Parallel Session B:
Coupled Models

B3: Biogeochemical processes

POSTER PRESENTATIONS

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B3-P-01

Assessment on the variability in optical and radiative effects of key aerosol types over IGP and NCP regions: Temporal heterogeneity and source identification

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Radiative forcing due to aerosols is a key parameter in quantifying their crucial impacts on climate change. It largely depends on chemical, optical and microphysical characteristics of aerosols. In order to understand the temporal evolution, properties, and effects of atmospheric aerosols over the IGP (Indo-Gangetic Plain) and NCP (North China Plain), considered as aerosol hotspot regions located in Asia, significant knowledge on the aerosol heterogeneity have been well established from individual observations over different sites in the two regions using limited span of measured data. To the best of our knowledge and existing literature, we understand that none of the researchers have studied and compared the aerosol characteristics utilizing the existing long-term AERONET data over these large aerosol regions. To achieve an in-depth understanding in the aforementioned, the present study aimed to identify and classify the major aerosol types following the very important clustering techniques adapted by several authors (e.g., Russell et al., 2012) and investigate the possible implications to radiative forcing over the regions based on the AERONET's sun photometer measured data during 2007-2018.

Differentiation of aerosol types over the selected sites in two regions was made using the appropriate thresholds for size-distribution of aerosols (i.e. fine-mode fraction, FMF) and radiation absorptivity (i.e. SSA440 and EAE). A detailed knowledge on the dominant absorption aerosol types was also investigated to unravel the mechanisms of aerosol radiative forcing and improve the accuracy of satellite remote sensing. Four different aerosol types were identified, viz., pure dust (PUD), polluted dust (POD), polluted continent (POC), mostly absorbing (MAB i.e., black carbon) and mostly non-absorbing (MNA i.e., organic carbon), in which the contribution of MAB type was found higher in Beijing and Lahore followed by POC to the total aerosols. However, Sacol and Karachi sites were found affected mostly with PUD, POD and POC. To detect the presence of specific emission sources that enhance the pollution over receptor sites, the conditional bivariate probability function (CBPF) and concentration weighted trajectory model are employed in the present study. Besides, the spectral dependencies of optical properties for these aerosol types differed considerably, with low variations for the dust and absorbing type of aerosols in AOD and SSA, respectively. The results will be further used to assess and quantify their radiative implications over the study regions. It is revealed that the higher atmospheric forcing was observed for MAB aerosol type at Beijing followed by POD type in Lahore, Karachi and Sacol along with the corresponding higher atmospheric heating rates. Whereas, the lowest was found for the POC aerosol type in Kanpur and Lahore during the study period.

Keywords: AERONET, Aerosol types, Optical and radiative effects, Multivariate statistical analysis, Asia

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B3-P-02

Spatio-temporal distribution of Aerosol Optical Depth over South Asia using MODIS data

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Aerosols play an important role in climate of the region. In this paper an effort has been made to study the spatio-temporal trends of aerosol optical depth (AOD) over South Asia. For this purpose, we have used AOD at 550 nm from Moderate Resolution Imaging Spectroradiometer (MODIS) during the period September 2002-August 2015. We have also compared AOD from Aqua-MODIS with those of Terra-MODIS, MISR and SeaWiFS. The highest value (0.973) of correlation coefficient (R) was found between Terra-AOD and Aqua-AOD while for MISR and SeaWiFS, values of R were found to be 0.711 and 0.520 respectively. During winter, the highest values (~1) of AOD were recorded over eastern part of Indo-Gangatic Belt (IGB) while during monsoon, highest values (~1) of AOD were found over western part of IGB consisting of Indus river basin in Pakistan. AOD anomaly were also calculated for the study region. Maximum values (~0.4) of AOD anomaly were detected over western parts of IGB in monsoon season. Time series of monthly deep blue Aqua-AOD over South Asia showed increasing trend with ΔAOD=9.75%. Annual mean AOD was found to be 0.290±0.048 with maximum value in the month of June and lowest in September.

Keywords: Aerosols, Remote sensing, South Asia