Non-stationary meta-Gaussian process for daily downscaling of precipitation: NSGPDS

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Abstract

Given the coarse spatial resolution of general circulation models (GCMs), finer-scale downscaling rainfall projections are needed to drive impact models, for example, in hydrology or ecology, among other fields, for risk estimation of floods and their impacts on infrastructure networks, water resource management, or land-use in a climate change context. This study aims to develop a downscaling model accounting for climate spatio-temporal non-stationarities. The model developed in this study relies on a single transformed and truncated Gaussian process to model rain fields (including both occurrences and intensities). The novelty of this work resides in: first the use of a censored likelihood to take into account the spatial and temporal intermittency of rainfall in the estimation of the covariance structure, second the use of a non-stationary covariance function allowing the introduction of spatial and temporal non-stationarities in the dependence structure and third the possibility to upscale rain fields at any target spatial resolution from rain gauges data. A perfect model experiment framework is adopted to evaluate the model's ability to reproduce spatio-temporal non-stationarity. The model is applied around the French Mediterranean covering a 91260 km^2 basin.

Keywords: Non, stationary, meta, Gaussian, downscaling, precipitation

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