

Interactive comment on “Copula based multisite model for daily precipitation simulation” by A. Bárdossy and G. Pegram

Anonymous Referee #3

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General comments

The paper proposes a new method to model multi-sites daily rainfall and a new criterion to assess the spatial correlation structure of rainfall. The rainfall model is based on multivariate asymmetrical copulas to jointly simulate the spatial and temporal structure of rainfall. According to the authors the novelty in the copula-based application is that both occurrences and amounts are generated from the same interdependence process. The criterion proposed for the evaluation of the spatial structure of rainfall fields is based on the entropy of triples and it is an alternative to the traditional bivariate indexes of correlation. The rainfall model and the evaluation method are applied on well gauged study case in a mountainous region. The paper is well structured and

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generally clear a part of few points specified below. The subject is relevant and the presented ideas are very interesting on both the practical and the scientific aspects. The publication is strongly recommended after few minor revisions.

Specific comments

!) I don't agree with the definition (provided in par. 1.1. lines 13-18) and use of the term clustering in the paper. Clustering is a specific spatial structure of rainfall fields, while generally the paper refers more generally to the spatial correlation. Also the entropy method does not evaluate the clustering degree or features of the rainfall fields, but more generally the correlation among the triples relative to their distance (more correctly the square root of the areas of the triangles). I would suggest to avoid the use of the term clustering but refer to the general spatial structure.

2) I suggest to replace figs. 8, 9, 11, 12 with GIS maps (as in Fig. 1) representing the variables at each gauging station with proportional dots and limiting the case just at winter and summer (as in the rest of the paper) instead of the months. For example the dry probability (of Fig 8) would be represented in two sided figures one for the winter season and the other for the summer season; in each figure there would be a map with a dots for all the stations (instead of just 4) with the diameter proportional to the dry probability. This change would help the reader to understand the spatial features of the rainfall fields.

3) In par. 3.1. at pag 4496 l. 9, it is said that when $m > 3$, s rapidly approaches Gaussianity (and the transformation dose not depend on a and k). In the application the parameter m is for almost of the months greater than 2 which means, however, that the right arm of the v -copula (which a and k refers to) is used only for very low probable values. Can you comment on this? Can you provide a sensitivity analysis for the method in respect to the parameters m , a and k ?

4) At pag. 4506 lines 16-23 and the relative Fig. 23, the copula model is shown to be better than the covariance model at smaller distances with respect to capturing the

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wet-dry occurrences. However in both models the dependence with the distance is not explicit. Can you explain the reason of this difference?

5) The entropy-based method is very interesting. However i think it has some limitation in an anisotropic field as the rainfall. As a matter of fact the spatial structure of the rainfall is often very heavily influenced by the orography and other hydrometeorological constrain (wind, costal lines, etc.). Also in the study case the orography could have an important role on the rainfall spatial correlation.

Technical and editing comments

A part the corrections already provided by the other reviewers, I have other few comments. 1) Fig. 1 should report also the label of the station numbers 2) Fig. 5 should report also the label on the y-axis in order to improve the understanding 3) At pag. 4496 l. 7, according to fig. 5 $P[S < 2.5] = P[-1.5 < Y < 2.12]$

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