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Hydrology and Earth System Sciences Discussions

Interactive comment on "Multi-objective regionalisation for lake level simulation, the case of Lake Tana in the Upper Blue Nile, Ethiopia" *by* T. H. M. Rientjes et al.

Anonymous Referee #3

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General comments

This is an interesting study to retrieve regional hydrological results from an HBV model for Lake Tana basin. However, structure can be improved to focus only on regionalization study rather than extending the analysis to simulate Lake Tana water level. Sources of uncertainty increases as one move downstream in a hydrological system.

Therefore, I think the paper would have been stronger, if limited to regionalization analysis alone. By removing lake simulation, the author may find enough space to strengthen the regionalization analysis, assess uncertainty involved, etc. However, lake water bal-

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ance simulation can also be used to assess error of computed runoff. i.e., compare Qin from ungauged catchment by the regionalization with the backward computation of Qin-ungauged from lake water balance. However, it is critical to realize what sources of errors in such analysis are, and try to assess each one separately.

Need to emphasize the physical meaning of the retrieved correlation results between HBV parameters and PCCs.

Needs to refer to literature using HBV model on the same catchment, but failed to retrieve regional results on daily time step, e.g., Uhlenbrook et al., 2010. Also refer to Lake Tana water balance studies, they were many.

Conclusion is too general. Try to make it specific with quantitative outputs. Don't concentrate only on evaluating results of Wale, 2009

Specific comments The title does not reflect the content. It is rather confusing. The study is a hydrological study, to model inflow from ungauged catchment using HBV model, as well as regression analysis. The water balance result is only small part of the paper. Therefore, a simpler title could be better, e.g., Regionalization of stream flow for the simulation of Lake Tana water balance, Upper Blue Nile, Ethiopia

P7342, L14. Would be good to show HBV model performance, and verification of transferability first, then results on lake level

P7342, L16. An average error of 85 mm/day over the lake, is approximately 250 million m3/day ($\sim$ 2800 m3/s). Discuss implication of this error on outflow ($\sim$ average is 120 m3/s) to verify sensitivity of various error sources. Please clarify if this extraction of results is not correct, and modify abstract accordingly. The results in the text of p 7362 is different, at least the interpretation.

Keywords?

Include more literature discussion on lake water balance in the introduction, e.g. other than Lake Tana. What are pros and cons, key sources of errors, etc.

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Fig. 1: be consistent with naming of stations: ET station, Rain gauge station, etc.

Fig.1.: too many colours, better make two colors only gauged and ungauged. e.g., Gumera gauged, Gumara ungauged, not clear?

P. 7345, L 21. Include a short description of Chara Chara weir, and whether it regulated outflow after 1998 onward.

P. 7347, L 7, refer also to Uhlenbrook et al, 2010, used HBV model for the same catchment

P. 7347, L 17, snowmelt is not relevant in study area, so need to explain snow routine of HBV.

P. 7351, L 10, you may also check NS for log Q to evaluate low flows.

P. 7351, L 15, more realistic to use absolute values, or RMSE, Root Mean Square Error

P. 7354, unnecessary long discussion on statistics.

P. 7355, L 22, it is not clear why retrieving albedo from MODIS for the water surface of Lake Tana to obtain a representative spatial pattern, while using climate data from one station for the Penman equation. Justify?. Spatial variability of albedo could be least sensitive compared to other climate parameters of radiation, temperature, and humidity.

P7369, Table 3, Koga and Gilgel Abay are not feeding directly into the lake, still large catchment before the lake , how flow was estimated?

P. 7357, L 23, number of catchments is a key point in regionalization analysis, and deserve critical discussion, e.g., to evaluate how much uncertainty for using only 6 catchments

P. 7357, L 27, assuming comparable catchment characteristics because of proximity may not be true. e.g., Koga is very much different compared to the neighboring Gilgel

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Abay, because of extensive dambos in the former. This renders no transferability between the two catchments for daily time step, see Uhlenbrook et al, 2010.

P. 7379, Fig. 3, size is very small, please increase to allow the reader to distinguish observed and simulated. The plot may give much better information than NS, RVE alone.

P. 7358, L 20, how HBV parameters compared to literature, e.g., Uhlenbrook et al., 2010, and why big differences.

Diversify literature sources, not so frequent reference to Wale, 2009 alone

P. 7360, L 2, Could be better to discuss the physical meaning of these correlations, rather than repeating numerical values gain here.

P. 7360, L 21, why albedo shows a big range for the water surface of Lake Tana? any validation?

P. 7360, L 2, on comparing observed, and computed lake level, how good is the match, give quantitative analysis of errors, and why? discuss

References: Uhlenbrook, S., Mohamed, Y., Gragne, A. S., 2010. Analyzing catchment behavior through catchment modeling in the Gilgel Abay, Upper Blue Nile River Basin, Ethiopia. Hydrol. Earth Syst. Sci., 14, 2153-2165, doi:10.5194/hess-14-2153-2010. http://www.hydrol-earth-syst-sci.net/14/2153/2010/hess-14-2153-2010.html

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/7/C3536/2010/hessd-7-C3536-2010-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 7341, 2010.