Hess-2023-19

Response to referee comment: Anonymous Referee #2

We thank Anonymous Referee #2 for the detailed review and his/her support for our work. We trust considering his/her feedback will be valuable for our work. Here we provide point-to-point responses to your comments.

Comment: Summary: This study uses a lumped hydrological model, along with (not "coupled with" as noted in the abstract) remote sensing data to examine the filling strategies of the Grand Ethiopian Renaissance Dam (GERD). The model used is the HBC-light model, which is used to simulate the inflow into the reservoir, evaporation etc. Overall, it is an interesting study that presents substantial results on inflow, outflow, and filling strategies for GERD. The paper is generally well written and there is a lot to like in the paper, thus I am generally supportive of the work and believe that it could eventually be published in HESS; however, substantial revisions are necessary before the paper can be accepted. I provide my detailed comments below.

** Abstract, Line 6, "coupled": I don't think the model is coupled with remote sensing data. RS data is used in conjunction with the model. Please revise this statement.

Response: "coupled" will be changed to "in conjunction with"

Comment: ** Abstract and conclusion: As I noted above, there is a lot going on in this study; however, I am not convinced that the study, at least as it stands in the current form, presents sufficient novel scientific insights. It surely presents substantial information that could be used to manage reservoirs in the study region, but I ask: what is the scientific merit? I suggest that authors revise the introduction to address this issue, and perhaps some changes in the results and conclusion sections should be made as well.

** End of introduction (Lines 70-79): this is not very convincing. Again, what is the major scientific contribution of this work? Please clearly specify scientific questions and objectives. The authors attempt to justify the study (toward the end of the paper) noting that the approach/framework could be generally applicable to other (data sparse) regions; I am not sure how valid this claim is given substantial uncertainties in the ability to simulate the flows by the model and the inherent limitations in remote sensing data.

Response: The introduction and conclusion will be revised to better clarify the novelty and address the issue raised by the reviewer.

Comment: ** The simulated inflow is somewhat questionable as it is not validated with any observed data. Given many sources of uncertainty, how do the authors ensure that the simulated inflow is reasonable?

Response: The model was validated with observed data at Eldiem station. This station is close to the dam location, hence we assume that the discharge in both locations (before dam construction) are equal.

Calibration and validation were done prior to dam construction to ensure adequate representation of catchment hydrology. The calibrated model was then used to estimate dam inflow, which was proved to be reliable based on good agreement with dam storage data retrieved from Landsat.

Comment: ** Figure 4 (related to the above comment), "Best simulation": I assume "observation" here is the outflow and "Best simulation" is the inflow. Please clarify by changing the legends.

Response: P13 Figure 4: "Observation" will be changed to "Outflow (observation)" and "Best Simulation" to "Inflow (best simulation)"

Comment: ** Figure 4: Is the unit "MCM"? Discharge should have a unit with per unit time, not just volume! Same applies to the right axis of Figure 11.

Response:

P13 Figure 4: the unit "MCM" will be changed to "MCM d^{-1}"

P21 Figure 11: the unit "MCM" will be changed to "MCM d^{-1}"

Comment: ** Figure 7 and other relevant section: Given limitations in Landsat imageries, could the authors use other remote sensing products such as those from Sentinel?

Response: We will try to retrieve water surface extent using Sentinel to provide some data points during wet season as suggested by the referee.

Comment: ** There are high uncertainties/errors in many of the results presented, which are not discussed in the present manuscript. The uncertainties arising from precipitation data are discussed, but there are many other sources of uncertainties including the use of PET data from ERA5. Is the PET data reliable? How do any uncertainties in the PET data affect the results. I suggest that the authors present a dedicated (concise) section on various sources of uncertainties, the implication on the results, and potentially the conclusion drawn.

Response: The discussion will be extended to include all points mentioned by the referee.

Comment: ** L403: The question here suffers from critical grammatical issues. Please carefully rewrite it.

Response: P22 L403 : the questions will be corrected to "How is the precipitation product selected?"

Comment: Minor comments:

** There are excessive abbreviations used in this paper. I suggest removing those that are not necessary.

Response: we will revise the abbreviations and unnecessary ones will be removed.

Comment: ** I found that figure number is not done in an increasing order in the text.

Response: This is mainly in L180 and will be revised.

Also, the arrangement/placement of figures in the text is not good; many figures are 2-3 pages away from where they are referenced in the text, which makes it hard to read.

Response: We agree; it will be corrected in the revised version.

Comment: ** L85: UBN was already spelled out.

Response: P3 L85: "the Upper Blue Nile (UBN) basin" will be replaced by "the UBN basin""

Comment: ** L118: What does "satellite imagery" mean here? Please specify.

Response: P5 L118: after "… satellite imagery" we will add "(Landsat 7,8, and 9)"

Comment: ** L210: "is" à "are"?

Response: P9 L210: "is" will be corrected to "are"

Comment: ** L248: "shows" = "show"

Response: P11 L248: "shows" will be corrected to "show"