Geophysical Research Abstracts, Vol. 9, 07206, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07206

The application of copulas to downscale daily precipitation

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Climate change has a potential impact on local hydrology, especially, on the extreme events. Downscaling daily precipitation is hence always necessary to assess the degree of the influence. The purpose of this paper is to demonstrate a downscaling methodology based on the theory of copula.

Copulas are the joint multivariate distributions. They are able to describe the dependence of multivariates with no account of individual marginal distribution.

The downscaling scheme what we propose here is a combination of classified circulation (CP) and continuous moisture flux at atmosphere. The circulation patterns are classified using fuzzy set logic. The moisture flux is a combined predictor of specific humidity and wind velocity. The empirical and constructed copulas are applied to link the local daily precipitation and large-scale moisture flux under the impact of individual circulation pattern.

The method is applied to the Neckar River basin in Germany. Indices for extremes in each season are used to assess the quality of downscaling.