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Hydrology and Earth System Sciences Discussions

Interactive comment on "Tailoring seasonal climate forecasts for hydropower operations in Ethiopia's upper Blue Nile basin" *by* P. Block

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The author would like to offer sincere thanks to Referee #3 for taking time to carefully review this manuscript and provide insightful comments. They are much appreciated. Below is a point-by-point response to issues raised. Referee comments are numbered.

1. The title is promising too much since Ethiopian hydropower is only taken as a hypothetical demonstration case study. The reservoirs have not been built and the reservoir/hydropower dam characteristics and economic model seem to be based on the 1964 USBR report. Consider cutting Ethiopian's etc. from the title, or in Discussion section come back to the actual hydropower development (plans) in Ethiopia including challenges in Nile basin geo-political context.

The author agrees with this suggestion, removing reference to Ethiopia, making the final title: Tailoring seasonal climate forecasts for hydropower operations

2. Alternatively to excluding the above normal rainfall predictions, the ensemble predictions could be used for refined decision making, e.g. by selecting probability threshold for in/exclusion of forecasts. Consider discussing/mentioning this in the Discussion section.

As suggested by the Reviewer, this will be explicitly mentioned in the discussion as the next step, moving toward a plausible operational approach. The real focus of this work is to evaluate the forecast potential, understand the associated uncertainty, and carry out a sensitivity-type analysis with the hydropower model (in lieu of probability thresholds) to determine the envelope of possible outcomes.

3. p3774, l19-22: The choice of using observed temperature instead of climatological values for the actual forecasts is not logic as main comparison in the paper is between actual forecast and non-forecast/climatological forecast, not with perfect forecast. Although it is stated here in brackets that differences are small, curiosity towards results with actual precip forecasts and climatological temperature input remains. Especially as in the end of the paper wet forecasts are disregarded, so dry forecasts, in which the differences between observed temperature and climatic temperature are relatively more important, make the positive difference.

Temperature changes are predominantly manifested through evaporation, and it turns out that temperatures do not deviate exceptionally from the average (or climatology) all that much in any given year. Additionally, since the reservoir is located at high elevation, evaporation losses only represent a small fraction of the water balance. To illustrate the difference in benefits between using observed and climatological temperature values for the actual forecast approach, the analysis was rerun for the four decades within 1961-2000 (for one reservoir only.) See attached figure.

The largest difference, in the first decade, is still only 1.6%. The smallest, decade

two, is 0.1%. Clearly they are differentiable, but not substantially. Another important point is that both the actual forecast and the non-forecast (monitoring) approaches used observed temperatures – not just the actual forecast. So one would expect a decline in decadal benefits from a substitution of climatology for observed temperatures in the non-forecast approach as well. (Not shown here, but that is indeed how it plays out.) Overall, the absolute value of the benefits from either approach are likely overestimated, considering the use of observed temperatures, however for comparison between forecast and non-forecast, it is essentially immaterial. Adding a temperature forecast, conditioned on the precipitation forecast, is an added layer of complexity for future stages of this research.

4. p3777, l8-10: Based on figure 4, one better performing, two (almost) equal performing, and one worse performing actual forecast, value of using actual forecasts is not yet clear.

What can be taken away from Figure 4 (and will be more clearly spelled out in Section 4.1) is that while for 3 decades there is little appreciable difference between forecast and no-forecast approaches, for the 1980s decade, the difference is stark. Even if this significant difference occurs less than 1 in 4 times, it is these big hits that managers wish to avoid. Forecasts (especially tailored forecasts) may help to reduce variability in benefits, and buffer against major setbacks, at least as compared to what may be expected under the no-forecast case.

5. Detailed comments: p3766, l 18: exhibits should be exhibit

Yes, agreed. Will change.

6. p3767, l2: ..even in regions of scarcity. Is there a reference available?

Both Rayner et al (2005) and Ziervogel et al (2010) refer to the lack of forecast uptake for water stressed or water-competitive regions. These references are given at the end of the paragraph (after the following sentence.)

7. p 3768, l21: .., and are joined..

Yes, agreed. Will change.

8. p3770, l23/24: reference?

Block and Rajagopalan (2007). Reference will be added.

9. p3772, l6/7: Is it just a 1 to 1 translation? Please describe.

Essentially, yes. The runoff from the hydrology model is calculated on a grid cell basis; to determine streamflow at a specific point, cells above that point (upstream cells) are aggregated. Upstream cells are based on topographic information (or DEMs.) A sentence will be added to clarify this in the text.

10. p3773, l18-20: spatial resolution of observed precip?

0.5-degree x 0.5-degree. This information will be added.

11. p3789, l18: reference Ziervogel is missing

Thank you. The reference will be added.

12. p3802, fig 11: Figures are too small/do not print well, a) and b) in the caption have been mixed: a) shows benefits, b) shows reliability.

The Figure quality will be improved and subplots properly identified. Thanks for pointing this out.

Again, the author would like to thank the Referee for their comments, which will undoubtedly improve the quality of the paper.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 3765, 2010.

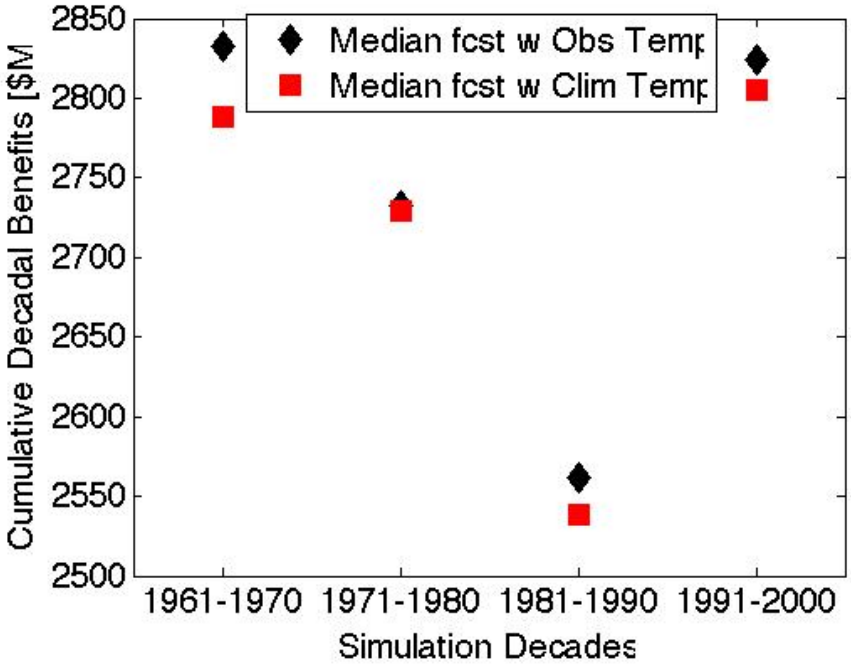
Median fcst w Obs Temp
Median fcst w Clim Temp
Cumulative Decadal Benefits [$M
2850
2800
2750
2700
2650
2600
2550
2500
1961-1970
1971-1980
1981-1990
1991-2000
Simulation Decades

Fig. 1.