Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2021-181

Anonymous Referee #2

Referee comment on "Sequential data assimilation for real-time probabilistic flood inundation mapping" by Keighobad Jafarzadegan et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-181-RC2, 2021

The paper is interesting and presents a useful methodology for using data assimilation in flood modeling studies. A few assumptions need to be clarified. Limitations, uncertainties and implications need to be further discussed. The authors should also provide recommendations on future research and how this work can be applied to other study areas. I have recommended several edits and some comments in the PDF. Here are some additional comments:

- Introduction: The section can be shortened and be more concise.
- Past research on probabilistic flood modeling should be further acknowledged (e.g., Aronica et al. 2012, Savage et al. 2016, Papaioannou et al. 2017, Ahmadisharaf et al. 2018).
- Please provide more information on the study catchment, particularly those that affect your model results. This includes computational area, soil type, channels' size, ground slope, land use etc.
- How well do the 120 m DEM represent the watershed topography and bathymetry? What are potential errors and how they affect your findings?
- More details on the hydrodynamic model setup is needed. How long was the warm-up period? What was the simulation time step? What was the Courant number?
- Please present the computational time of your simulations. In practice and with the existing resources, how practical it is to use the 2D unsteady models for real-time flood forecasting? In particular, high resolution analyses might be desired. Is the presented DA-hydrodynamic modeling framework computationally efficient to be applied in practice?
- Please italicize all variables/parameters in the text.
- Any rational for considering a normal distribution for the model boundary conditions with a mean of zero and relative error of 20%? If it is derived from previous studies, please point this out the first place you present this assumption. You should also discuss the validity of your assumption by discussing how close the previous studies are

to your study.

- Any rational for considering a normal distribution for the model initial conditions with a mean of zero and relative error of 1 m? If it is derived from previous studies, please point this out the first place you present this assumption. You should also discuss the validity of your assumption by discussing how close the previous studies are to your study.
- Any rational for considering uniform distributions for the channel roughness and bathymetry? Where are the ranges—(0,0.1) and (39,42)—coming from? If it is derived from previous studies, please point this out the first place you present this assumption. You should also discuss the validity of your assumption by discussing how close the previous studies are to your study.
- To perturb the uncertainty of parameters via Latin Hypercube Sampling, how many samples were settled? How did you ensure that the samples are sufficient for the numerical convergence?
- The three experiments presented under the Results section, should be clearly defined and described under the Methodology section. As of now, it is hard to follow the difference between the three experiments and details of each.
- Figures 6 and 7 should be merged.
- In addition to the inundation extent, it will be useful to compare the performance of EnKF with the OL on other flood characteristics such as depth.
- Broader impacts need to be discussed. The authors should discuss what implications these results have for urban planners and floodplain managers etc. and what existing programs in the US may benefit from this research.
- Study limitations and potential areas for future research need to be expanded.
- Please discuss how your presented DA-hydrodynamic modeling framework can be used in other study areas. What considerations should be taken to do so?
- Please spell out all the abbreviations in the headings, figures and tables. These need to stand alone.

I hope the authors find these comments useful in their research. If the authors decide to submit a revision, both sets of my comments, including the above and in the PDF, should be addressed.

Please also note the supplement to this comment:
https://hess.copernicus.org/preprints/hess-2021-181/hess-2021-181-RC2-supplement.pdf