

Interactive comment on “Operational aspects of asynchronous filtering for hydrological forecasting” by O. Rakovec et al.

Anonymous Referee #1

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General Comments:

This manuscript titled “Operational aspects of asynchronous filtering for hydrological forecasting” compares the traditional Ensemble Kalman filter (EnKF) with its modified version, asynchronous EnKF (AEnKF). The main difference is in the update step, with the traditional EnKF using observation data from a single time step whereas the AEnKF uses observation data from multiple time steps in the past.

The paper is well written and structured in a systematic manner. The results clearly support the findings and make an important contribution to the data assimilation literature. However, my main concern is how to identify the specific contribution from the AEnKF approach. That is, are the improvements in the discharge forecast purely from

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using multiple data points in the past at the update stage? This question arises from the observation (in Figure 7) that the forecast improvements in the AEnKF are very systematic for most lead times. Given that the forecast improvements are systematic, I think it is safe to say that the improvements at the update stage are also systematic. If this is true, that means that there is a linear relationship between the updates made with a single observation data and those made with multiple data points in the past. Practically, this is unlikely because you expect different levels of updates especially for transition periods like dry to wet and vice-versa (or low to peak flows and vice-versa).

On a related note, the level of improvement from EnKF to AEnKF seemed to be relatively constant irrespective of the lead time (Figure 7). For me this is a worrying sign because it looks as if you are able to identify and quantify this constant difference (maybe call it bias) then you can get a better forecast. In other words, the AEnKF seemed to have a better treatment of bias. It will be interesting to know how the AEnKF will perform for low flows, normal flows, and peak flows independently. That is, will updating the model with multiple data points in the past always have a positive impact on forecasts made during low and peak flows?

I think these are important questions the authors need to address, even if they do not have results to support it at least a clarification is needed about which conditions their methodology will mostly apply.

In Figure 6, the no-update looked pretty accurate and almost comparable to the assimilation, but in Figure 7 the evaluation measures for no-update is very poor. This is a stunning difference, please clarify.

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