

Interactive comment on “Physical and chemical consequences of artificially deepened thermocline in a small humic lake – a paired whole-lake climate change experiment” by M. Forsius et al.

Anonymous Referee #1

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This is a very well written and clear manuscript, describing a large-scale climate experiment at a whole lake in Finland. The experimental design follows the now classical paired-lake design pioneered by Dave Schindler et al at the Experimental Lakes Area in Canada in the 1960s. The treatment here was to induce a major change in lake stratification by means of a circulation pump placed in the middle of the lake. The research included measurements of all major physical, chemical and biological components. This manuscript describes the physical and chemical changes, while 2 parallel manuscripts deal with biological components and effects on Hg, respectively. I do not have access to these other 2 manuscripts so cannot judge these parts of the results.

The manuscript clearly lays out the major results of this manipulation: namely that the treatment created the desired major change in lake heat content and thermocline depth, and that the resultant changes in water chemistry were (with a few important exceptions) very small. The observed water chemistry changes were all related to changes in redox conditions due to the mixing. Apparently the biological changes were also very small. These results are consistent with the similar Norwegian THERMOS experiment conducted a few years ago.

I feel that this manuscript is suitable for publication in HESS following a few minor revisions (see below).

Specific comments:

1. The authors devote considerable space to try to relate the experimental change in thermocline to a postulated future climate scenario (such as A2). There is nothing wrong with doing this, but they might instead consider phrasing the text along the lines of “the experiment was designed to cause a major intervention in the lake thermocline development, and thus provoke ecosystem response. It was not possible to artificially reproduce the exact changes in climate expected under a given climate scenario. Nevertheless the experiment provides direct evidence on how lake ecosystems may respond to future climate changes.”
2. p. 2921, line 16-23. How exactly does this pump work (not by bubbling air, I presume). At what depth was it positioned?
3. p. 2926, line 8-14. It would be useful to present a figure showing the time traces for NH₄ and totN in both lakes (maybe also show alkalinity and Mn, Fe?).
4. p. 2927 line 26-29. The Discussion section repeats unnecessarily some of the results. For example, the MyLake results have already been presented in the results section, can delete here.

5. p. 2932, lines 10-11. “strongly modify” is perhaps a bit exaggerated? After all, the lake responses were rather minor as a whole.
6. Table 3. The *, **, and *** notation was not actually used in the table itself.

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