

***Interactive comment on* “Selecting the optimal method to calculate daily global reference potential evaporation from CFSR reanalysis data” by F. C. Sperna Weiland et al.**

Anonymous Referee #1

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Summary

In this paper potential evapotranspiration (PET) is calculated from the Climate Forecast System Reanalysis (CFSR) data set using six different methods. These different estimates of PET are then compared to Penman-Monteith PET calculated using the CRU TS 2.1 and CL 1.0 data sets. PET from the different methods is used as input to a global hydrological model to determine the influence of PET calculation method on model actual evapotranspiration and discharge. The CRU derived Penman-Monteith PET is used to validate the other estimates of PET, with modified versions of the Har-

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greaves and Blaney-Criddle methods found to provide the closest fit. Although PET method also influences actual ET and discharge, the sensitivity is decreased from PET to AET to discharge.

Overall, this paper is within the scope of HESS, and presents interesting findings on an important topic. I find the paper to be generally suitable for publication, subject to a few relatively minor modifications (listed below).

General points

1. P7357, line 21: bias in radiation would also influence 'offline' calculation of PET
2. P7358, line 17: however, local calibration has been undertaken successfully previously – and as is also carried out in this paper.
3. P7361, line 23: net incoming radiation is not included in the CRU TS 2.1 data set. Please explain how this variable was derived.
4. P7361, line 25: cloud cover is included in CRU TS 2.1, so why did you use the non-time varying CRU CL 1.0 data?
5. Please comment on the implications of CRU-PM calculation procedure for PET accuracy, and subsequent comparison with CFSR – e.g. use of climatological wind-speed, given importance of windspeed for calculation of PET shown by other studies (e.g. Roderick et al. 2007)
6. Please comment on why differences occur in PM PET between CFSR and CRU – can this be pinned down to the influence of one particular meteorological variable (e.g. use of average rather than time varying wind, procedure for calculation of net radiation)? It would be highly informative to see a systematic analysis of this.
7. Additionally, it should be acknowledged that you are validating CFSR PM PET against a data set (and calculation procedure) that is itself of varying quality and subject to uncertainty.

8. P7362, line 4: Were CRU data downscaled to daily resolution, and if so how?
9. Figure 4 is too small. In general, all of the figures would benefit from being a little larger.
10. P7362/7363: The stability of the BC calibration unlikely to be satisfactory under a changing climate – whether over the historical period or for scenario climate – therefore the validity of including modified BC in this study can be questioned. To a lesser extent, the same argument applies to the Hargreaves calibration.
11. On the other hand, given that both BC and HG are calibrated it is a little strange that calibration of the alpha parameter in the PT equation was not at least discussed.
12. Phrasing is awkward in a number of instances, although it remains possible to understand the MS (some examples included in Minor Points, but too many to mention individually)
13. Although reference is made to previous papers which have described the PCR-GLOBWB, some further information is required in this paper – including the extent to which the limitations of this model influence this study.
14. Whilst able to follow the general results, I got a little bogged down reading through the various different analyses described in Section 3. Is it possible to simplify this section?

Minor points

1. Abstract, line 21: change ‘relative’ to ‘relatively’.
2. P7357, line 19: GHM acronym not defined in the text.
3. P7359, line 14: do not use colloquialisms such as ‘pros and cons’. Whole sentence is awkwardly phrased.
4. P7359, line 21: capitalise Atmospheric Research (as in NCAR)

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5. P7359, line 25-26. awkward sentence.
6. P7360, line 8: provide reference for PCR-GLOBWB here
7. P7360, line 12: 'op' = spelling mistake?
8. P7360, line 21: which CRU data sets?
9. P7361, line 24: Mitchell and Jones (2005) is the correct reference for CRU TS 2.1. Note that CRU TS 3.0 has superseded CRU TS 2.1
10. P7362, line 6: need to be clearer here. PT is radiation based (it includes net radiation), whereas HG is temperature based – the only radiation term is extra-terrestrial solar radiation, which only varies by latitude and season.
11. P7362, line 24: replace 'mode' with 'more'
12. P7362, line 25: see above. You should clarify that Hargreaves includes a measure of extra-terrestrial solar radiation, and so varies with latitude and season only.
13. Line 26: sentence unclear
14. P7363, line 21: change 'exists of' to 'consists of'?
15. P7365, line 13: please provide a reference for Welch's t-test. How is this different from the more commonly used student's t-test?
16. Line 15: could you be a bit more specific – is "x bar subscript CRU" the annual average PET value?

References

Mitchell, T. D., and P. D. Jones (2005), An improved method of constructing a database of monthly climate observations and associated high-resolution grids, *Int. J. Climatol.*, 25, 693-712.

Roderick et al. (2007) On the attribution of changing pan evaporation, *Geophysical*

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Research Letters, 34, L17403, doi:10.1029/2007GL031166.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 7355, 2011.

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