

Interactive comment on “Tailoring seasonal climate forecasts for hydropower operations in Ethiopia’s upper Blue Nile basin” by P. Block

Anonymous Referee #1

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This is an interesting paper. I do have a serious concern as to whether the coupled modeling system properly captures the forecast uncertainty. The deterministic reservoir operation model (IMPEND) is run in an on-line mode using hydro-meteorological sequences of 12 months, to finally cover a planning period of 120 months. Three different types of forecasts are then used to quantify the value of seasonal forecasts: “perfect”, “actual” and “monitoring”. The three cases assume that future streamflow sequences (12 months) are known, therefore overestimating the benefits of system operation. The benefits derived from the three cases are then compared, and what ultimately matters is the difference between these three cases. But still, the uncertainty could at least be incorporated implicitly. In the “actual” case, this could be done by directly optimizing over the 500 members of the ensemble, and then calculating the ex-

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pected benefits. Explicitly incorporating the stochastic nature of forecasts is probably beyond the scope of this paper but the author should mention this option as well as the limitation of the proposed modeling scheme in the introduction and/or in the discussion/conclusion. Some relevant references on the incorporation or flow forecasts in reservoir operation are: Karamouz and Vasiliadis, WRR, 1992; Kim and Palmer, JWRPM, 1997; Faber and Stedinger, JoH, 2001. These references also provide background information on explicit and implicit stochastic programming.

Other comments

The manuscript would be easier to read if some terms were defined: forecast vs. prediction, climatological vs. historical values, observed vs. historical values, etc. Page 3767. Suggest one paragraph with the above references on the value of hydrologic information in reservoir operation. Page 3771. Line 15. What happen to the 500 members that are generated by the forecasting system? Are the medians/means considered as the forecasts in the “actual” case? A diagram describing the flow of information between the different components of the modeling system would probably be useful. Page 3772. Line 16. The value of electricity is set to 8 cent/kWh. Does the value remain constant throughout the year? Section 3-3. The description of the three types of forecasts is a little bit confusing. Some terms must be defined and a figure illustrating these three types would make the reading easier. Page 3774. Line 9. Why was a 12 month foresight chosen? This seems rather long to me, and the informativeness of the forecasts after a couple of months must be negligible. Page 3775. Line 7. The forecasts modes are evaluated by comparing the sum of monthly hydropower benefits (generation) over the several periods of 120 months. Comparing the firm energy is also important, especially for risk-averse managers. Page 3777. Line 15. The mechanism used to generate the 100 decades does not preserve the temporal persistence between December and January. How does the author address this important issue? Page 3778. Line 3. Negative benefits can be observed because low storage levels and outflows are penalized. Could be penalties be removed and replaced by constraints so

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as to avoid negative benefits? Page 3779. Line 14. It is still unclear to me how the “observed” and “observed with error” series were generated. Why did the author choose to add 25 mm of monthly precipitation? What does 25 mm correspond to? Page 3776. Line 20. Fig 4. Figure 4 presents the cumulative benefits for the four decades (1960-2000). Why working with four independent decades and not a single period of 40 years? Why 4 periods of 10 years and not, say, 8 period of 5 years? I have a similar concern with the forecast horizon (12 months). Those modeling choices should be better explained and justified. They should be based on the hydro-meteorological characteristics of the system and on the storage capacity of the reservoirs. No need for long lead times if the storage capacity is small... Figure 5. The difference between forecast and monitoring benefits is positive for low benefits, i.e. dry years. The opposite is observed during wet years. The discussion in the paper focuses on points A and B but not on the overall pattern. Above normal forecasts are then corrected to improve the performance of the system during wet years. One alternative to avoid this poor performance during wet years is to impose a target storage at the end of each year. Why was this option not implemented? Page 3779. Line 25. We need more information on how the forecasts are “modulated”. Page 3782. Line 3. I would also add that a forecast system may be considered useful if the inherent uncertainty is properly accounted for, which is not yet the case here. References. Reference Ziervogel is missing.

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