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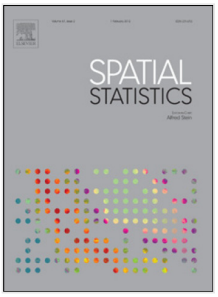


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# Modelling spatio-temporal data with multiple seasonalities: the $NO_2$ Portuguese case

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**Abstract**

This study aims at characterizing the spatial and temporal dynamics of spatio-temporal data sets, characterized by high resolution in the temporal dimension which are becoming the norm rather than the exception in many application areas, namely environmental modeling. In particular, air pollution data, such as $NO_2$ concentration levels, often incorporate also multiple recurring patterns in time imposed by social habits, anthropogenic activities and meteorological conditions. A two-stage modelling approach is proposed which combined with a block bootstrap procedure correctly assesses uncertainty in parameters estimates and produces reliable confidence regions for the space-time phenomenon under study. The methodology provides a model that is satisfactory in terms of goodness of fit, interpretability, parsimony, prediction and forecasting capability and computational costs. The proposed framework is potentially useful for scenario drawing in many areas, including assessment of environmental impact and environmental policies, and in a myriad applications to other research fields.

*Keywords:* Geostatistics, Spatio-temporal modelling, Hourly air pollution data, Multiple seasonalities

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