Hydrology and Earth System Sciences Discussions

Interactive comment on "Robust assessment of future changes in extreme precipitation over the Rhine basin using a GCM" *by* S. F. Kew et al.

Anonymous Referee #2

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1   General comments

Succinctly, this paper presents a method to estimate future changes in extremes of multi-day precipitation sums. This statistic is critical for the assessment of the future extreme discharge in large river basins. 17 ensemble RCM simulations from 1950-2010 (ESSENCE) are used for the evaluation. Historical data (CHC-OBS) is used as a reference for the period 1961-1991. The subject covered by this paper is relevant for HESS. Moreover, the state-of-the-art in this subject is still far from satisfactory, thus, of relevant research in this subject should be encouraged. In this present paper, however, there are many points that have to be clarified before publication.

2   Specific comments

This paper has the following technical shortcomings:

- A key question that this kind of study should address is: Are the RCMs in re-analysis modus able to reproduce extremes observed in the past? If not, how can be justified that these models are able to predict extremes in the future? It is also argued in the summary that this ensemble with 17 members is large enough to capture the climate signal, specially the extremes. This assumption is quite strong in my opinion. I suggest to quantify extreme statistics from the interpolated data and the RCM results and to check whether they are able to reproduce statistics such as maximum monthly precipitation, frequency of wet and dry spells, number of days per year with precipitation large a threshold, etc. Otherwise it is non-scientific to accept this hypothesis. Without these empirical evidence it is difficult to accept the conclusions of this study.

- Another issue that should be consider in more detail is the comparison of the coarse RCM output with the interpolated data based on point observations. In my opinion, a statistical downscaling is needed this in this case.

- The term scaling is misleading. I suggest to remove it from the manuscript. This term refers to a percentage increase w.r.t. reference period. Just call this statistic it what it is.

- Provide more information regarding the CHR-OBS data set. e.g. resolution, time scale, interpolation method, etc.

- P9047 L7. Sentence not clear. Is it necessary to know that this data set was used for forcing a HBV model in another study? It would be useful for the reader to know how this dataset was developed and by whom.

- Indicate the bootstrap procedure to estimate the confidence interval of Δq. How are the 30-y time slice found?

- PDFs in fig2 it is indicated that "the black curve is a fit" does not indicate which theoretical PDFs were used. The vertical lines indicate quantiles in which dry events have been either included or not. Why? Which is the purpose for that? This fig also indicate that there are large discrepancies in the PDFs for pre. sums large than 10 days. Panel a and d also exhibit large completely different alocations of the probability density. Please comment on that taken into account that your are using reanalysis data.

- Fig. 4 should indicate the period for which this analysis was done. Comparison in the validation period is necessary.

Technical corrections

This manuscript require also the following corrections:

1. Fig2 is very confusing. The double axes make it difficult to read. I suggest to separate dry and wet and indicate in the caption the meaning of (a)...(f).

3   Final Remarks

Based on the comments mentioned above and bearing in mind the HESSD publishing standards for a research article, I recommend to return this manuscript for major revisions.