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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Consistent Initial Conditions for the Saint-Venant Equations in River Network Modeling" *by* Cheng-Wei Yu et al.

Anonymous Referee #2

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The paper evaluates methods for setting up initial states of large scale hydrodynamic models on complex river networks. It tests method as a cold start followed by spin up simulations using unsteady flow equations and the solution of backwater problem from steady flow model. Conclusions show that the later can be a good alternative. Improving simulation methods for complex river networks is an important topic, as new continental scale datasets are available, allowing hydrodynamic simulations at this scale. Setting up model initial states can be a pain and, to my knowledge, there is no definitive study indicating what is the appropriated method for large river networks. The proposed methods are not entirely new, as hydraulic engineers/scientist often use these kind of approached to start the hydrodynamic models. However, objective tests showing what methods are better is something that is not fully documented. The paper is pretty well written. It is technically precise and it was easy to follow. It is technically correct and it

documents new results. It will probably be a very good reference for the field and that is why it should be published at HESS. The authors can find a few comments above that hopefully can help to improve the manuscript.

What kinds of hydrodyanamic models require very good initial conditions to avoid numerical issues? Do simplified models as finite volumes using inertial approximation (Bates et al. 2010) as Lisflood-FP(Neal et al., 2012), MGB-IPH (Pontes et al., 2017), Camaflood (Yamazaki et al., 2013) require all this effort for very precise and consistent initial conditions? Please discuss this issue.

Why good initial states are necessary? What is more important? Having no numerical issues by using a consistent set of initial states? Or having goo d initial states to get correct unsteady simulations ? Please discuss and clarify it.

115-121. Add references.

Why simply solving backwater equations is not a good options for cold start ???? Please discuss it.

Can you also have numerical issues on PTM depending on how you set the Q0 and A0? If cold start is to bad, I guess that you can have numerical issues on PTM. Please discuss it.

One alternative to PTM is to start the model with flat water levels (h*), as a reservoir, and them run the model with downstream boundary conditions as water levels decreasing slowly from h* to h0. Please discuss this option. Please discuss it.

What are the difficulties of SSM? Does it work for looped river networks? What about situations with hydraulic structures, dams, or hydraulic controls? Please discuss it.

How convergence time of the unsteady solver compares to SSM time to solve steady flow equations? Please discuss it.

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