

Interactive comment on “How over 100 years of climate variability may affect estimates of potential evaporation” by R. P. Bartholomeus et al.

Anonymous Referee #2

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Review of HESSD 11, 10787–10828. Bartholomeus et al.: How over 100 years of climate variability may affect estimates of potential evaporation.

General comments This paper investigates how non-stationarity in climate data can influence the estimates of potential Evaporation using the “two step” or crop factor approach. Overall this is a timely discussion to have. It is more and more clear that there is a large amount of variation in the climate and this affects the performance and behavior of hydrological and climate modelling if parameters in the model are considered stationary. Simply put, non-stationarity is unexplained variance.

On the one hand, it is good to indicate these issues and to warn practitioners, but on the other hand, do we really believe we can make accurate predictions outside a

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calibration period? This is not even true for simple regression models, so why would it be true for calibrated hydrological and climate models. Any extrapolation outside calibration data is going to suffer from increased uncertainty. This has been known for years. The question might be more, why is this easily forgotten, and how do we deal with it? The probable reason why it is easily forgotten, is that we believe that our models, because we are attempting to represent real physical processes, are not regression models. What I really missed in the paper is a solution. We could define the uncertainty and attempt to adjust the management to deal with the uncertainty, but this is rather unsatisfactory as a scientist. The other, more important approach, is to find a way to modify the model to deal with the issue. Are you suggesting we throw out the two-step approach? Or can we adjust the two-step approach? In the end, Figure 10 actually indicates that there is some pattern in the over and underestimation, both between models and in time periods. So there is some predictability in the actual deviations. This would have been nice to explore. The other issue of interest that emerges from the paper is the comparison between models. While this is highlighted (Hargreaves and Blaney-Criddle versus Makkink and Priestley-Taylor), it is not really analysed in relation to the structure of these models. Why do the temperature models fail more than the radiation driven models? Finally there is the difference between vegetation. While this is just synthetic data, this incorporates the “current knowledge” about the evaporation from these vegetation types. In addition, the variation between veg types appears to be lower than between models. Is this interesting? So, while I think the analysis is tidy and neat, and the topic of interest, I miss depth in the article to actually progress the science and the application.

Specific comments I have a few specific comments P10792 line 27: no-analogue? Is this a typo, I wasn't sure, should this be non-analogue? P10795 line 5 & 6: The accuracy of SWAP, It is not really irrelevant. I think you need to at least identify whether the choices of parameters in SWAP would affect the variability and the relative proportions of the calculated E components. So has your choice of crop, soil depth etc affected the different E component variation in time. You are assuming that the relative

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relationship between E_i and other E components is invariant of your crop choice and soil depth. Page 10797 line 14, this might cover my previous comment, but still worth checking. Page 10799 line 24: Would it worth highlighting what in these models causes this? They are both calibrated on the same data, both temperature based, but given the same temperature series one deviates downward (under climate change) and one upward, even though the temperature series has the same direction for both. Looking at the equations in Table 1, both use average temperature (which is supposedly increasing), but Har also uses Radiation and the difference between T_{max} and T_{min} , which might be stable Page 10805 line 7: advance in the ability Page 10805 line 12: assumptions (plural)

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