

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 #2

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There is an increasing need to better interpret and utilize the outputs of climate models to support impact studies. The quantile mapping method has been widely used as a means to improve the correspondence of simulated climate patterns and trends with observed variability and changes. This paper aims to answer whether quantile mapping tends to improve or degrade the performance of a multi-GCM ensemble in reproducing observed changes in precipitations trends over the conterminous United States. The results suggest that quantile mapping modifies simulated precipitation trends and that this effect is model-specific and spatially heterogeneous, which is consistent with some recent studies on this issue. Overall, this paper is well written and organized. Methods

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are clearly described. Findings are informative and valuable to impact studies regarding water resources management. However, the value and potential impact of this work could be improved through addressing the following issues.

1. It is helpful to use a hypothetical case prior to the real-world case to illustrate the general effect of quantile mapping. As this paper has a clear focus on the performance of a GCM ensemble, I would suggest enhancing the hypothetical case to reflect the cumulative effects of bias corrections of two or more models, i.e., how would the modified trends of individual models amplify or counteract each other in an ensemble context?

2. I agree on the merits of quantile mapping in matching observed and simulated precipitation patterns. The authors have made a successful effort to explain the effectiveness of quantile mapping from a statistical perspective. What is lack here is a better discussion of the underlying physical processes associated with the imperfect behaviors of the involved GCMs. It is good to know that quantile mapping comes with a price. However, as shown in Cloke et al. (2013), it would be also important to understand in what circumstances we need to apply this kind of transformations instead of using alternative methods.

3. Extreme rainfall events are among the most challenging components in the evaluations of hydrological impacts of climate change. Although the effect of bias correction on extreme events is listed as a direction of future efforts, I suggest that authors provide more insights into this issue in the present framework. This may highlight the motivation of this work and enhance its value to a broader range of researchers.

Reference:

Cloke, H. L., Wetterhall, F., He, Y., Freer, J. E. and Pappenberger, F. (2013) Modelling climate impact on floods with ensemble climate projections. *Quarterly Journal of the Royal Meteorological Society*, 139 pp. 282-297. doi: 10.1002/qj.1998.

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