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Comment on hess-2021-393

Anonymous Referee #2

Referee comment on "Ensemble streamflow forecasting over a cascade reservoir catchment with integrated hydrometeorological modeling and machine learning" by Junjiang Liu et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-393-RC2>, 2021

Reservoirs represent an important but difficult issue for hydrological modelling. This paper presents a method for ensemble streamflow forecasting at the hourly timescale considering the effects of cascade reservoirs. The method makes use of TIGGE-ECMWF meteorological forecasts, CSSPv2 land surface model and LSTM deep learning model. Through the case study of a reservoir in China, the method is shown to reduce probabilistic and deterministic forecast errors. In general, the paper is well-written with results clearly presented.

There are five comments for further improvements of the paper.

First of all, more details on the contribution of this paper can be added. As is illustrated in the introduction, the proposed method is built upon the CSSPv2 land surface model (Yuan et al., 2018). What are the limitations of the previous model? Can the limitations be illustrated through some diagnostic plots? Such analysis would make the contribution of this paper more convincing.

Second, the method is demonstrated for one reservoir. In the meantime, the “study area” section illustrates that there are ten cascade reservoirs in the Hongshuihe hydropower base. Is it possible to select another 2-3 reservoirs to show the robustness of the proposed method? It is noted that the additional case study reservoirs can be elsewhere and are not necessarily located in the Hongshuihe region.

Third, Figure 8 presents an interesting illustration of the time lag between Longtan outflow and Yantan inflow. This lag is largely due to the flowing distance between the two reservoirs. Meanwhile, the section of methods does not tell how the river flow is considered in the method. Is it performed by routing or hydro-dynamic simulation? How are the parameters determined?

Fourth, lead time plays an important part in forecast verification as forecast skill tends to decrease with the increase lead time. Meanwhile, the simulations shown in Figures 4 and 5 seem to have nothing to do with lead time. Please present some plots of ensemble forecasts at different lead times.

Fifth, CRPS in Figure 7 exhibits some diurnal circle that can relates to the diurnal circle of reservoir inflow/outflow in Figure 8. This result may be due to the setting of the LSTM deep learning model. When preparing streamflow data for LSTM, has the mean been subtracted? Are alternative settings, e.g., subtracting the mean or not, tested for LSTM?

Below are a few minor comments.

- The location map can be improved by illustrating all the reservoirs in the Hongshuihe hydropower base. In addition, the location of the Hongshuihe hydropower base in China can be presented by using an inset plot.
- In Table 1, please illustrate the year/month range and time step for the hydrological dataset.

