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Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-494

Anonymous Referee #1

Referee comment on "Reconstructing climate trends adds skills to seasonal reference crop evapotranspiration forecasting" by Qichun Yang et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-494-RC1, 2021

In the manuscript "Reconstructing climate trends adds skills to seasonal reference crop evapotranspiration forecasting", Yang et al. adopted a new method to improve the prediction of evaporative water loss based on seasonal climate forecasts from the ECMWF model. This method is capable of dealing with the impacts of the changing climate on the prediction of future evapotranspiration (Reference crop evapotranspiration, ETo), and could lead to more realistic predictions. The changing climate has substantially altered the water cycle, representing one of the most critical challenges in hydrological modelling and water resource management. This work is innovative in taking this impact into account and addressing the challenges associated with climate change in the prediction of future evapotranspiration. The developed method is expected to be applicable to other models and thus benefit both forecasters (weather/climate centers) and forecast users (irrigators, hydrological modelers).

The manuscript is generally well written. The introduction clearly explains the background, challenges, motivation, and objective of this work; Method provides detailed information of the model, how the model runs are conducted, and evaluation metrics; Results generally are clear and readable; Discussion provides valuable insights and important implications for future improvements of climatology-based models in hydrological modeling and forecasting.

I encourage the authors to address the following issues before publishing this work.
1. For time-series data, in addition to the magnitude of trend, another important feature is the statistical significance. I noticed the authors had taken this into consideration in selecting the months (8,9,10) for evaluating the performance of trend construction. In constructing the observed trends in calibrated forecasts, you empirically set limits of the trends in equation 8. I understand this is to avoid extremely large trend values. In addition to this adjustment, I think you should limit trends to zero, in grid cells where observed trends are insignificant ($P<0.05$). Otherwise, the trend reconstruction may overestimate climate trends. I see decreases in the correlation coefficients and skill scores when compared with the calibration without trend reconstruction (Figures 2 and 3). I think

limiting the insignificant trends could avoid these unwanted decreases. I suggest the authors rerun the trend-reconstruction calibration and take statistical significance into account. If you see improvements in the new runs, update the results accordingly.

2. In addition to the improvements in the three selected months, whether trend construction improve the calibration over the whole study period?

3. Presentation of the improvements in figures 2 and 3. I suggest the authors use the percentage of changes to demonstrate the differences. Since correlation and skill score vary largely from short to long lead times, using percentages could better demonstrate the more significant improvements at long lead times.

Specific comments:
Page 1. line 22, forecast should be forecasting
Page 3. line 92-93. This study is performed across Australia only
Page 4. line 100, Calculation of ETo observations and forecasts
Page 6. line 160-165. Please italicize k in this paragraph and throughout the manuscript to be consistent with the equations.
Page 15. Figure 7, It is hard to read the alpha index values in the figure. Please consider changing the limits of the color bar, and use narrower limits (e.g.,0.8-1), to make the alpha index maps more readable.
Page 17. line 378. To change with time?