

Integrating Low-Cost and Spaceborne Sensors for High-Resolution Air Quality Mapping in African Cities

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Abstract

Limited data availability has hindered our understanding of air quality dynamics in African regions. To address this challenge, we use observational data from low-cost sensors and satellite observations to develop high-resolution maps of air quality parameters, focusing specifically on PM_{2.5} and PM₁₀ concentrations in various African cities. By employing machine-learning techniques, we integrate ground sensor data with concurrent satellite observations from Sentinel-5p and MODIS for gas and Aerosol Optical Depth (AOD) measurements. Our algorithm successfully generates 1km x 1km daily resolution air quality maps, demonstrated over Nairobi and Dar Es Salaam. An important outcome of these high-resolution maps is the identification of local air pollution hotspots down to individual roads. We also examine how seasonal variations, influenced by changing weather patterns, impact local air quality. These results are valuable for urban planners in managing air pollution and present broader opportunities for air quality sensing. Our methodology can be adapted for other data-sparse regions, particularly in developing economies across Latin America and Asia. These high-resolution maps can be made available to scientists working on air quality in similar data-scarce regions, facilitating improved environmental management and public health strategies.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

MAP-AQ: Monitoring, Analysis and Prediction of Air Quality

IGAC Regional Working Groups

ANGA: African Group on Atmospheric Sciences, Americas Working Group, MANGO: Monsoon Asia and Oceania Networking Group