Hydrology and
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Discussions

Interactive comment on "Data assimilation in integrated hydrological modeling using ensemble Kalman filtering: evaluating the effect of ensemble size and localization on filter performance" *by* J. Rasmussen et al.

Anonymous Referee #3

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General comments

This paper deals with the assimilation of synthetic groundwater head, stream discharge, and/or parameters in a hydrological model using an asynchronous Ensemble Transform Kalman Filter. The paper is a useful contribution in the field. The comparison between the assimilation of the groundwater head observations with or without stream discharge observations, and with or without parameters is of interest. However, I have a couple of point of concern.

The first point is the clarity and consistency between results shown in different figures. Results shown in Figure 4 seem not to be consistent (much higher) with those shown in figures 3, 4, 6, and 8. Many of the figures contain more than one figure. The authors should identify each of the two figures as figure 3a and figure 3b for example. See Specific comments for clarity comments on figures. Also, many errors in figure notations have been found and an entire review of figure notations has to be done.

A second issue is why the authors do not simulate the same ensemble size for each case. In figure 4, we can see that 8 obs were performed for 25, 50, 100, and 200 members. 0 and 2 obs were not performed with 25 members and 35 obs was not performed with 200 members. Conclusion of 35 obs could be different if tested with 200 members.

Another concern is about the description of the assimilation schemed used. Authors specified that an asynchronous assimilation was used, but no specification about the assimilation windows was specified Does this assimilation window have an impact on results?

Specific comments on figures

Figure 1: What are the two triangles in the figure? Not specified in the legend.

Figure 3: Does figure 3a is for adaptative localization? Does figure 3b is for parameters a and b = 2 ? This is not clear.

Figure 4: The figure 4b is unreadable.

Figure 5: In legend, Add no localization and adaptative localization instead or incl Local (if it is really adaptative localization that was used).

Figure 8 : Difficult to read, please improve.

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