available for some selected locations; hence satellite remote sensing fill the need for

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