Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
https://doi.org/10.5194/hess-2022-218-RC1, 2022

Comment on hess-2022-218

Anonymous Referee #1

Referee comment on "Ensemble streamflow prediction considering the influence of reservoirs in Narmada River Basin, India" by Urmin Vegad and Vimal Mishra, Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-218-RC1, 2022

The manuscript entitled "Ensemble streamflow prediction considering the influence of reservoirs in India" submitted to journal Hydrology and Earth System Sciences. The authors evaluated two weather forecast systems, namely the Extended Range Forecast System and Global Ensemble Forecast System, for streamflow prediction in India using the Narmada River Basin as a case study. The authors used a variant of VIC called VIC-Res to simulate rainfall-runoff and river flow. They concluded that the Global Ensemble Forecast System can provide reliable forecasts at a 1-5 day lead. Both the forecast products showed better skills for maximum and minimum temperatures than precipitation. It is also necessary to include reservoirs and their operations in simulating streamflow. Please see below my comments to the authors.

Major comments:

- It is likely the main novelty of this study is the combination of directly incorporating reservoirs in hydrologic modeling and weather forecast. While the topic of ensemble streamflow prediction has been studied worldwide, this topic has recently discussed in Nanditha et al. (2021) for the case of India. Here I have a question regarding to the information on the website https://www.iastoppers.com/articles/editorial-notes-flood-forecasting-in-india in which they mentioned "ensemble forecast" of flood forecasting systems. Does this mean ensemble forecast has been applied in India? Also, the authors should add more literature review about the importance of representing reservoirs in hydrologic models and how other similar studies have been conducted worldwide (e.g., methods, products, temporal/spatial scale).
- In my opinion, the use of one river basin can't represent for the whole India which is a large country and has different types of land scape and climate.
- How did the authors deal with the difference in resolutions between VIC model and Soil, Land Use – Land Cover, and SRTM data?
- It is not clear to me how did the authors setup the optimization for model calibration. Do the authors use the multi-objective evolutionary algorithm for NSEs calculated at

the four stations? Also, it would be useful to report parameters of the optimization exercise and VIC model paraters in the main text (not in the SI). Should the authors include a Pareto-front from the optimization or state how did you choose the solution (VIC parameters)?

- Did the authors consider warm-up periods for hydrologic simulations?
- Since the authors compared the streamflow forecast generated using ERFS and GEFS with simulated data for the period 2019 – 2020 (Lines 180-183), how uncertainty in model calibration will influence on this comparison?
- The discussion and conclusions section focused on the comparison between the two forecast products, and I did not see much discussion about "the influence of reservoirs" until the 2nd conclusion.

Minor comments:

Please revise the manuscript more carefully for writing issues; some are below:

- Although the case study can be scaled up for the whole India, the authors only conducted modeling and comparing the performance of the forecasting systems for the Narmada River Basin, the title sounds a bit misleading. I would call it "for a case study in India". The performance of these forecast products may be different in different river basins?
- Line 28: the most common?
- Lines 29-30: the evidence (20% of the total flood-prone area gets affected every year) does not support the main sentence.
- Line 34: "mitigate economic loss and human lives"?
- Lines 34-36: financial loss can't be reduced with flood early warning systems?
- Line 41: how uncertainty quantification can reduce the risk of false alarms (according to Todini, 2007)?
- Line 50: if possible, please list some of the advantages of ensemble flood forecasts reported in the previous studies.
- The authors should add a table showing main parameters of the reservoirs simulated in this study.
- Line 93: 25° is ~ 27.5 km.
- Line 95: Pai et al. (2015) examined daily rainfall trends, long-term climatology, and variability over the central Indian region. What is the conclusion of this study?
- Line 109: obtain/purchase
- The authors can add a table showing the list of data and sources of the data used in this study.
- The authors can discuss briefly about methods used to develop the forecast products (ERFS and GEFS).
- Line 137: "Therefore, … routing model" can be removed.
- Line 138: revise this sentence.
- Line 142: linearized Saint-Venant Equations
- Line 143: fraction?
- Lines 153-154: this sentence can be removed.
- Lines 347-348: it is not clear to me how limited efforts to establish an ensemble streamflow forecast system at river basin scale are since there are many efforts (e.g., see Alfieri et al., 2012 [cited in this study] and Troin et al., 2021)
- Line 356: was GEFS only available for the period of 2019-2020?

- Figure 7: are there any reasons why simulated water level/live storage of Reservoir Bargi was significantly lower than observed water level in 2007-2008
- Figure 12: it is difficult to read this figure since the symbols and texts are too small.
- In References, all of the references missed name of the journals; there are two Dang et al. (2019a,b), Liang et al. (1994a,b), and Srivastave et al., (2009a,b) which are similar; some references have DOI, and some do not.

References

Alfieri, L., Burek, P., Dutra, E., Krzeminski, B., Muraro, D., Thielen, J., & Pappenberger, F. (2013). GloFAS–global ensemble streamflow forecasting and flood early warning. Hydrology and Earth System Sciences, 17(3), 1161-1175.

Nanditha, J.S., Mishra, V. 2021. On the need of ensemble flood forecast in India. Water Security, 12, 100086.

Troin, M., Arsenault, R., Wood, A. W., Brissette, F., & Martel, J. L. (2021). Generating ensemble streamflow forecasts: A review of methods and approaches over the past 40 years.