Hydrology and Earth System Sciences Discussions

Interactive comment on "Variational assimilation of streamflow into operational distributed hydrologic models: effect of spatiotemporal adjustment scale" *by* H. Lee et al.

H. Lee et al.

haksu.lee@noaa.gov

We would like to thank the anonymous reviewer for very helpful comments. In the following, our response to each comment is given.

Comment 1) Please give an interpretation of the five SAC state variables (UZTWC, UZFWC, LZTWC, LZFSC, LZFPC) in section 2.2.2. Are they independent of one another? And why are these variables used in the study?

Response) We added description on the five SAC state variables in subsection 2.1 which is more appropriate place than subsection 2.2.2. The five SAC-states describe

the soil moisture states of different subsurface storage components. Since they fully describe the state of soil water contents and hence prescribe the model initial conditions, they are updated via data assimilation in this study.

Comment 2) According to the manuscript, the case of assimilating interior flow can improve the streamflow at outlet. Then why the outlet flow in the case of assimilating both outlet flow and interior flow showed worse results than the case of assimilation outlet flow?

Response) The reviewer's interpretation is based on streamflow analysis shown in Fig. 11 in the original version. Note in the streamflow prediction results in Fig. 12 that outlet flow for assimilating both outlet and interior flows (22% reduction in RMSE of streamflow) outperforms assimilating outlet flow only (14% reduction in RMSE of streamflow). This indicates that assimilating outlet flow only may be more susceptible to overfitting than assimilating both outlet and interior flows; the former results in higher performance in streamflow analysis but lower performance in streamflow prediction. The question of overfitting associated with outlet flow-only assimilation is already discussed in the original version in line 18 in page 113 through line 6 in page 114.

Comment 3) The authors claimed that biases in precipitation and potential evaporation (PE) were adjusted only in the abstract and conclusions, which should be discussed in the paper? How to adjust these biases?

Response) Subsection 2.2.2 describes how the two biases, $X_{P,k}$ and $X_{E,k}$, are adjusted. Equation (8) in the original version shows how they are used in the objective function and lines 5 to 7 in page 103 (in the original version) explain the temporal adjustment scales used to adjust them within the assimilation window.

Comment 4) A basin named with WTTO2 appeared in the section 4.2.3. But I cannot find it in any other parts of the manuscript.

Response) Corrected. We apologize for the mistake. SLOA4 is the correct name of the

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basin.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 93, 2012.

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