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Spatial Compound Event Spells in Present and Future Climates – Weather Generator vs. Regional Climate Models

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Weather generators (WGs) are often used to produce input weather data for climate change impact studies. While the single-site generators are commonly used in agriculture, the multi-site generators are preferred for hydrological experiments. To justify the use of WG in the impact studies, WGs should be validated for their ability to represent various features of statistical structure of the real-world weather data, especially the features which may significantly affect outputs from the impact models. The validation indices may include characteristics of (a) probability distribution functions of individual weather variables (mean, variability, quantiles, extremes), (b) temporal structure (persistence, occurrence of spells of specific weather type), (c) spatial structure (only for the spatial WGs), and (d) relationships between variables. Having been validated, the WG may be used to produce arbitrarily long weather series representing the baseline climate for use in the impact studies. To produce weather series representing the future climate, the generators parameters are typically modified by climate change scenarios derived from GCM or RCM simulations.

This contribution focuses on the results obtained by the parametric spatial weather generator SPAGETTA and compares its performance for selected European regions with the results based on the ensemble of RCM simulations available from the CORDEX database. In the first part, the WG and RCMs are validated for their ability to reproduce spatial temperature and precipitation patterns focusing on compound temperature-precipitation event spells: spells of spatially extensive hot-dry, hot-wet, cold-dry and cold-wet weather; the use of the spatial compound event spells was motivated by the fact, that they are affected by multiple aspects of the statistical structure of weather series: spatial and temporal structure of weather data, and correlation between individual weather variables. In the second part, the spells are analysed from both WG-based synthetic series (WG parameters are modified by RCM-based climate change scenarios) and RCM future climate simulations. In comparing the WG-based and RCMs-based results, a special attention is given to inter-model variability of results in the RCM ensemble.

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