Hydrol. Earth Syst. Sci. Discuss., 12, C151–C153, 2015
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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A continuous rainfall model based on vine copulas" *by* H. Vernieuwe et al.

Anonymous Referee #2

Received and published: 12 February 2015

The manuscript describes a rainfall model based on vine-copula for simulating the dependence structure of four variables: storm volume, storm duration, dry duration after the storm, and the fraction dry within the storm. The analyzed case study consists on fitting the model on a long rainfall time series (105 years) and comparing simulated and observed data.

The topic is particularly interesting since rainfall simulators are pivotal for several hydrological models.

The paper is well written, easy to read and understand, so I am glad to suggest to publish it. I have some minor comments to share with the authors listed in the following.

Introduction. This section could be improved. In the present form it reviews five is-

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sues: importance of rainfall simulator, types of rainfall simulators, copulas for rainfall analyses, multivariate copulas, summary of the paper. While the general structure is appropriate, each "sub-section" could be better described and reviewed.

The first "sub-section" (from pag. 490 line 14 to page 491 line 6) is too vague. It could be removed or it should be clearer. From the practical point of view, in my opinion, rainfall simulators are pivotal for continuous rainfall-runoff models to overcome the drawbacks of event-based approach, so maybe this issue could be underlined. Page 491 lines 7-15. This paragraph could be clearer.

Concerning the multivariate copula review, vine-copula is an hot-topic now and there are some papers published in the last two years that should be mentioned, i.e.: Gräler, B. Modelling skewed spatial random fields through the spatial vine copula (2014) Spatial Statistics, 10, pp. 87-102. Xiong, L., Yu, K.-X., Gottschalk, L. Estimation of the distribution of annual runoff from climatic variables using copulas (2014) Water Resources Research, 50 (9), pp. 7134-7152. so I would devote more lines here for providing literature review compared to the standard copula that is well known.

Concerning the Huff curve, the citation of Candela et al. ,2014 should be included in the Section 4.2, while here, briefly, the Huff curve should be defined.

Section 2 Authors should make the effort to make lighter this section. I would suggest to include an appendix where all the equations are listed. At the same time I would remove all basic equations about copula that are well known or in any cases available in many other papers (for sure, Eq. (1), (2), (3))

Section 4.1 The a priori choice of Frank copula seems in contradiction with the choice to adopt the vine-copula. However, I understand that the best fitting copula issue is out of the scope of the paper. At the same time two questions arise: which is the impact on final results, in practice, of the best copula selection? authors in the conclusions say that the approach is "data driven and does not need any calibration", however a four-dimensional copula is fitted on the observed data....is there not a risk that with

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105years the fitting is reasonable while in the common situation (50years) the number of parameters to be estimated are too numerous? these issues should be at least mentioned in the conclusion as future work.

Concerning Figures, often in paper where copula and time series are applied, a plot with the comparison among observed and simulated data is included since it is highly communicative. So, I would suggest to include a matrix plot for the four-dimension copula visual assessment and a spot (not all 105 years...but only short window) of the time series.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 489, 2015.