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## A weather generator based on vine copulas and phase randomization for producing scenarios

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Using weather generators to produce scenarios with changed statistics commonly involves the output of numerical climate models and/or leveraging the correlations in an observed data set. This contribution proposes vine copulas as a method to improve the latter in a parsimonious way. The vine copula construction flexibly models multivariate dependence structures as it breaks these down into pair-wise relationships that can be modelled individually with the wide variety of bivariate copula families. Setting up the vine tree carefully allows a user-supplied change in one specific variable, e.g. air temperature, to spread to the other simulated variables according to the fitted dependence structure.

In order not to increase dramatically the number of free parameters, the copula is only employed for time-invariant, inter-variate dependence, leaving all temporal and inter-site dependencies to Phase Randomization. Phase Randomization is a spectral method which generates "surrogate time series" that share their autocorrelation function with a source time series. It can be modified to handle cross-correlations in multivariate time series as well.

Precipitation occurrence and amounts are simulated in a joint fashion, using a latent variable constructed with information from other meteorological variable at the same locations. The methodology will be illustrated with an example involving daily air temperature, precipitation, sunshine duration and relative humidity from measurement stations in southern Germany.