

Spatial and Temporal Analysis of Winter Fog Episodes over South Asia by exploiting ground-based and satellite observations

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The South Asian region in general and the Indo-Gangetic Plains (IGP) in particular hold about 1/6th of the world's population and is considered as one of the major hotspots with increasing air pollution. Due to growing population and globalization, South Asia is experiencing high transformations in the urban and industrial sectors. Fog is one of the meteorological/environmental phenomena which can generate significant social and economic problems especially havoc to air and road traffic. Meteorological stations provide information about the fog episodes only on the basis of point observation. Continuous monitoring as well as a spatially coherent picture of fog distribution can only be possible through the use of satellite imagery. Current study focus on winter fog episodes over South Asian region using Moderate Resolution Image Spectrometer (MODIS) Level 2 Terra Product and other MODIS Aerosol Product in addition to ground-based sampling and AERONET measurements.

MODIS Corrected Reflectance RGBs are used to analyse the spatial extent of fog over study area. MOD04 level 2 Collection 6 data is used to study aerosol load and distribution which are further characterised by using aerosol type land product of MODIS. In order to study the variation of ground based observations from satellite data MODIS, AERONET and high volume air Sampler were used.

Main objective of this study was to explore the spatial extent of fog, its causes and to analyse the Aerosol Optical Depth (AOD) over South Asia with particular focus over Indo-Gangetic Plains (IGP).

Current studies show a descent increase in AOD from past few decades over South Asia and is contributing to poor air quality in the region due to growing population, urbanization, and industrialization. Smoke and absorbing aerosol are major constituent of fog over South Asia. Furthermore, winter 2014-15 extended span of Fog was also observed over South Asia. A significant correlation between MODIS (AOD) and AERONET Station (AOD) data was identified. Mass concentration of PM_{2.5} and PM₁₀ over sampling sites exceeded the Pak-NEQS at most occasions. However, during the current winter of 2015-16 the number of fog days has substantially reduced. Although, reasons are not clear yet but may be attributed to the atmospheric changes induced by the onset El-NINO.