

Interactive comment on “Tributaries affect the thermal response of lakes to climate change” by Love Råman Vinnå et al.

Anonymous Referee #1

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Specific comments:

1. Section 2.1.(ii) refers to a state-of-the-art river intrusion scheme. The authors provide no comparison to other river intrusion schemes in the literature, and so this claim is difficult to justify, particularly as this type of river intrusion model has been around for 30+ years. Additionally, Appendix A1 (where the intrusion scheme is described) does not identify why this approach was used over other approaches in the literature, or what makes this approach an advance on other approaches in the literature. The authors need to assist the reader here – if you have done the work to show this is the best model, then explain why.

2. Some discussion is required for the SSC model in the Aare River. The inset is missing from Figure 4a (which is present in Figure 4b, and Figure 3a, 3b), presumably

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because the r^2 of this model isn't great (Table 2). I expect the reason for this is that the SSC in the river is almost always zero (or at least very low), with occasional large spikes, as compared to the Rhone where there is a non-zero SSC for much of the year. So clearly modelling SSC in the Aare is complex – what does this mean for the study? How does this uncertainty propagate to the results that are built upon this SSC model? Following on from this, there is a statement in section 4.3 that the SSC doesn't really even matter for the Aare – so why not include this earlier in the paper, and remove iSSC from consideration in the Aare?

3. Given the nature of the study, and the delicate balances referred to, a comprehensive discussion of uncertainty is required. For example, how do we know that the results shown in Table 5 are signal and not noise? You report small numbers over decadal timescales, and so model results will be sensitive to the parameters selected – how robust are these results to uncertainty in the parameters? There are a number of comments following here that discuss uncertainty.

4. Figure 8b demonstrates that it is the SSC concentration that causes greater volumes of deep water renewal under a warming climate. That is, the SSC overcomes the temperature effects and reverses the trends in Figure 8a. This indicates the model results (and a key part of the papers conclusions) are highly sensitive to the SSC model used. Given that the RMS error is approx. 200 g/m³, what implications does that have on these results?

5. Given that the SSC increases under a climate change scenario, what does this imply for the SSC model? The SSC model only has flow as an input, indicating that the changing flow pattern with climate change is enough to cause higher SSC at just the right time to cause the deeper intrusions?

6. I would like to see the comments in the abstract tied in far more strongly with the material in the manuscript. In particular, the key component of the abstract that will capture the attention of readers is that you expect to see more deep water renewal.

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This component of the results and discussion needs to be made far clearer – give it the attention it deserves, so readers can make the link between abstract and text.

Technical comments

7. Line 538 contains a typographic error, I believe the word “dishrag” should be discharge.
8. Figure 6 caption refers to mean and standard deviation – of what? It is not clear.

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