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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Response of water temperatures and stratification to changing climate in three lakes with different morphometry" *by* M. R. Magee and C. H. Wu

Anonymous Referee #1

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This manuscript by Magee & Wu is based on an extraordinary data set of 104 years and focuses on effects of changing air temperature and wind speed on water temperature and stratification patterns of lakes with differing morphometry. The lakes are situated close to each other which is a great asset in this kind of research. The long data sets on basic variables and drivers is a good argument for publication and the results based on these data are fairly convincing. They are also logical and actually so logical that they very often leave a feeling that 'I already know this'. This may at least partly be due to simplification of morphometry to lake depth and surface area, but also due to lack of deep discussion; big part of 'Discussion' actually belong to 'Results' and to certain extent to 'Methods'. Thus restructuring and extending the real discussion (starting from

4.4.), the paper would certainly improve. Some parts of the paper are also technically challenging for the reader since they are based on listing the numerical results one by one; a good example is section 3.5. The authors should also think about leaving Lake Wingra out completely; I suggest this because this paper has strong focus on lake stratification and Lake Wingra is a polymictic lake. The problem with Lake Wingra becomes obvious in Tables 2, 3 and 4 – lots of N/A markings. I also find it strange that in a paper where models are such an elemental part, they are not properly described; besides the equation for light extinction (eq 1), the authors only use references to published articles. More emphasis should also be given to description of gap filling and calibration data; both are now somewhat superficial. Besides these more general comments, I list here some more detailed ones: 1. I found it a little bit strange that sediment heat fluxes were hardly mentioned in this paper. Although there may have been no data on this or these fluxes were not included in models, they should have been tackled somehow at least in 'Discussion'. 2. The readers would benefit from some more information about the lakes. Especially information on lake clarity (water colour etc; cf. Table 1) would have been useful in a paper with such a strong focus on lake stratification. 3. As a reader I would also appreciate information on fetch for each lake; now the word 'fetch' and importance of fetch is mentioned several times, but the reader is left with the bathymetric maps to figure out the fetch 4. It is said that water level in Fish Lake has raised considerably and this has probably affected some of the results. However, nothing is said about the possible reason behind this phenomenon. Related to climate, human activity or what? 5. The authors state that Fish Lake does not always turn over completely in spring. This is an important piece of information, since in small, dark coloured boreal lakes this is a fairly common observation and it is believed that it is weather/climate driven change. It would be nice if the authors could dig deeper in this observation, especially since they have such a long time series. 6. Fish Lake and Lake Wingra have Secchi-depth results only from 1995 onwards. This appears problematic; could your give more explanation on this. 7. Data on below-ice Secchi-depth were used which I to certain extent understand, but since it is not that

common practice to measure Secchi under the ice, it would be useful to have some more information. 8. Figure 3 shows that in general simulations resulted in slightly lower temperatures in comparison to observations. Did you make this clear also in text? 9. The possible importance of internal waves is mentioned only on general level and not properly discussed in relation to the study lakes 10. Using wording 'increasing (decreasing)' is clumsy for the reader 11. Throughout the text there is repetition, e.g. in 'Results' sentences which belong to 'Material' and are already tackled there. Check the whole manuscript for that 12. Table 1: The meaning of the row 'Groundwater' is not clear to me 13. In Figure 4, the legend contains some description of results 14. In Figure 6, results on Lake Wingra should be left out (= zero line). And in general, the stability index is somehow funny in this context since the lake was known to be polymictic 15. The real discussion starts in 4.4. and all before that should be merged with 'Results'. An indication of that is the fact that for instance in 4.3.1 and 4.3.2 there are no references in the text. 16. There are some spelling mistakes in the text, please check.

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