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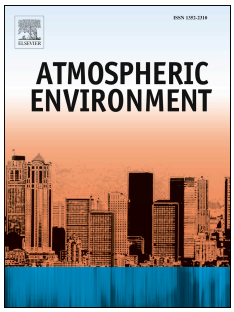

Effect of spatial outliers on the regression modelling of air pollutant concentrations: A case study in Japan

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Effect of spatial outliers on the regression modelling of air pollutant concentrations: A case study in Japan

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Abstract

Land use regression (LUR) or regression kriging have been widely used to estimate spatial distribution of air pollutants especially in health studies. The quality of observations is crucial to these methods because they are completely dependent on observations. When monitoring data contain biases or uncertainties, estimated map will not be reliable. In this study, we apply the spatial outlier detection method, which is widely used in soil science, to observations of $PM_{2.5}$ and NO_2 obtained from the regulatory monitoring network in Japan. The spatial distributions of annual means are modelled both by LUR and regression kriging using the data sets with and without the detected outliers respectively and the obtained results are compared to examine the effect of spatial outliers. Spatial outliers remarkably deteriorate the prediction accuracy except for that of LUR model for NO_2. This discrepancy of the effect might be due to the difference in the characteristics of $PM_{2.5}$ and NO_2. The difference in the number of observations makes a limited contribution to it. Although further investigation at different spatial scales is required, our study demonstrated that the spatial outlier detection method is an effective procedure for air pollutant data and should be applied to it when observation based prediction methods are used to

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