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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Precipitation ensembles conforming to natural variations derived from Regional Climate Model using a new bias correction scheme" *by* K. B. Kim et al.

B. van den Hurk (Editor)

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Dear authors

Your manuscript has triggered a good discussion with the reviewers on the appropriateness of your new proposed bias correction scheme for a perturbed parameter climate model ensemble. Although many comments of the reviewers have been addressed, your reply and new manuscript version do not yet satisfactorily address all relevant issues and editorial suggestions. Not all your answers to the reviewers and editor comments are appropriate and convincing.

On the observational uncertainty I agree that a bootstrap method to produce distributions of the parameters of the underlying gamma-distributions is a good way to estimate this for daily data. However, allthough you nicely state that the observations are just a single possible realisation from a large ensemble of (likely plausible) observational records, there is no way in which you can describe observational uncertainty that is not included in the observations that you use. For instance, variability of observations on a slow time scale (decadal or centennial), or realisations of precipitation amounts with very long return times (exceeding the record length of this observation data set) can not be estimated, but may be highly relevant. So although you rightly point at the fact that observations are uncertain dus to natural variability, you do not adequately address the time scale at which natural variability that can be quantified by your bootstrap method.

An editorial remark related to this is that it would be very illustrative if the natural variability that your bootstrap quantifies is not only quantified in the plots showing the scale and shape parameters, but also the distribution of daily observations themselves (e.g. fig 3A, 4A and 10).

The point raised by the anonymous reviewer (and by me) that the application of a separate transfer function to every ensemble member may delete some of the variability that you want to generate with an ensemble is not satisfacorily commented. It may well be that the ensemble is much better able to capture modes of variability (both decadal oscillations and unprecedented extremes) that is not captured by the observations. In that sense your figure 13 can evenly be considered to be misleading: it is possible that it is not an overestimation of flood probability by the ensemble, but an underestimation by the observations. Therefore I find it a bit surprising that you did not include any extreme value analysis to evaluate the effect of your bias correction.

A number of further editorial comments also apply:

- L28: "proposed methodology": it is very unclear at this point what this "proposed

methodology" is about

- Introduction: you did not follow reviewer's 2 suggestion for strucutring your introduction section of the paper by starting with a discussion on possible problems of biases in practice
- L65-66: "distribution mapping is the best" but also suffers from severe overfitting!
- L88: replace "all the" by "each of the individual"
- Fig 2 is not very helpful: it shows the bias but not the bias correction you propose
- L168: unclear. I think you mean "daily bias correction is applied for each month separately"
- L186: these characteristics of natural variability are NOT analysed in your sensitivity study, that only monitors the size of the bootstrap. You need to think on how these characteristics affect your methodology
- Fig 11 needs a better caption tekst
- I think Fig 12 and its discussion needs to be moved to the results section, and should be complemented by argumentation that actually supports that the spread that you generate this way is possibly realistic
- L488: please acknowledge the reviewers.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 10261, 2015.