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Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessing the potential hydrological impact of the Gibe III Dam on Lake Turkana water level using multi-source satellite data" *by* N. M. Velpuri and G. B. Senay

M. Gebremichael

mekonnen@engr.uconn.edu

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The work focuses on one of the controversial issues in East Africa: impact of the proposed Gilgel Gibe III on the lake level of Turkana. The authors have used data from the past 12 years to estimate future possible impacts. The conclusion drawn is that the drop in the lake level due to the dam construction will most likely be within 2 m. In my opinion this is an interesting research question, attempted here with an interesting methodology rooted in real data and satellite remote sensing.

This paper definitely contributes its part in shedding light on this controversial issue. Having said this, the paper may further be strengthened by addressing the following

points:

1. On Uncertainty: As shown in Fig. 2, the model results are subject to errors, however consecutive figures (Figs 3 – 5) show only deterministic model results (i.e. how does the error shown in Fig. 2 affect the lake level simulations shown in subsequent figures?) Admittedly, how to quantify and show uncertainty is a challenge. Perhaps you could use different satellite rainfall products as inputs (see references below for high-quality rainfall products in the region) to get ensemble of possible streamflow or lake level simulations. At a very minimum, the uncertainties associated with model results should be acknowledged.

2. Figures 3 – 6: the scales of the y-axis (for the lake levels) are different for different figures, and this makes it harder to compare the resulting lake levels. Please use the same scale bar for the lake levels.

3. Figure 3: there are a few points (see the hydrograph before 2008) where the flow "with Gibe III" exceeds the flow "without Gibe III". Please explain this.

4. Results and Discussion involving Figure 7. Why is it counter-intuitive to see a smaller impact on the lake level when there is BN rainfall, and a higher impact on the lake level when there is AN rainfall? I think this shows the impact of the elevation-area curve. Would it be better to show the volume as well? I am not convinced the importance of this Figure. If the authors feel this is an important figure, they will then need to justify the results.

5. On Sampling Experiments: Both Approach II and Approach III are sampling experiments, so I would recommend combining them in one section (you can have different sub-sections), and giving them more fitting names. I would drop "Knowledge-based scenarios" as this may mean lots of other things.

6. On Model: (1) Explain where or how you would get WHC, (2) What is the time scale of the model simulation?

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7. On Section 3.7 (NBR): this section goes into further details and distracts readers attention. I would recommend moving the steps to Annex.

8. On Section 4.1: L 4 what do you mean by “initial comparison”? The whole paragraph is not clear. Which statements do refer to Fig 2 and which statements refer to elsewhere?

9. On Section 4.7: this section should be removed from the results and discussion section. It reads like conclusion or recommendation.

10. On Fig. 4: show legend.

References

Romilly, T.G., and M. Gebremichael, 2011: Evaluation of satellite rainfall estimates over Ethiopian river basins. Hydrology and Earth System Sciences, 15(5), 1505-1514, DOI: 10.5194/hess-15-1505-2011.

Bitew, M. M., M. Gebremichael, F. A. Hirpa, Y. Michael, Y. Seleshi, and Y. Girma, 2009: On the local-scale spatial variability of daily rainfall in the highlands of the Blue Nile: Observational evidence. Hydrological Processes, 23(26), 3670-3674, doi: 10.1002/hyp.7468.

Bitew, M. M., and M. Gebremichael, 2010: Spatial variability of daily summer rainfall at a local-scale in a mountainous terrain and humid tropical region. Atmospheric Research, 98(2-4), 347-352.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 2987, 2012.