Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-659-AC1, 2020

Hydrology and Earth System Sciences
Discussions

Interactive comment on "From skill to value: isolating the influence of end-user behaviour on seasonal forecast assessment" *by* Matteo Giuliani et al.

Matteo Giuliani et al.

matteo.giuliani@polimi.it

Received and published: 31 March 2020

The subject of the paper "From skill to value: isolating the influence of end-user behaviour on seasonal forecast assessment" is of direct interest to the Journal of Hydrology and Earth System Sciences. Authors introduce and apply a framework in the context of valuing the potential benefit of seasonal forecast in terms of economic end users benefit. Although there are several aspects that need to be further elaborated, this is a step forward in moving from skill to impact (financial) based assessments.

1. One of my concerns is that the examination of the value of forecast is limited to a single lead time (51 days ahead) and the potential benefit of other lead times to the

current framework are not examined, or at least discussed.

Our analysis focuses on a specific forecast lead time that was identified in a previous work, i.e., Denaro et al. (2017), as the most valuable for improving Lake Como operations. In that work, we did indeed comparatively analyze forecasts over different lead times from 1 week to 60 days. We will better clarify this point in the revised manuscript.

Denaro, S., D. Anghileri, M. Giuliani, and A. Castelletti (2017), Informing the operations of water reservoirs over multiple temporal scales by direct use of hydro-meteorological data, Advances in Water Resources, 103, 51–63

2. Crop yield modeling is an integral part of the valuing framework. The simulation of crop production is based on water availability and growing degree days controlled by temperature. From the information provided in the manuscript it is not clear whether the heat unit module of agricultural model is also informed by seasonal forecasts.

The agricultural model is not informed by the forecasts because our analysis investigates the value of forecasts in informing the Lake Como operation that provides the irrigation supply to the agricultural districts considering as water demand the sum of the water rights of the different users, which therefore does not vary across years. Conversely, we are not exploring here decisions by the farmers that could benefit from the seasonal forecasts, but we studied this problem in a previous work (see Li et al., 2017). In the revised manuscript, we will better clarify the decisions we are considering as well as the definition of the irrigation demand.

Li, Y., M. Giuliani, and A. Castelletti (2017), A coupled human–natural system to assess the operational value of weather and climate services for agriculture, Hydrology and Earth System Sciences, 21, 4693-4709

3. I understand that the present study, beside other components, examines the usefulness/applicability of a continental scale hydrological model (E-HYPE) with known issues in simulating streamflow dynamics due to local scale hydrological features (as

referred in L120-125 – constant positive bias of E-HYPE / failure in seasonal dynamics).The question is whether the use of fine-tuned local scale model would increase the performance of the overall system?

We agree with the reviewer that a fine-tuned local scale model may in principle increase both the skill and the value of the forecasts. However, in Crochemore et al. (2020) we showed that E-HYPE seasonal forecasts can yield as skilful information as a local model can when looking at anomalies or other statistics relative to model historical time series. In this study, the Lake Como operations were optimized using E-HYPE historical time series so that operations are informed by seasonal forecast anomalies. We will discuss this point in the revised version of the paper.

Crochemore, L., M.H. Ramos, and I.G. Pechlivanidis (2020), Can Continental Models Convey Useful Seasonal Hydrologic Information at the Catchment Scale?, Water Resources Research, 56(2)

4. Finally, the manuscript would benefit from considering a section summarizing the limitations of the study and ways to overcome these limitations. This could be included in the discussion section.

We thank the reviewer for the suggestion and we will add such discussion about the limitation of the study, including the continental vs local scale model from the previous point, in the last section of the revised manuscript.

Considering these, and the fact that the scientific significance and quality are excellent, my suggestion to the editors is to accept after minor revision in the context of my specific and technical comments. I am listing a number of suggestions in the form of technical comments that will improve the presentation of the study.

We thank the reviewer for the positive and constructive comments.

TECHNICAL COMMENTS L200: The simulation horizon for the policy optimization is 2007-2015 while results are presented for the 1996-2008 period (thereafter). In case

this is correct, is there any effect from potentially different operation policies between these two periods (considering also that the 2005 drought is out of the 2007-2015 bound)?

This is a typo and all experiments refer to the horizon 1996-2008.

Figure 4: Please consider adding a straight line in panels (b) and (c) indicating flood level.

We thank the reviewer for the suggestion and we will revise the figure accordingly.

L240-241: This is not clear in the figure. Please explain.

The comment refers to the similarity of the baseline, ESP, and SYS4 trajectories, which are on average almost overlapped until the third week of June, while they look more separated during the drawdown period with the SYS4 that is able to keep a high level also in July. We will rephrase this comment in the revised manuscript.

L249-250: but also less efficient onwards (from July to mid-August).

The comment by the reviewer is correct, ESP and SYS4 reach lower levels than the baseline in the second half of the 2005 summer. Yet, this strategy is not necessarily less efficient and can also be considered as an extreme drought mitigation measure triggered by the extreme drought conditions predicted for August in order to support a more reliable irrigation supply than under the baseline by sacrificing few extra centimeters of lake level. We will add a sentence to discuss this aspect in the revised version of the paper.

Figure 5: could consider adding a second panel on the right illustrating the benefit with respect to the baseline.

We thank the reviewer for the suggestion and we will revise the figure accordingly.

Table 2: Based on the values in the table, does the optimum profit comes from informing farmers with the minimum values (SYS4-min)?

Yes, this is correct. The minimum of the ensemble results in the best forecast looking at the performance over the full period. However, for the extreme drought of 2005, the 25th percentile would perform better.

L279: Please provide more information on the behavioral factors.

We model behavioral factors capturing different levels of risk aversion in the interpretation of the uncertainty associated to the forecast ensemble: we first explore decisions that are dependent on the ensemble mean and then move to more and more risk averse behaviors that condition the decision on low percentiles of the ensemble, thus looking at the more negative conditions in terms of irrigation supply. We will better describe and motivate the behavioral factors in the revised version of the paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-659, 2020.