

High Resolution Mapping of Particulate and Gaseous Air Pollution across Bengaluru, South India using a Hybrid Air Sensor Network

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Abstract

In recent days, air quality assessments using hybrid methods, deploying a combination of reference-grade Continuous Ambient Air Quality Monitoring Stations (CAAQMS), satellite-based monitoring and sensor-based monitoring, have tremendously increased in various parts of the world. However, most hybrid air sensor networks only focus on particulate measurements. The current study is from Bengaluru, a metropolitan city in south India. Fifty air sensor nodes from six different manufacturers are used to monitor particulate matter ($PM_{2.5}$, PM_{10}) and various trace gases (O_3 , NO_2 , CO and SO_2) at high spatial ($\sim 4\times$ more nodes than the government reference network) and temporal (\sim minutes) resolution. The main goal of this study is to develop spatial maps of various air pollutants by using observations from a hybrid air sensor network combined with land-use regression (LUR) models, which can then be used to estimate population exposure. Air sensors from six different manufacturers were initially collocated with a CAAQMS for six weeks at the India Sensor Evaluation and Training (Indi-SET) centre in Bengaluru, to evaluate the performance of sensors from different manufacturers with multiple nodes from each manufacturer. Correction models based on machine learning algorithms were further developed to improve accuracy of the sensor data. Subsequently, the sensors were deployed in over 40 locations across the study region, with sites selected based on satellite estimates of surface air pollution, land-use attributes, and identification of various point-of-interest areas. The performance of sensor nodes from the different manufacturers before and after development of localized correction models, as well as the spatio-temporal variation in air quality across Bengaluru will be discussed in detail during the presentation.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

Allin-Wayra: Small Sensors for Atmospheric Science

IGAC Regional Working Groups

MANGO: Monsoon Asia and Oceania Networking Group