Review of "Exploratory studies into seasonal flow forecasting potential for large lakes", by Sene et al.

In this study, the authors explore novel ways to forecast lake levels and outflows that move beyond the classic approach of estimating all individual terms of the lake water balance. The authors discover the potential of combining system inertia (i.e. serial correlation), over-lake precipitation and climate indices for producing skilful seasonal flow predictions.

It seems that this paper is indeed among the first to systematically explore the potential of seasonal flow forecasting in the African Great Lakes regions, a much needed work. As far as I know, also the development of the theoretical framework is innovative and the results of this analysis are interesting. This paper thus demonstrates the potential to make a useful contribution to the scientific literature on seasonal forecasting and the African great Lakes. However, I have some concerns which require the manuscript to be revised. In general the study can only be considered for publication if the comments specified here below are sufficiently addressed.

General Comments

1. My main concern regards the quality of the observational data that are used in this study. As I've worked with meteorological observations in the region extensively myself, I am well aware that these data are often very sparse, and when they are available their quality is often questionable. In general, it would be useful if the authors could discuss whether the quality of the input data may influence their results. The discussion section on page 19 already hints in this direction. See also specific comments 3 – 5 and 8.

Specific comments

1. P3L16: This statement would benefit from a reference

2. P6L6: In the case of Lake Victoria these departures from the 'Agreed Curve' have been substantial in the past, and a reason for concern. See for Instance Kull (2006), who attributed more than half of the severe drop in lake level during 2004-2005 to over-releases at the Jinja dam.

3. P7L13: Which data for over-lake precipitation was employed? Precipitation on Lake Victoria is to my knowledge not observed directly except for some sparse data reported by Datta, 1981. Yet we do know that precipitation is highly variable over the lake both in space and time due to the interplay of mesoscale and synoptic-scale circulation (see for instance presentations.copernicus.org/EGU2017-18256_presentation.pptx).

Generally the presence of the African Great Lakes doubles precipitation amounts over their surface area and triggers severe thunderstorms, and shoreline stations are therefore believed to be an inaccurate source of over-lake precipitation (Thiery et al., 2015; 2016). Yet most water balance studies for Lake Victoria employ shoreline stations to estimate over-lake rainfall amounts (Also Piper et al., 1986 who use 8 shoreline stations).

4. P7L15: how many offshore stations were used to estimate precipitation over Lake Malawi? As this lakes stretches >500 km in N-S direction, precipitation patterns may highly differ in space.

5. P7L18: To my knowledge some tributaries are not monitored at all (cfr. 'ungauged perimeter' in Piper et al., 1986).

6. Figure 1: including a simple map showing the locations of Lake Malawi and Lake Victoria as inset in this figure would be useful for the readers not familiar with the study area.

7. Figure 2: As this figure will probably be reduced in size in the final lay-out, it is perhaps useful to shorten the y-axis range.

8. P10L6: are these observations independent from each other? cfr. specific comment 4.

9. P12L10: Did the authors run the forecast model starting every month of the validation period and then computed the R^2 per lead time month for the whole period? This is not clear from the method section.

10. P13L13: What is the mechanism behind the strong increase in lake levels leading to higher forecast skill?

11. P13L20: A philosophical point: for short lead times I agree, but for longer lead times it may be impossible to increase the skill of (seasonal) forecasts beyond a certain level. At the moment the meteorological forecast community advances short-term forecast skill at a rate of 1 day per decade of research and technological development…

12. Figure 5: Please replace the y-axis label by 'R^2' and increase the label font sizes. It may also be useful to add the lake name to each figure panel.

13. Figure 6: I would mention the climate indices that were used in the regression in the caption of this figure.

14. P19L17-18: I fully agree; for our new statistical storm warning system for Lake Victoria this approach proves to be highly valuable.

Textual comments

1. P2L1: Please consider changing to "Another situation where storage influences are…"

2. P3L22: Please consider changing to "if – as is often the case – the"

3. P3L23: Please consider changing to "rainfall, then"

4. P3L25: Please consider changing to "the current exploratory studies"

5. P4L17: Please introduce acronym and perhaps also a reference.

6. P9L10: Please consider omitting "as noted earlier" to enhance readability.

7. P12L4: Please consider changing to "records, respectively"

8. P15L26: please enhance the readability of this sentence

References

- Datta, R. K., 1981: Certain aspects of monsoonal precipitation dynamics over Lake Victoria. Monsoon Dynamics, J. Lighthill and R. P. Pearce, Eds., Cambridge University Press, 333–349.
- Kull, D., 2006: Connections Between Recent Water Level Drops in Lake Victoria, Dam Operations and Drought, https://www.internationalrivers.org/sites/default/files/attached-files/full_report_pdf.pdf.
- Piper, B. S., Brown, E., & Sutcliffe, J. V., 1986: The water balance of Lake Victoria. Hydrological Sciences Journal, 58, 342–353.
- Thiery, W., Davin, E.L., Panitz, H.-J., Demuzere, M., Lhermitte, S., van Lipzig, N.P.M., 2015: The impact of the African Great Lakes on the regional climate, J. Climate, 28(10), 4061-4085.
- Thiery, W., Davin, E.L., Seneviratne, S.I., Bedka, K., Lhermitte, S., van Lipzig, N.P.M., 2016: Hazardous thunderstorm intensification over Lake Victoria, Nature Communications, 7, 12786.