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A Multi-Purpose Multi-Site Stochastic Weather Generator

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A new stochastic weather generator (WG), which is able to produce synthetic (but realistic) multi-variate multi-site (gridded or irregularly distributed in space) weather series is now being developed. Though its development was started within the frame of the new project (more details will be presented in a separate contribution by Huth & Dubrovsky), in which the synthetic series are employed for assessing statistical significance of trends analysed simultaneously at multiple sites, the WG is assumed to be applicable also in the climate change impact studies. The generator, whose model is based on the multi-site extension (Wilks, 1999) of the parametric (Richardson's type) single site M&Rfi WG, may be run in two modes: In the first mode, it is run as a classical generator, which is calibrated in the first step using the weather data from a number of sites distributed either regularly (grids) or irregularly (stations) in space, and only then it may produce arbitrarily long synthetic time series mimicking the spatial and temporal structure of the calibration weather data. In the second mode, the user provides only basic information (not necessarily to be realistic) on the temporal and spatial auto-correlation structure of the surface weather variables and their mean annual cycle; the generator itself derives the parameters of the underlying autoregressive model, which produces the multi-site weather series. For the purpose of developing the methodology for assessing significance of trends in multi-site weather series, the user is allowed to prescribe the trend, which is added to the values produced by the generator. The superimposed trend is assumed to be either linear or non-linear (to account for the longer-term variability related to, e.g., ENSO), and may vary in space.
The contribution will present (a) the model of the generator, (b) basic validation of the generator with a focus on its ability to represent the spatial variability (using the EC&D station data and EOBS gridded data), (c) examples of its use in assessing the significance of trends at multiple sites.