Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., author comment AC1
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Reply on RC1

François Clayer et al.

Author comment on "Sources of skill in lake temperature, discharge and ice-off seasonal forecasting tools" by François Clayer et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-312-AC1, 2022

Thank you for this thorough and helpful review. And I apologize for this rather late reply, I hope this can still trigger some further discussion upon interest. Below and some preliminary responses for the main points the reviewer raises and some more specific answers.

Chosen drainage areas and lakes

Yes we agree that the rationale behind our site selection is not well presented, especially regarding skills of SEAS5 predictions. We selected those sites to "test out" the applicability of SEAS5 outside the tropics. This point will be emphasized in the revised introduction. Also what do you mean by "an analysis of latitudinal effects for the used forecasting method to improve forecasting towards the North/South pole"?
I'm not sure I understand what you expect here.

Very good points on water temperatures. Thank you for raising those. We indeed overlooked the impact of the water temperature of the inflows on the lake/reservoir heat budget, although it is mainly based on air temperature with some time lag. Allowing for some time for additional analysis, we will be able to include that in section 3.4, as well as the connection between surface and deep waters.

Data

We have used ERA5 data to indeed cover all the catchment areas, but most importantly to avoid using observations with data gaps. Several case studies had issues gathering continuous timeseries of observed weather data. So in some cases, forcing the models with observations for a long-enough period of time (over 20 years to have at least 20 seasons) to allow for probabilistic outputs was not even possible.

A second reason is also to keep our workflow transferable to other sites.

We will make sure these points are clearer in the manuscript

Clarity

Yes we can add an index for clarity.

The models were run one after the other, the catchment model provide inflows to the lake/reservoir model. We will make that point clearer in the manuscript.

The language

We agree and apologize for our lack of precision on the terminology and any impact it might have had on your understanding of this study. This is a point that the other reviewer has also raised so we will make sure to use the common terminology in the forecasting community, and define any terms that are not common when necessary.

Thank you for your detailed comments on each line. We will add a map and make sure we respond to all your concerns. Below are some preliminary answers for a few specific points.

About, L. 235-238, you were concerned about "hysteresis should make linear relationship between ex. air temperature and water temperature rather bad" (…)

Pearson partial correlation coefficients (PPCC; first described here l. 235-238 and displayed in Fig. 5) are calculated from seasonal means, and not daily values, which likely yielded much cleaner correlation than expected from daily values. This point will be made clear in the revised MS.

Line 243 the reader are not familiar with the contributions of local heat fluxes at the chosen locations.

Agreed, we will include some additional figures showing each lake heat budget to back up our assumptions here.

Figure 3 and 4 : missing Germany and Australia, add or explain.

We apologize for this oversight. The German and Australian case-studies were left out of this analysis because of the resource and time-consuming process running these experiments and because both sites showed only one or two skillful season-tercile-variable combinations. This point will be included in the MS in the method section.

Figure 4 : Something do not add up in your analysis. Top row for Spain – Bottom temperature, and Norway - Surface temperature appear to be to large compared to the individual season values taken together. I.e. if the impact is small most seasons, I do not see how it could e much larger on an annual basis.

We agree with you that it can appear quite surprising that the sensitivity calculated on an annual basis is much larger that over each single season. However, Norway's climate is subjected to strong seasonal cyclicity which can be well captured over annual scales, but still have low correlation for a given season. We can better explain this point in the MS.

Figure 5 : Why so many data gaps? Consider showing seasons where significance is worse (higher) but clearly state which significance level you trust.

Many were not significant with p-value > 0.1, so not show on the plot. We can still add these on the figure.