

Project Abstract

Title: Assessment and prediction of the air-quality using dynamically downscaled high resolution data from numerical models

Investigators:

PI: Prof. Vimlesh Pant¹

Co-PI's: Prof. Sandeep Sahany¹, Prof. S. K. Mishra¹, Prof. S. K. Dash¹, Prof. Maithili Sharan¹, Prof. B. K. Panigrahi², Prof. Anupam Dewan³

Affiliations:

¹Centre for Atmospheric Sciences, Indian Institute of Technology Delhi, New Delhi

²Department of Electrical Engineering, Indian Institute of Technology Delhi, New Delhi

³Department of Applied Mechanics, Indian Institute of Technology Delhi, New Delhi

Contact Information:

Email: vimlesh@cas.iitd.ac.in, Tel: +91 (11) 26591319 (office)

Project Summary:

The physical and chemical properties of atmospheric aerosols depends on their sources and interaction with other gaseous species in the atmosphere. The fine aerosols below the size of 2.5 micrometer diameter (PM_{2.5}) are an integral part of air pollution that can penetrate deeply into the lungs and cause health problems associated with respiratory system. The alarming levels of fine particulate matter (PM_{2.5}) in Delhi-NCR region have widespread sources in the local, neighbouring states, and remote locations. Once emitted in the atmosphere, the spatial distribution of PM_{2.5} and other gaseous pollutants largely depends on the prevailing meteorological conditions. The atmospheric boundary layer height, wind speed and direction, air temperature and its profile, relative humidity, etc. defines the particulate matter concentration over a given location. The Delhi-NCR region is a location in the western parts of the Indo-Gangetic plains (IGP), which is known to have higher concentrations of PM_{2.5} as compared to regions outside the IGP. The proposed study utilizes the state-of-art numerical models over the regional domain that acquire its boundary conditions from the larger domain global model. The dynamical downscaling approach and nested model domains facilitate prediction of atmospheric variables with higher accuracy and better spatial resolution. Apart from the dynamical numerical models, the artificial neural network (ANN) technique based machine learning tools would also be utilized for improving the air-quality prediction over the selected region, e.g. Delhi-NCR.

Deliverable:

The project will have the following deliverable:

1. Air-quality maps at a spatial resolution of about 1 km using numerical models and observational data.
2. Prediction of air-quality a week in advance over a desired state or region, e.g. Delhi-NCR using machine learning.