

## ***Interactive comment on “A large set of potential past, present and future hydro-meteorological time series for the UK” by Benoit P. Guillod et al.***

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### **Reply to the review by E. Blyth**

We are very grateful to E. Blyth for her review. We include our answers to the comments in blue font right under the unmodified comments from the review.

#### **REVIEW**

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I think this paper describes a useful product that can be used by the scientific community. However I am a little concerned at the lack of analysis particularly of the bias in the model estimates of potential evaporation (PE). On page 12, lines 9 to 11, you state that there a “small overestimation” of the PE and claim this this is satisfactory. I think you might be brushing it off to casually. The bias is 20% which is not “small”. Firstly, I think you should tell us where this bias is coming from. You mention earlier (Page 12, line 1) that there is a warm bias in the south in the summer. Presumably this is driving this 20% overestimate of PE. Secondly, I think you need to quantify what impact this will have on your drought estimates. Drought isn’t only about rain - it’s about drying as well. With a 20% overestimate of PE in the very dry area of the UK, you might be overestimating the drought. Please add a paragraph or so on the drying bias.

Thank you for this comment, which was also raised by referee #2. We agree with the referee that more discussion is needed on the PE bias. The PE bias can have various sources, including (but not limited to) the positive summer temperature bias. Other possible causes for the PE bias can be through its radiative (e.g., an overestimation of the net radiation through an underestimation of cloud cover) and aerodynamic (wind) components. These two additional possible sources of biases are difficult to correct owing to a lack of observations. Moreover, the uncertainty of the true PE is very large, as highlighted by the discrepancies from observational datasets (i.e. from datasets other than CHES-PE).

To address this point, we have rewritten the discussion around PE biases in the manuscript. We have explained what the pitfalls of bias-correcting PE are in Section 4.1.2, justifying our decision not to correct these biases. We have also clearly stated at several places that the users of this dataset should be aware of this bias and,

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depending on the application, should account for it in their analysis.

The many plots of results (figs 7, 8, 10, 12, 14 and 15) are hard to read. Firstly they all look much the same. Secondly, there is no map of where these regions are. You should have a map so that we know where catchments such as 'Dee' and 'Tweed' etc are. Not everyone has a geographical-hydrological map in their heads! In fact what I recommend (although it would take some time) would be to just do the 4 regions that we used in the CHES paper (Robinson et al): Scotland, Wales, England and Lowland England. The advantage is that you have separated the climate zones of the UK and the plots are easier to digest as there are less of them.

This is a good point and indeed a map of the regions is lacking. We agree that a lower number of regions may be preferable, although we prefer to stick to the UKCP09 water regions as these are river basins. We have selected six representative regions (Western Highlands, North East Scotland, Tweed, North West England, Anglian and Thames) and have added a map of these regions (new Figure 7). The plots for all 19 regions are still included for interested readers, but as part of the supplement rather than in the main part of the paper (see also Supplementary Fig. S3 for a map of all regions).

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