Calibration methods for Spatial Risk Analysis

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Abstract

In an environmental framework, extreme values of certain spatio-temporal processes, such as wind speed and precipitation are the main cause of severe damage in property, such as electrical networks, road and agricultural infrastructures. Therefore modeling extremes of such spatio-temporal models are highly important in risk analysis and in particular in producing risk maps showing the spatial distribution of such damage risks. Usually data for modeling are available at few stations with many missing observations and consequently simulated data are often used to augment information, since simulated environmental data are typically available at high spatial and temporal resolutions. However, simulated data often mismatch and misalign observed data, particulary on tails, therefore calibrating and bringing it in line with observed data may offer practitioners more reliable and richer data sources. Response relationships between the extremes of simulated and observed data are by nature highly non-linear and non-Gaussian, therefore data fusion techniques available for spatial data are not adequate for this purpose. Our main target is the development of statistical methods for data fusion and calibration that can take on board the need for extrapolating beyond the range of observed data, into the tails of a distribution. We will also explain how these new data fusion techniques for extremes of simulated and observed data may help in producing more accurate risk analysis in certain environmental problems.

Keywords

Calibration; Extremes; Bayesian hierarchical modelling; risk maps.

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