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## Cascade-based disaggregation of continuous rainfall time series: the influence of climate

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**Abstract.** Rainfall data of high temporal resolution are required in a multitude of hydrological applications. In the present paper, a temporal rainfall disaggregation model is applied to convert daily time series into an hourly resolution. The model is based on the principles of random multiplicative cascade processes. Its parameters are dependent on (1) the volume and (2) the position in the rainfall sequence of the time interval with rainfall to be disaggregated. The aim is to compare parameters and performance of the model between two contrasting climates with different rainfall generating mechanisms, a semi-arid tropical (Brazil) and a temperate (United Kingdom) climate. In the range of time scales studied, the scale-invariant assumptions of the model are approximately equally well fulfilled for both climates. The model parameters differ distinctly between climates, reflecting the dominance of convective processes in the Brazilian rainfall and of advective processes associated with frontal passages in the British rainfall. In the British case, the parameters exhibit a slight seasonal variation consistent with the higher frequency of convection during summer. When applied for disaggregation, the model reproduces a range of hourly rainfall characteristics with a high accuracy in both climates. However, the overall model performance is somewhat better for the semi-arid tropical rainfall. In particular, extreme rainfall in the UK is overestimated whereas extreme rainfall in Brazil is well reproduced. Transferability of parameters in time is associated with larger uncertainty in the semi-arid climate due to its higher interannual variability and lower percentage of rainy intervals. For parameter transferability in space, no restrictions are found between the Brazilian stations whereas in the UK regional differences are more pronounced. The overall high accuracy of disaggregated data supports the potential usefulness of the model in hydrological applications.

**Keywords:** Rainfall, temporal disaggregation, random cascade, scaling, semi-arid, temperate climate.

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