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The conditional resampling model STARS: weaknesses of the modeling concept and development

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The Statistical Analogue Resampling Scheme (STARS) is based on a modeling concept of Werner and Gerstengarbe (1997). The model uses a conditional resampling technique to create a simulation time series from daily observations. Unlike other time series generators (such as stochastic weather generators) STARS only needs a linear regression specification of a single variable as the target condition for the resampling. Since its first implementation the algorithm was further extended in order to allow for a spatially distributed trend signal, to preserve the seasonal cycle and the autocorrelation of the observation time series (Orlovsky, 2007; Orlovsky et al., 2008). This evolved version was successfully used in several climate impact studies.

However a detaild evaluation of the simulations revealed two fundamental weaknesses of the utilized resampling technique. 1. The restriction of the resampling condition on a single individual variable can lead to a misinterpretation of the change signal of other variables when the model is applied to a mulvariate time series. (F. Wechsung and M. Wechsung, 2014). As one example, the short-term correlations between precipitation and temperature (cooling of the near-surface air layer after a rainfall event) can be misinterpreted as a climatic change signal in the simulation series. 2. The model restricts the linear regression specification to the annual mean time series, refusing the specification of seasonal varying trends. To overcome these fundamental weaknesses a redevelopment of the whole algorithm was done.

The poster discusses the main weaknesses of the earlier model implementation and the methods applied to overcome these in the new version. Based on the new model idealized simulations were conducted to illustrate the enhancement.