A copula based multisite model for daily precipitation simulation

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The purpose of this contribution is to investigate the underlying interdependence between daily rain-gauge readings and model it faithfully. Careful study of the dependence structure of many hydrometeorological data sets, both spatial and temporal, reveals that the dependence is more complex than that modelled by conventional correlation of the multivariate normal. The interdependence is investigated with the help of experimental copulas. These show significant departures from the normal. The different spatial structure of advective and convective precipitation might be an explanation for this fact. As an alternative a v-copula transformation is applied to a multivariate ARMA process which provides a non-Gaussian multivariate spatial and temporal dependence structure. By imposing the different marginals corresponding to the different locations one obtains the multisite simulation model. Parameters of the v-copula transformation and of the ARMA process are estimated using a likelihood approach. The model is applied for the simulation of 32 precipitation stations located in South-West Germany. A large number of different diagnostics is used to assess the quality of a simulation comparing 40 year historical observations with 100 realizations of matching time periods.