

Copulas as a signature of hydrological response

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Hydrograph peak, volume, duration, and shape intrinsically include pivotal information about watershed hydrological properties and about the nature of the rainfall-runoff dynamic. In this talk, I will present a preliminary investigation of the connection between the statistical dependence structure of peak-volume-duration and some properties of the rainfall-runoff transformation. Given a set of synthetic direct runoff time series simulated varying watershed soil use and concentration time, it is possible to evaluate the variability of the dependence structure of peak-volume, peak-duration and volume-duration pairs. We obtained results suggesting that for similar watersheds and with similar rainfall input, the peak-volume-duration dependence structure is invariant while for significant changes of the soil use properties the correlation tends to decrease and the empirical copula is inclined to modify its shape. The simulation experiment supports the hypothesis that the dependence structure could characterize the hydrological response. This conclusion could be particularly effective in two practical applications: the classification of similar watersheds when hydrograph observations are available, and the merger of observations in similar watersheds to facilitate and improve copula estimation.

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