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Hydrology and Earth System Sciences Discussions

Interactive comment on "Derivation of RCM-driven potential evapotranspiration for hydrological climate change impact analysis in Great Britain: a comparison of methods and associated uncertainty in future projections" *by* C. Prudhomme and J. Williamson

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I would first like to thank the authors for this quite interesting and timely study that clearly demonstrates the impact of the choice of PET formulation in a climate change context. It will inform future (but also previous) hydrological impact studies that make often (if not always) use of only one formulation on the large uncertainties linked to this choice. Assessments of changes computed for each formulation are quite informative

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Interactive Discussion

Discussion Paper

on this important topic for hydrological impacts.

I have however three main comments detailed below.

General comments

Present-day comparison

Present-day comparisons are highly dependent on the reference PET selected (MORECS here) and therefore it is no wonder that FAO56 formulation gives the best results, as MORECS is a PE model based on a similar Penman-Monteith formulation. Conclusions in terms of baseline goodness of fit should therefore be seen in this very specific context. One has to remind that PE is always a model, even in pseudo-observations like MORECS.

Bias-correction

Bias-correction of RCM outputs is an important issue. Here, only temperature is bias-corrected whereas other correlated variables (mainly radiation) are not (P607, L1-1). This assumption/choice has definitely some impacts on computed PET values. This is in my opinion an important issue and limitation of this work that should be at least thoroughly discussed in this paper.

Sources of uncertainties

I definitely agree with the authors on the need to compare the uncertainty due to the choice of PET formulation to other more studied source of uncertainty in climate pro-

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jections. Preliminary studies on the Durance catchment (Southern French Alps) show that the choice of formulation between Oudin and Penman-Monteith accounts for 50% of the dispersion in catchment-scale changes in PET at the end of the 21st century when using 3000 transient projections based on several runs from 4 ENSEMBLES STREAM2 GCMs statistically downscaled with 3 stochastic downscaling methods (Vidal et al., 2013). This study also shows that interactions between PET formulation and downscaling method is not negligible, and suggests that the uncertainty in PET formulation should be combined with the uncertainty in the downscaling method. In the specific context of this manuscript, it would be therefore worthwhile discussing about the potentially different results that would be obtained with the other RCM parameterisations developed within the UKCP09 projections.

Specific comments

P599, L11-15: You mention that "recalibration of conceptual hydrological model(s) across Great Britain would entail a large effort". Based on my personal experience in calibrating (a large number of) conceptual models in the UK, I would tend to disagree on this amount of effort. The main advantage of conceptual models is indeed their low requirements in computational time that allow them to be relatively easy to recalibrate based on different data and/or different periods. I would therefore suggest that the authors either reformulate or specify this comment.

P602, L9-25: A recent national-scale study (Christierson et al., 2012) for example made use of the Oudin et al. (2005) temperature-based formulation based on UKCP09 change factors, as well as on the 11 RCM continuous runs that include the one used in the present manuscript. In my opinion, it would be useful to mention it here as an industry-driven study that is actually being used for long-term water planning management. Christierson et al. (2012) moreover discussed their choice of PET formulation

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by comparing PET change results with other studies on specific UK catchments using other formulations, both at the national scale and for specific case study catchments.

Table 3: The differences between different formulations is visible here through only 4 selected months. It would be much more interesting to have the complete monthly cycle in order to have a clear overview of differences. Indeed, it could appear that some formulations are constantly better than other over entire seasons, which would bring in some further elements of discussion.

P605, L11-17. The list given in the Supplement is useful. However, are all equations based on daily input values? Please specify it as results can be very different when using hourly or daily values.

P605, L20-25. It would be nice to have the equation in the Supplement along with other equations.

P606, L20: Please make explicit what variables from HadRCM3-Q0 are actually used in this study (presumably only mean daily temperature, relative humidity and cloudiness fraction).

P606, L25-27: Please specify the equation for obtaining radiation. Is it based only on temperature and cloud fraction?

P606, L20-27: It would be much useful to describe how this study can be actually put in context of UKCP09 CFs.

Fig. 2 and Fig. 3: I would have a similar comment as for Table 3 on these figures. In my opinion, they convey an incomplete view of the results computed in this study. I would rather like to see a panel of maps (with two axes showing formulations and months) in order to have a continuous overview of biases and changes along the seasonal cycle.

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References

Oudin, L., Hervieu, F., Michel, C., Perrin, C., Andréassian, V., Anctil, F. & Loumagne, C. (2005) Which potential evapotranspiration input for a lumped rainfall-runoff model? Part 2–Towards a simple and efficient potential evapotranspiration model for rainfall–runoff modelling. *Journal of Hydrology*, 303, 290-306. doi: 10.1016/j.jhydrol.2004.08.026

Christierson, B. v., Vidal, J.-P. & Wade, S. D. (2012) Using UKCP09 probabilistic climate information for UK water resource planning. *Journal of Hydrology*, 424-425, 48-67. doi: 10.1016/j.jhydrol.2011.12.020

Vidal, J.-P., Tilmant, F. & Hingray, B. (2013) .Uncertainties in changes in potential evaporation: the formulation issue. *Geophysical Research Abstracts*, vol. 15, EGU2013-11231

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