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Data Fusion for Functional Data

R. Ignaccolo[(a)], S. Bande[(b)], M. Franco-Villoria[(a)], A. Giunta[(a)]
[(a)]Università degli Studi di Torino, Torino, [(b)]ARPA Piemonte, Torino

In the air quality framework, chemical transport models (CTMs) simulate air pollutant transport, transformation and diffusion and provide pollutants concentrations on a regular thick grid, whereas observed concentrations are gathered from irregularly spaced sites of monitoring networks. Data fusion methods aim at combining these two kinds of data in order to obtain an accurate air quality assessment. In particular, we are interested in applying a data fusion strategy to nitrogen dioxide, ozone and particular matter concentration in Piemonte, Italy. To this goal, we exploit a functional approach and propose a spatial data fusion strategy based on a functional kriging model with external drift. The proposal will be evaluated and compared to other strategies, such as spatial and spatio-temporal kriging, in terms of prediction perfomance and computational cost.

Coverage Uncertainties in Global Temperature Fields

M. Ilyas[(a)]
[(a)]University College London, London

Temperature measurements are subject to uncertainties. Observational uncertainties come from the non-climatic factors (e.g. station movements, changes in instruments, observing practices, urbanization). Coverage uncertainties arise from the lack of spatial coverage of temperature fields. In other words, it is the uncertainty associated with interpolation estimates. The HadCRUT4 ensemble members present the observational uncertainties in temperatures. These temperature fields are sparse. Therefore, we use the multi-resolution lattice kriging proposed for the full spherical domain. We extend the temperature anomalies over the whole planet and quantify coverage uncertainties in these predicted temperatures. This leads to the generation of a large ensemble of fields sampling coverage uncertainties in HadCRUT4 temperature anomalies. These uncertainties are higher in the past at the global scale. The uncertainties in temperatures are expected to propagate to the classification of ENSO. Therefore, we define the ENSO classification to cope with the uncertainties in temperatures. The assessment of these uncertainties reveals that coverage uncertainties dominate early records. Hence, the impact of these uncertainties is significant at the regional scale as well. We further aim to incorporate parametric uncertainties in the model using Approximate Bayesian Computation (ABC).
