

Review of the paper "Bias in downscaled rainfall characteristics" by Potter et al.

The authors analyse the effect of empirical bias correction on characteristics of daily precipitation from an GCM-RCM ensemble, which are relevant for runoff modelling. A seasonal empirical quantile-quantile mapping is applied to a historical and future period. A novel method for analysing the performance of bias correcting transition probabilities is presented. The bias correction performs as expected for rainfall amounts, but is not able to correct transition probabilities. Furthermore, the bias correction has only a minor effect on the climate change signals.

The paper has improved substantially, and I recommend to publish it after some minor issues are corrected.

Minor issues

1. On page 1 in line 37, the sentence suggests that there is already fine scale information in the GCM that just needs to be extracted. Revise this sentence to make clear that GCMs are too coarse to provide the fine scale details needed.
2. It is somehow unclear what observations were used to calibrate the QQM. I suppose it was AWAP, but mention it explicitly in section 2.3.
3. To me it is also occasionally unclear whether the NCEP-downscaled WRF data were used in the figures or only the GCM-downscaled WRF data. For instance in Fig. 5, where the caption only states "(b) absolute bias". State more precisely in the captions or figure titles which data went into the figure.
4. The calibration period used to construct the QQM is identical to the period it is applied to (1990–2009), page 5 in line 21 to 22. It is therefore clear, in particular as empirical QQM is used, that overfitting affects the results. This should be discussed in the Discussion section.
5. Remove redundant information in the text that describes the figure content. For instance, on page 6 line 8 to 9; page 8 on line 8 to 9; on page 7 in line 29 to 30. The figures should be self-explanatory.
6. On page 2 in line 13 to 14, the sentence is redundant to line 25 to 26. Just include Themeßl et al. to the listed references.
7. Add zero lines in Fig. 5 and Fig. 12 for better distinguishing positive and negative values.
8. On page 8, line 6 and 7, remove the last bullet point. The sentence makes no sense, because one reads "The bias in wet-wet transition probabilities is more problematic for modelling runoff [...] because [...] [it] increases the magnitude of the bias in wet-wet transition probabilities".
9. Add Haerter et al. (2011; doi: <https://doi.org/10.5194/hess-15-1065-2011>) as reference for the sentence on page 11 in line 3 to 4, who first showed that bias correction affects different time scales.
10. Some parts of the Conclusion should be moved to the Discussion section. For example, page 11 beginning in line 29.
11. "This" should always be followed by a subjective to which it refers. Otherwise, the sentence is imprecise and prone to ambiguity. Examples are on page 1 in line 15 and 21; page 2 in line 19 and 34; page 7 in line 26; page 10 in line 10; page 11 in line 31 and 36; page 12 in line 7).

For instance page 7 in line 26:

"[...]. This results in ...[.]"

In this example, 'This' can either refer to 'low residual bias in dry-dry transition probabilities', or to 'more bias in wet-wet transition probabilities'. Small revisions would make such sentences more precise, e.g.:

"[...]. This reduced wet-wet transition probability results in ...[]"

12. Correct the punctuation where "however" is used in a compound sentence (e.g. page 1 in line 29 and 35; page 3 in line 19; page 10 in line 7) from

"[...], however ...[]"

to

"[...]; however, ...[]"

13. You might want to revise some long and bulky sentences to make them more concise and concrete, which improves readability. For instance on page 8 in line 32 to 35, but there are more cases.