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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Stochastic generation of multi-site daily precipitation for the assessment of extreme floods in Switzerland" *by* Guillaume Evin et al.

Anonymous Referee #2

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The authors propose extensions of a classical multisite daily rainfall generator initially proposed by Wilks in 1998. The framework of Wilks model is flexible enough to allow many adaptations, and the authors of this paper propose - to add more structure in the dynamics of the model by considering higher order Markov model for the occurrence process and an autoregressive component for the amounts - to use a hybrid distribution for the marginal distribution to deal with heavy tail distributions - to use a Student copula for the spatial structure to catch upper tail dependance I believe that all these extensions make sense and are interesting to try.

General comments

Many extensions of the Wilks model have already been proposed in the literature. I think that a review of this literature must be included in the paper and that the authors should explain why the extension that they propose is original and useful with respect to this literature.

In my opinion, one weakness of the paper is that the model is formulated as a simulation tool rather than as a proper statistical model. It is also the case for the original Wilks model, but it has then been reformulated by other authors as a statistical model, see e.g. Thompson et al. (2007). I think that the paper would be easier to read for statisticians like me if a similar formalization was done in the paper. In particular, the various assumptions on the occurrence/amount processes should be written precisely using formulas and the definition of the model should be separated from the discussion on parameter estimation and simulation.

I believe that the validation part must also be improved. First, some usual validation criteria for rainfall generators, such as diagnostics based on the marginal distribution (e.g. qqplot) and the second order structure of the process (autocorrelation and cross-correlation functions) are not shown and it makes it difficult to see the benefit of using a hybrid distribution and the autoregressive component. Also the chosen validation criteria does not permit to see the interest of using a student Copula (does it really improve the modeling of extremal dependance?). Finally, I find the simulation results generally disappointing. If I understand correctly the categorization, we should obtain about 90% of good if the model was able to reproduce the statistics of the observed rainfall? Is it satisfactory to obtain percentage around 50%?

Specific comments

- Keywords are missing?

- End of Page 1/top of page 2. I am not really satisfied by the proposed classification. For example weather type models are often used as multisite rainfall generators (without conditioning to large scale information). Also it would be useful to cite the review

papers on rainfall generators here.

- Section 2.1. The authors go directly from a Markov chain of order p=1 to a Markov chain of order p=4. I would expect that the best value of p is somewhere between these two values. The authors could try to find the optimal value of p, using for example standard model selection criteria.

- Equation (5). I am surprised that the authors use a diagonal matrix for A. I would expect that it is useful to add some spatial structure here?

- Section 2.3 and 3.3 should be merged.

- Section 3. Why is it called “Application”? I do not see any application here.

References

Thompson, C. S., Thomson, P. J., & Zheng, X. (2007). Fitting a multisite daily rainfall model to New Zealand data. Journal of Hydrology, 340(1), 25-39.

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