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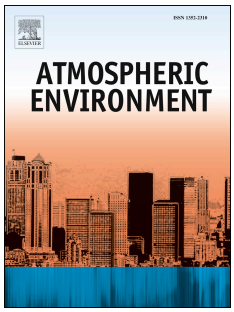

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A Functional Data Analysis of Spatiotemporal Trends and Variation in Fine Particulate Matter

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Abstract

In this paper we illustrate the application of modern functional data analysis methods to study the spatiotemporal variability of particulate matter components across the United States. The approach models the pollutant annual profiles in a way that describes the dynamic behavior over time and space. This new technique allows us to predict yearly profiles for locations and years at which data are not available and also offers dimension reduction for easier visualization of the data. Additionally it allows us to study changes of pollutant levels annually or for a particular season. We apply our method to daily concentrations of two particular components of $PM_{2.5}$ measured by two networks of monitoring sites across the United States from 2003 to 2015. Our analysis confirms existing findings and additionally reveals new trends in the change of the pollutants across seasons and years that may not be as easily determined from other common approaches such as Kriging.

Keywords: Particulate matter; Functional data; Air pollution; Kriging; Functional principal component analysis.

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