A dynamic process convolution approach to modeling ambient $PM_{2.5}$ and PM_{10} concentration levels

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Abstract

Elevated levels of particular matter (PM) in the ambient air have been shown to be associated with certain adverse human health effects. As a result, monitoring networks that track PM levels have been established across the country. Some of the older monitors measure PM less than 10 μm in diameter (PM_{10}) while the newer monitors track PM levels less than 2.5 μm in diameter ($PM_{2.5}$); it is now believed that this fine component of PM is more likely to be related to the negative health effects associated with PM. We propose a bivariate dynamic process convolution model for $PM_{2.5}$ and PM_{10} concentrations. Our aim is to extract information about $PM_{2.5}$ from PM_{10} monitor readings using a latent variable approach and to provide better space-time interpolations of $PM_{2.5}$ monitoring information. We illustrate the approach using $PM_{2.5}$ and PM_{10} readings taken across the state of Ohio in 2000.