2.177 Field evaluation of low-cost PM sensor and results of network deployment in heavily polluted Kathmandu Valley, Nepal.

Early Career Scientist

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Abstract:

Field evaluation of low-cost air quality sensors is critical in validating their performance for application in indicative and research monitoring. Notwithstanding sensing limitation and the required rigorous in-situ calibration and data quality check, such low-cost sensors could be one of the feasible means to determine air quality in developing countries. This study provides the first field evaluation of three PM sensors (Plantower PMS1003; Nova SDS011; Alphasense OPC-N2) in the Kathmandu Valley, Nepal which is one of the highly polluted urban areas in South Asia with strong seasonal emission variability. The field evaluation primarily focused on the Alphasense OPC-N2; a total of 15 identical units were locally configured and assembled into weatherproof systems and deployed in different parts of the valley after in-situ calibration for a year, from June 2017-May 2018. The results of the in-situ calibration and data validation will be presented. The influence of the relative humidity (RH) and concentration range in sensor's response (e.g., linearity) including the sensor's mean bias and error to reference measurements is also evaluated. The sensor performance with varying temperature, wind speed, and sample flow rate is also evaluated in order to determine the optimum operating condition for best sensor performance. Correction of the sensor response using multiple linear regression as well as supervised machine learning techniques will be shown. Using the network deployment in the valley the city-scale temporal and spatial variation of PM (mass/number, temperature, and humidity) and its association with local emission and meteorology will be discussed.