

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 #2

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This paper describes a whole-lake experiment in which the seasonal thermocline has been artificially deepened. Changes in the main physical and chemical variables of the lake have been monitored before, during and after the treatment in the experimental lake as well as in a control lake of similar characteristics. The experiment is certainly interesting, and has been executed in a proper way. The results are presented in a comprehensible way and the statistical treatment is appropriate for the comparison intended. However the discussion of the results is insufficient, a point that needs to be addressed before the paper can be considered ready for publication.

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The discussion deals almost exclusively with results that are part of the experiment, but not those specifically presented here (i.e. physical and chemical data). Possible effects on the biota of the lake (described in other papers submitted elsewhere) are discussed, but there is only a loose connection with the results of the paper, making the discussion rather speculative. CO₂, CH₄, and Hg possible changes are discussed, but they have not been measured here. In contrast, the most significant changes detected (totN, NH₄⁺, TOC) are merely mentioned. The discussion has to be largely improved focussing more on the results presented.

Another major concern is how representative of the future climate-induced changes is the experiment. The authors present simulation results that show that the expectable change is an increase of the temperature of the epilimnion without deepening of the thermocline. In contrast, the result of the manipulation is a deepening of the thermocline without changes in the epilimnetic temperature. Although this is recognised in some parts of the text, the authors argue that the mean heat content change of the experiment adequately mimics the predicted change and falls within the confidence interval of the simulation (Fig. 6). However this is a poor argumentation, because the confidence interval is rather wide, and the simulated and observed patterns of variation are substantially different. This likely have important limnological implications that could be discussed. In any case, the experiment is valuable and interesting in itself from a limnological point of view. Perhaps there is not a real need to justify that it mimics an expectable change, although it would of course reinforce the implications in the global climate change context.

As a minor comment, it would be useful if the chemical analyses could be very briefly described. Also, it would be good to make clear if totP and totN are truly total or the total dissolved fraction.

In line 22, page 2926 year 2005 is mentioned twice instead of 2005 and 2006