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Simulating precipitation at a fine time scale using a single continuous-state distribution

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Some hydrometeorological processes such as precipitation are usually modelled as two-state processes distinguishing the wet and dry state and simulating each of the two in different ways. It can be noted that the assignment of either of the two states in observation records involves some difficulties, as the accuracy of measurements in the area of low values is problematic. This is even more perplexed by the fact that the low values are the most frequent as in most rainfall records, measured at a fine temporal scale, the mode of the continuous part of the distribution is zero. However,the separation in two states may not be necessary. Here we apply a modelling framework of geophysical processes, such as precipitation, without treating them as two-state processes but with a single continuous-type distribution, which has very high densities at values close to zero. This requires the simulation of arbitrary marginal distributions, with very high skewness and kurtosis, as well as ability to preserve any dependence structure. These requirements can be satisfied in a rather simple manner using a recent simulation framework (Dimitriadis and Koutsoyiannis, 2017), which is here tested with fine time scale precipitation.
Reference: Dimitriadis, P., and D. Koutsoyiannis, Stochastic synthesis approximating any process dependence and distribution, Stochastic Environmental Research & Risk Assessment, 2017 (submitted in January 2017 and accepted with minor changes).
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