Comment on hess-2021-484

Anonymous Referee #2

Referee comment on "Toward hyper-resolution global hydrological models including human activities: application to Kyushu island, Japan" by Naota Hanasaki et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-484-RC2, 2021

Hyper-resolution global water resource modeling is important for provide locally relevant information (e.g., water stress) for the public and policy makers. However, the lack of precise data (e.g., forcing, flow directions with the consideration of facilities, local scale water consumption, local scale dam operation rules and etc.). Hanasaki et al., provide a successful example of high resolution water resource modeling by using the global water resource model. The paper is generally well written, but I still have some major comments before its publication in HESS journal.

Major Comments:

- The added value of high resolution meteorological forcing, high resolution hydrological and geographic data (e.g., flow direction, agricultural area, domestic water withdraw) and model improvements (e.g., improved crop classification, new aqueducts scheme) are not clear currently. Although the author discussed this issue in the results and discussion, for example "We speculate that the difference in performance between the two simulations is due to the quality of precipitation data"in L367. I suggest to separate the contributions from these three different factors to make it more clear to the reader that which is the most important for the improvement in high resolution modeling. Sensitive experiments such as "only use high resolution meteorological forcing", "use both high resolution forcing and hydrological data" can be conducted to address the above issue.
- The inter-grid-cell connection for groundwater. The author give a comprehensive discussion on the challenges of high-resolution modeling and have noticed the importance of inter-grid-cell connection (e.g., the aqueducts and water supply). However, the subsurface or groundwater lateral flow which is important at high resolution is not discussed (Ji et al., 2017). I am wondering whether the H08 model has considered the lateral transport of groundwater from the adjacent grids to the gird which experiences extensive groundwater plumping? If not, whether this process, that is important in hydrology science, lead to uncertainties to the water resource assessment?

Ji, P., Yuan, X., & Liang, X.-Z. (2017). Do Lateral Flows Matter for the Hyperresolution Land Surface Modeling? Journal of Geophysical Research: Atmospheres, 122(22), 12,077-012,092. doi:10.1002/2017jd027366

- The author review the Wada's work which found " water stress is unrealistically concentrated in grid cells containing the downtown areas of the largest cities (e.g., Paris, New York) and therefore recommended assessment across larger spatial domains, such as sub-basins and counties."While current work wants to assess the water stress at 2 km resolution or even higher resolution in the future. How do you consider or address this unrealistic phenomenon shown by Wada et al., (2016)? Moreover, the author pointed out that " Thus, water scarcity may be underestimated in major cities in this simulation..." this seems to be contrary to Wada's work. Detailed discussions are needed.

- On the difference of using global and local water resource model. The author said that data localization and model localization are important for global high resolution hydrological modeling. As I am not expert at water resource modeling, I am confused that what the difference between high resolution global modeling and high resolution regional modeling? If the difference is due to the input data (e.g., forcing, reservoir operation, water use data), then what the difference between the following pathways: 1. use global water resource model, 2. use regional models (e.g., SWAT) and apply them at all global catchment.?