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Geoscientific Model Development Discussions

Interactive comment on "eWaterCycle: a hyper-resolution global hydrological model for river discharge forecasts made from open source pre-existing components" *by* Rolf Hut et al.

Anonymous Referee #1

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General comment

The manuscript describes a new computationally advanced global hydrological forecasting system that combines a number of pre-existing open-source components. It addresses relevant scientific modelling questions within the scope of GMD and EGU, and provides a practical method (and freely available tools) how freely available ensemble weather forecasts can be used as input to a global hydrological model, how to include data assimilation and how to automatically visualize the modeling results on a webserver. Therefore, I think the manuscript is certainly very interesting to hydrologists who lack knowledge on available computer science methods and tools. However, as also stated by the authors, the system is currently not able to produce reliable 9

day forecasts of river discharge or even estimate river discharge at the current day (as compared to observations). Unfortunately, the presentation of the work is very "sloppy" and requires an intensive revision. On the one hand, typos and other formal/language errors abound and requires careful language editing. More importantly is the lack of thoroughness and clarity in the description of the work. This strongly decreases the knowledge gain of the reader.

Specific comments

1) The authors call their product "eWaterCycle" alternatively a "global hydrological model for river discharge forecasts" (in the title) or a "global hydrological forecasting framework" (in the first line of the abstract). I may suggest calling it a "global hydrological forecasting system".

2) In my opinion, it is not appropriate to use the term "hyper-resolution" as in Wood et al. 2011, hyper-resolution refers to a resolution of 1 km x 1 km, but not, as here, 10 km x 10 km. In addition, the climatic drivers are only available at a resolution of approx. 25 km x 25 km. Due to 1) and 2), I think that the title is not adequate.

3) In the first line of the abstract, it is stated that eWaterCycle runs an ensemble of hydrological models. This seems to be incorrect, as just global hydrological model is included according to the manuscript for providing the forecasts available at forecast.ewatercycle.org.

4) P2L16-18: Why is data assimilation necessary for having societal value? And: it is tautological that "in the context of an HEPS, they should be run as ensemble forecasts".

5) Section 3.1., in particular P2L23: explain better how the input ensemble was generated, it is not clear what "superimposing the deviation of the GEFS ensemble mean on GFS" might mean. How many ensemble members are used as input to the 20 realizations of PCR-GLOBWB? (in Section 4.2, there is a reference to 3.1. but I cannot find the information in 3.1) What is the temporal resolution of the climate input?

6) Section 3.2.: The “observational” product that is assimilated needs to be described in more detail, including the spatial and temporal resolution, and that it represents soil moisture down to which depth beneath the land surface.

7) Section 4.2: The data assimilation procedure has to be explained better relating it to both the hydrological model (soil moisture of which layer) and the “observational” data.

8) Section 4.5: Here, a focus should be on modeling of the soil water balance as soil moisture is assimilated. Also, information on the assumed soil moisture modelling errors required for data assimilation needs to be provided. The last paragraph of the section should be deleted as it is not pertinent to the manuscript topic.

9) Figure 2 is hard to read as the sizes for the letters vary too much. Use larger size for letters in Fig. 3, too.

10) Figure 4: The plume is shown with two colours. Please explain their meaning not only in the caption but also on the website. Besides, in case of smaller river discharge, the plume can show negative discharge values. You need to point out somewhere in the paper that the Cesium-ncWMS visualization currently leads to this wrong visualization.

11) What is missing is a discussion of the results in the light of other hydrological forecasting systems both at the global scale (e.g. GloFAS) and a the basin scale. For a scientific paper on a new forecast system, it is paramount to relate to previous experiences with such systems, e.g. comparing computer methods used within the systems but also discussing the accuracy of forecasts.

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