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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.

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Review of Vernieuwe_et_al_hess-2014-475

This paper is like the "curate's egg" - good in parts. It raises more questions than it gives answers. It is a mixture of ancient and modern [e.g. Huff curves and Fern copulas]. There is plenty of math offered in describing how to construct a fern copula, which is nicely done after one had read Aas et al. (2009) for guidance (the paper's Section 2 gives a nice description of the practicalities of fitting vine copulas), but there is not enough material of how these were chosen/calibrated in the context of the 105 year 10-minute record of rainfall at Uccle. What I found missing was how the choices were made for the ordering of the 3- and 4- dimensional copulas chosen in this paper.

How was the non-unique ordering of the fern tree chosen? Where are the sample copulas? We need more figures - such as sample plots of the material for the copula models. How far are they from Gaussian? How good would an alternative, simpler Gaussian copula have been in competition? It seems that no justification was provided for the choice. There were no comparisons made with alternative multidimensional probability distribution models; fern and Frank copulas were chosen and that was it.

I question the complicated (and difficult to follow) method of disaggregating the generated rectangular pulses of rainfall "events". Instead of using Huff curves directly with a strangely unique recipe, why not use a practical alternative (even if the authors are reluctant to go "parametric"!), such as an autoregressive generator or similar. This would provide a sequence of serially correlated pulses, with breaks, then use the seasonal Huff curves to scale the elemental pulses, constrained by the rectangular pulse total, to get the right "shape". There is quite a nice example which does the job, designed by Koutsoyiannis, D. (1994) "A stochastic disaggregation method for design storm and flood synthesis", Journal of Hydrology, 156, 193-225, which I reviewed - there will be others. Further questions come to mind. What constitutes a break within an event that is not a separation of storms? Can you justify the limit of 24 hours? This seems artificial and constraining - storms don't obey the 24-hour clock for their starting time, although they tend to initiate based on diurnal variation - particularly convective storms in summer rainfall regions.

This review is choppy and irritable - please excuse me. It comes partly from the felt need for more explanation combined with a respect for the innovation and bright ideas that are put forward by the authors. However, after all is said and done, the last two sentences of the paper highlight the nature of the incompleteness one obtains in reading it.

My recommendation is: moderate revision before resubmission.

Geoff Pegram 16 January 2015

494_23: This choice is not unique; there are other combinations: f12|3.f3, or f23|1.f1

500_20: correct the reference

501_10: "asserted", not "ascerted"

502_5: "quartile of the storm" - don't you mean "quarter of the storm duration?"

502_10: "duration" instead of "extremity"?

502_15: "have internal dry 10min intervals" what is the maximum duration of an internal dry period that does not define the end of a storm?

504_6-17: this paragraph is difficult to understand. Also the limitations are very fussy and artificial - the choice of 10 min & 23h as storm duration limits affects the modelling of 24 hour storms - see 1st and last images in Fig 7

504_18 to 505_20: remove the word "step" from the explanation, because "time b" is an instant, not an interval

505_8-20: this passage is difficult to follow - consider revision. I think that in panel (c) of Fig 4, "min" is in the wrong place; it can't be below Vrc(b)

507_3: 6a not 6b

507_10: "lag-2 covariances" - between what variables?

507_13: "With respect to" instead of "W.r.t."

507_29: consider replacing "seems to perform well" with "has promise"!

508_8: "and does not need any calibration" - not as such, but the Huff curves are a limitation/constraint. The choice of Frank copulas is a matter of convenience? Couldn't we have some plots? How poor would the choice of Gaussian copulas be? At least they would replace the very involved vine copulas. True, that would remove much of the reason for the paper, but the choice seems a touch one-sided.

520: Fig 3 please add labels of 10% and 90% or mention "upper" and "lower curves" in the caption?

521: Fig 4 this is very difficult to follow - the explanation in the text and in the caption need improvement. It would be helped if a selected set of 24h time series of wet 10m pulses [separated by dry 10m periods if appropriate] were shown in a companion figure, so that readers could weigh up the choice of model.

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