



## **Urban-scale mapping of PM<sub>2.5</sub> distribution via data fusion between high-density sensor network and MODIS Aerosol Optical Depth**

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### Title

Urban-scale mapping of PM<sub>2.5</sub> distribution via data fusion between high-density sensor network and MODIS Aerosol Optical Depth

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### Abstract

High-resolution mapping of PM<sub>2.5</sub> is the prerequisite for precise analytics and subsequent anti-pollution interventions. Considering the large variances of particulate distribution, urban-scale mapping is challenging either with ground-based fixed stations, with satellites or via models. In this study, a dynamic fusion method between high-density sensor network and MODIS Aerosol Optical Depth (AOD) was introduced. The sensor network was deployed in Beijing (> 1000 fixed monitors across 16000 km<sup>2</sup> area) to provide raw observations with high temporal resolution (sampling interval < 1 hour), high spatial resolution in flat areas (< 1 km), and low spatial resolution in mountainous areas (> 5 km). The MODIS AOD was calibrated to provide distribution map with low temporal resolution (daily) and moderate spatial resolution (= 3 km). By encoding the data quality and defects (e.g. cloud, reflectance, abnormal), a hybrid interpolation procedure with cross-validation generated PM<sub>2.5</sub> distribution with both high temporal and spatial resolution. Several no-pollutant and high-pollution periods were tested to validate the proposed fusion method for capturing the instantaneous patterns of PM<sub>2.5</sub> emission.