Multisite daily precipitation simulation in Singapore

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Abstract	Stochastic precipitation simulation is of great importance for the design and operation of water infrastructures. The objective of this research is to develop a stochastic simulation method for daily precipitation. Daily precipitation generation needs special treatment because of many zero values appearing due to dry days. It is implemented for 26 rain gauge stations located in Singapore. This research follows three steps. First, a hidden autoregressive (AR) model is fitted to time series data at each gauging station using a power transformation. Zero precipitation amounts are treated as censored values of the power-transformed Gaussian process. The hidden AR has four parameters: mean, autocorrelation, power transformation, and variance of error. Second, a conditional multivariate Gaussian distribution is fitted to residuals of the AR models and used to fill in censored values corresponding to errors of the AR at dry events. Third, stochastic simulations from the created spatial-temporal model are carried out. Single and multi-site statistical characteristics such as empirical distribution function, cross-correlation coefficient and entropy are used for evaluation of the model. The results of this research show that the developed model produces synthetic precipitation amounts having statistical characteristics very similar to the observed ones.
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