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Hydrology and Earth System Sciences Discussions

Interactive comment on "Reliability and robustness of rainfall compound distribution model based on weather pattern sub-sampling" *by* F. Garavaglia et al.

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Detailed response to the comments of referee 2

We want to thank referee 2 for his accurate and helpful review of our manuscript. In this author comment, we list how each of the remarks provided by the referee was addressed. The comments made by the referee will be referred as RC and printed in bold; the authors' comments and answers as AC.

Concerning the detailed comments

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Interactive Discussion

Discussion Paper

1.1 RC : "P. 6762, l. 15-20. I think the description of the applied probability distributions needs to be a bit more elaborated, especially the MEWP and MGPWP which are new in this context. It should be described how the peak over threshold samples are defined."

AC: The MEWP and MGPWP are based on POT sampling. The threshold is chosen equal to the 70% empirical quantile of each weather pattern sub-sample. This choice was checked on Mean Residual Life (MRL) plot. It proved to be a good compromise for the whole dataset (Garavaglia et al., 2010). We propose the following redaction:

"... the seasonal rainfall records are split into several sub-samples corresponding to each WP. For the MEWP, an exponential distribution is fitted on a POT sampling of each WP sub-sample. For the MGPWP, a GP distribution is used. The seasonal distribution is then defined as the composition, for a given season, of all WP sub-sample marginal distributions, weighted by the relative occurrence of each WP. A comprehensive discussion on the threshold selection can be found in Garavaglia et al. (2010)..."

1.2 RC : "P. 6783, l. 1-2. It is not clear why the WP frequencies should not be considered as model parameters. They are sample estimates."

AC: They effectively are sample estimates and could be considered as parameters even if not fitted. We propose the following redaction:

"The WP frequencies may or not be considered as parameters of the MEWP and MGPWP models: our choice is not to call them parameters because they are computed rather than fitted. Anyway, as the number of parameters is not explicitly accounted in the computed criteria, this does not affect the presented results".

1.3 RC : "P. 6769-6770. I am not convinced that COVER is a good robustness criterion. As also shown in the results, models that provide very wide confidence intervals get better COVER scores. One could maybe include some kind of accuracy measure to trade-off the coverage and the widths of the confidence

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intervals."

AC : The COVER is a robustness criterion, but we agree that being robust is not sufficient. In our paper we chose to complete the robustness criterion with the reliability. Dealing with sharpness, we didn't propose any criterion for simplicity's sake but we refer to mean values in the text:

"The EXP, GP and MEWP distributions have respectively interval confidence width equal to ± 0.17, ± 0.52 and ± 0.22 of the central estimation".

1.4 RC : "P. 6771, l. 8-9. Why do the GUM and EXP and GEV and GP perform identically? There is a theoretical relationship between these distributions, but their sampling properties differ. This is also reflected in the reported results. They are not identical."

AC : We will rewrite the sentence : "The GUM (resp. GEV) distribution performs closely to the EXP distribution (resp. GP) so for clarity's sake the scores of GUM and GEV distributions appear only in the tables and not in the figures of this section".

1.5 RC : "P. 6772, l. 10-11. The fitting of the shape parameter is problematic for small samples. Especially, it has been shown in several papers that for small samples the ML method may provide highly biased shape parameter estimates. Why not apply a more efficient estimator for small samples, e.g. the L-moment method. Would this affect the conclusions with respect to the GP and MGPWP performances?"

AC : A preliminary comparison between GP estimations, obtained fitting parameters by maximum likelihood function and L-moments, has been done to test the influence of estimation technique. Any relevant differences haven't been observed on proposed criteria, so we have chosen to use the maximum likelihood function. We think that to improve GP and MGPWP performances is more important to work on a regional estimation of the shape parameter.

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1.6 RC : "P. 6772, l. 24-25. Not clear what is referred to here."

AC : Table 3 shows the results of FF test in a more intuitive way, as is described in the precedent paragraph (p. 6772, l. 17-24).

1.7 RC : "Table 1. Explain symbols. Variable x has different interpretations for annual maxima and peak over threshold models."

AC : We will change the name of the variable x. We will use the label "x" for maxima sampling, the label "y" for POT sampling and the label "z" for POT and WP sampling.

References

Garavaglia, F., Gailhard, J., Paquet, E., Lang, M., Garçon, R., and Bernardara, P.: Introducing a rainfall compound distribution model based on weather patterns sub-sampling. Hydrol. Earth Syst. Sci. Discuss., 7, 313-344, doi:10.5194/hessd-7-313-2010 (2010).

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