Stochastic generation of daily rainfall at multiple sites

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Rainfall data are a major input to water resources and agricultural modelling systems. As the historical record only provides a single realisation of the underlying climate variability, stochastically generated data are used to assess the impact of climate variability on water resources and agricultural systems. The generation of climate data at a single site is a well researched area in the hydrological and climatological literature and a two-part model has been widely used to generate daily rainfall data. The assessment of hydrological and land management changes over larger catchments or regions however requires that the spatial dependence between the climate data generated at multiple sites to be preserved. This is particularly important to the simulation of rainfall, which displays the largest variability in time and space. This paper describes a multi-site model developed using a number of single site two-part models driven by a cross correlated set of random numbers and nesting the daily model in multi-site monthly and annual models. Nesting of the daily model is necessary to preserve the statistical characteristics of the rainfall at the monthly and annual time scales. The results from applying the model to four catchments/regions, with the number of rainfall stations varying from 3 to 30, to generate spatially and temporally consistent daily rainfall will be presented.