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Geoscientific Model Development Discussions

Interactive comment on "Shyft v4.8: A Framework for Uncertainty Assessment and Distributed Hydrologic Modelling for Operational Hydrology" *by* John F. Burkhart et al.

Anonymous Referee #1

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The manuscript titled "Shyft v4.8: A Framework for Uncertainty Assessment and Distributed Hydrologic Modelling for Operational Hydrology" by Burkhart et al. describes a hydrological modelling framework for streamflow forecasting targeted for use in hydropower production and research. The authors give a detailed descriptive document of the hydrologic modelling software: Shyft, which enables the development and implementation in operational setting and capability with multiple model and forcing. In addition, they shows three applications including: i) streamflow forecasting in a Scandinavia basin, ii)the investigation of aerosol impact on the snow melt and discharge, and iii) uncertainty reducing by snow assimilation with snow cover products. The manuscript is well written, and the studies are well designed. This work is of high interest for the

hydrology community as well as for hydropower industry. I therefore recommend publication after resolving the issues / answering the questions below in the revision.

1. It is nice that authors gave a detailed statement on the reasons of building such a new hydrological framework aim for operational purpose. The authors have emphasized very much in the paper about the efficiency of the new software, but no such information was further shown in the paper. How this Shyft are superior than other existed models or framework in terms of it's computational efficiency? A bit more information and some comparison results are appreciated in the paper. 2. for the Shyft's architecture and description, the uncertainty assessment methods / components were not seen in the paper, except in one of the application papers by Teweldebrhan et al. (2018b). This needs a better clarification. 3. In the hydrology community, the regionalization is one of the main challenges regarding the prediction in Ungauged Basins (PUB). Has this been considered in the Shyft? And How the Shyft could deal with it under it's structure? 4. If I understand correctly, for the spatial interpolation, there are only IDW and Bayesian Kriging methods can be chosen in the Shyft? But how are the temperature lapse rates considered in the interpolation, which is very important for hydrological modelling, especially in glacier- / snow-fed region? 5. One of the challenges in such an operational-based hydrological forecasting framework is probably to balance between a better forecasting performance and a better computational efficiency? How is Shyft designed and deal with such conflict?

Some specific comments and technical corrections: 1. Line 69: missing a comma here. It should be : "scale, (iii)" 2. Fig. 2: the sentence in "Simulate" box can not be seen properly. 3. Acronym needs explanation for the first time. For example, in the Fig 2 and line 249: What is "PTSSK" ? 4. Line 555 and line 566: what are LOA and LoA? Are they the same thing? 5. Line487-488: "Using the model state based on the historical simulation and latest discharge observations, the model state is updated so that the discharge at forecast start equals the observed discharge. " We can see in the Fig.5 that the red line of historical simulation has shown a large bias comparing with black

line of observation (it also missed the time of peak flow). Could you explain a bit more clearly on why such a big bias and how do you exactly use the historical simulation (red) and latest discharge observation (black) for updating the model initial condition?

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