

Satellite-based Multi-Pollutant Index to Assess Changes in Surface Air Quality over India

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Abstract

Ambient air pollution poses a significant threat in India, with fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂) being primary pollutants that adversely affect human health. Advancements in satellite-based remote sensing have enabled the estimation of surface-level PM_{2.5} and NO₂ concentrations. The surface-level concentrations of multiple air pollutants can be used to define a Satellite-based Multi-Pollutant Index (SMPI) following the Cooper et al. (2012) study. In this research, we used high-resolution (1 km x 1 km) satellite-based PM_{2.5} from Van Donkelaar et al. (2021) and NO₂ from Cooper et al. (2022) to calculate SMPI and SMPI exposure (population-weighted) over India from 2005 to 2019. Our analysis of the SMPI exposure for each state, district, and urban-rural area in India during this period has identified air pollution hotspots in various states and districts in Indo-Gangetic Plain (IGP) and eastern India. Most districts in India exhibited a significant (90%) increasing trend in SMPI from 2005 to 2019. Interestingly, some districts in the IGP region displayed a decreasing trend from 2011 to 2019. Furthermore, the analysis of SMPI exposure in rural and urban areas for each state indicates that air pollution in India is not solely an urban problem. Our findings demonstrate that the satellite-based multi-pollutant index is a valuable tool for assessing air pollution levels and identifying areas needing air quality improvement.

Early Career Scientist

YES, I am an early career scientist.