

Interactive comment on “Bias correction can modify climate model-simulated precipitation changes without adverse affect on the ensemble mean” by E. P. Maurer and D. W. Pierce

Anonymous Referee #3

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The paper tests the effect of quantile matching on GCMs over the United States. Although the paper deals with an important issue and is nicely presented, the point that bias correction has to be applied with care is known and discussed in literature already. Also, the setup of the study is questionable, as also pointed out by a previous reviewer.

Major comments 1. Applying bias correction to coupled models with no forcing from SSTs or atmospheric nudging will correct not only for systematic errors but also for internal climate variability. This was mentioned by a previous reviewer, but this has to be more carefully addressed. Quantile mapping cannot be applied in this way unless you can show that the discrepancy between GCM output and observations are only

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due to model structure errors and not external forcing or internal climate variability. As applied in this study, the corrected output from individual GCMs will have different and conflicting results, but with a large enough sample it will not affect the mean, which is also what the study shows. This is however to be expected, and is not novel. The advice to always use an ensemble of models is good practice, and it is of course worth repeating.

2. Bias correction, or model output statistics (MOS), is usually performed in smaller case studies where quality of precipitation is well known, and the performance of the climate models can be carefully assessed. Using it on such a large area as the US is questionable since, and if used for impact studies on this level I would suggest not using bias correction, or employing a simpler one, like the delta approach. It is not clear what the advantage is to employ it over such a large area.

3. The authors raise concern on the misuse of MOS for impact studies, but a simple way of avoiding this is to always use raw climate model output together with corrected output to assess the possible climate impacts along with the effect of such a correction. Ideally, the methods of correction should be more than one since they have different characteristics. This would provide a more robust assessment of the uncertainties in the modelling chain as well, and account for the effect of MOS.

4. The language in the paper is quite casual, and although this is a style I was sometimes distracted by it, especially the overuse of “we”. For me it is obvious that the authors have carried out the research, and this does not have to be pointed out constantly.

Minor comments.

1. P11586, L5. You use General Circulation Model as the abbreviation GCM, but I think in this context Global Climate Model or perhaps Earth System Model (ESM) is more correct, since it is coupled models. You also point this out later in the text. General Circulation Models is a generic term, and in this case the models are AOGCMs,

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correct?

2. P11588, L14. “quantile for” should be “quantile of”

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 11585, 2013.

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