Parametric vs. non-parametric weather generators

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In assessing sensitivity of various ecosystems to climate, stochastic weather generators are often used to provide synthetic observed-like weather series as an input to agricultural, hydrological or other models. The quality of the weather generator consists in its ability to mimic structure of the observed series: ideally, all climatic characteristics should be reproduced by the generator. This contribution will compare two different stochastic daily weather generators, Met&Roll and GeNNeR, in terms of their ability to reproduce various features of the daily weather series with a stress on extreme temperature and precipitation events.

Met&Roll represents a parametric approach: Markov chain model is used to model precipitation occurrence, precipitation amount is modelled by the Gamma distribution, the 1st order autoregressive model is used to generate solar radiation and daily extreme temperatures. Parameters of the generator exhibit annual cycle.

GeNNeR is based on a nearest neighbours resampling technique, which is a non-parametric method making no assumption on the distribution of the variables being generated. Each term (except of the fist one) of the synthetic time series is derived from a followers of K terms which are closest (in terms of the Mahalanobis distance) to the previous term. Various settings of the resampling algorithm will be tested.

The generators will be validated in terms of (i) the means and variability, (ii) lag-0 and lag-1-day correlations among the variables, (iii) extreme temperature and precipitation characteristics (annual and 30-years extremes of daily maximum temperature, daily minimum temperature, daily precipitation and 5-day precipitation), and (iv) annual and 30-year maxima of duration of hot, cold, dry and wet spells. The validation tests will be based on observational weather series from several European stations available from the ECA&D project (http://eca.knmi.nl).