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How to improve the calibration of Bartlett-Lewis stochastic point rainfall models in order to better simulate extreme rainfall events?

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More and more, there is a need for reliable and long time series of point rainfall as they provide indispensible information for all kinds of engineering, hydraulic design and flood risk assessment studies. Until now, stochastic rainfall models, based on either the Neyman-Scott or Bartlett-Lewis point process, have shown a good potential for these purposes. However, some deficiencies still remain with respect to the representation of some important characteristics of the rainfall, such as its extreme behaviour. A possible way to improve the rainfall simulations is to improve the calibration procedure.

This study focuses on an improved calibration process of some Bartlett-Lewis rainfall models. Traditionally, the calibration consists in matching simulated and observed rainfall statistics at different aggregation levels through the optimization of some objective function. Mostly, analytical expressions of the mean, variance and covariance are used for this purpose.

Two different aspects of the calibration are considered here. On the one hand, it is assessed whether the incorporation of the third order moment (or skewness) could improve the extreme behaviour of the simulated rainfall. Therefore, recently developed analytical expressions of the third order moments are used. On the other hand, attention is also paid to the nature of the objective function and the type of optimization routine used.

The merits of the incorporation of the third order moment together with the use of an advanced optimization routine will be evaluated and discussed from a practical point of view.