

Interactive comment on “The HOOPLA toolbox: a HydrOIOlogical Prediction LABORatory to explore ensemble rainfall-runoff modeling” by Antoine Thiboult et al.

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This technical note introduces a modeling framework developed in MATLAB environment for progressive model building, calibration and data assimilation. I welcome the contribution.

Most of my comments are regarding the manuscript and not the code itself. To me, it looks as if the manuscript is written in a rush! The abstract is not sufficiently explanatory of what is in the manuscript. It should be clear that the toolbox is evolving around simple bucket rainfall-runoff models. There is no consistency between the paragraphs of the first two pages describing the need for the toolbox. The model starts from

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ensemble forecast, predictive uncertainty, initial condition, structural uncertainty and finally existing modeling toolboxes (where the manuscript refers to previous works on flexible toolboxes; also please include MARRMoT, Knoben et al., 2019). Given that, the manuscript does not position the toolbox well in the generation of other toolboxes that are designed to explore similar research question on structural comparison, input uncertainty, and data assimilations while it gives the feeling to readers that the proposed modeling framework is the only modeling framework that deals with input uncertainty while also considering the structural uncertainty combined. Following this comment, I would suggest:

- 1- Make the abstract more elaborative of what is going on in the manuscript. Possibly provide some understanding of the importance and the added values of HOOPLA.
- 2- Make sure that the paragraphs in the introduction are following logically. For example “In this respect” in the second paragraph should refer to the ensemble forecast from the first paragraph but instead, it explains the initial condition instead. Although they are related, the link here is not well explained and the story is not smooth.
- 3- Parameter and structural uncertainties are coming earlier than the framework which is designed to elaborate them (paragraphs 3 and 4 can be merged).
- 4- Section 2.1 and 2.2 can also be better organized. At this moment there is a mix of models structure, code capabilities, data assimilation, and optimization. I would suggest the authors separate the model and hydrological capabilities in one section, for example, 2.2 can be about the different hydrological models with the subsections of transpiration and snow, surface runoff formulation (section 2.3 and 2.6 can be put under the model section with more elaboration on the other processes as well if the authors wish to elaborate on the processes in this technical note), then calibration, and finally assimilation. Moreover, section 2.1 can be more technical rather than descriptive; the authors can objectively explain on parallelization, modularity in a much more structured fashion.

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5- The information on the parallelization that is expressed in Appendix B should somehow come to section 2.1 as parallelization is one of the technical aspects of the toolbox. This section should really explain the toolbox capabilities clearly. There is model set up convenience provided by the toolbox but there should be also tangible gains provided by the toolbox as well. I would suggest Section 2.1 include subsection with the philosophy of development and also an actual feature of the toolbox such as parallelization, modularity, etc.

6- May be I missed here; what is the numerical implementation for the model. Forward explicit or iterative explicit or implicit? Also, explain more about the time stepping of the model. Can it do internal aggregation, interpolation of input forcing for example?

7- I think there are a lot of similar figures in the manuscript. I would suggest diversifying the figures by including an ensemble forecast for predictions for hydrograph for example. Including one figure with hydrograph would be a wise thing to do.

8- The conclusion should wrap up the technical aspect of the toolbox and its added values. It can be a bullet point conclusion and a short description of how those objectives have been met.

9- In my opinion, by looking at the code from GitHub, I feel that the codes can be written in a more efficient way using generic usable components. This is just a suggestion as I did not dive deep into the code. BTW, just mentioned the GitHub page once in the manuscript.

Overall, I would suggest a major revision for this manuscript. The presentation should be improved significantly.

With regards,

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