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The Cryosphere Discussions
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Interactive comment on "Sensitivity of lake ice regimes to climate change in the nordic region" *by* S. Gebre et al.

Anonymous Referee #2

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Major Comments:

With the rapidly ongoing changes in the Arctic, it is very important to improve our ability to predict possible changes in the cryospheric components such as lake ice to be able to predict possible impacts on e.g. society. This paper can contribute to this process. Overall, it is a well-written scientifically sound paper. However, the paper needs major revisions before publication.

The most important issue is to better describe what makes this study unique compared to the several other studies that have been published previously on similar topics. This information is currently buried but needs to be highlighted and lifted out.

Some sections of the manuscript are too long, e.g. you say you will only include a

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brief description of the model but I consider this to be quite detailed. I suggest that you simply refer to the papers that you have listed and then leave out the detailed description of the model unless you have made some adjustments that need to be highlighted (which I could not identify).

Some parts of your "Summary and Conclusions" are more like a discussion part where you bring in new information on e.g. impacts. It is great that you include the information as we should always be able to answer the question "Why should we care?" in this case about the projected changes in lake ice, but this information needs to be incorporated into the discussion part. Your summary and conclusions section should be short and concise to highlight the key findings from your paper.

You have many figures and there is always a risk when you have many figures that your key results get buried. Therefore I suggest that you consider if there are any figures that you can leave out (e.g. Fig 7). In addition, I suggest to expand figures 9 and 11 to include results from all the four depths (see comment below).

Detailed comments:

Page 744: line 20-21 ". . .. revealed that the changes are less dependent on lake depths though there are slight differences" please explain what those slight differences are

Page 744: line 22 please alter "climate warming" to "climate change" or "changes in climate" as you use 6 different meteorological parameters when you are performing your modelling and you refer to climate change later in the manuscript.

Page 745: line 23 please alter (Benson et al., 2012) to Benson et al. (2012). . .

Page 746: line 5 I assume that "ever" should be "even"?

Page 748: line 1 ". . .to give an indication of the anticipated changes. . ." Changes in what parameter, please specify as this is where you tell what you have done in this study. Also, please try to highlight what is unique with this study.

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Page 753: line 16 please delete one “the” before Rossby

Page 756: line 1 please add “In” before Fig. 2 it can be seen. . ..

Page 756: line 2 Add a parenthesis after season).

Page 760: line 23 you state that “a significant portion of these errors are expected to cancel out. . .“ please describe how.

Page 761: line 4 here you need to point out the difference between your study and that of Magnusson et al 2000. Why are your results more reliable compared to theirs? Please add a sentence explaining this.

Page 761: line 23-25. The sentence “Even though there are differences in the magnitude. . ...the two models are in agreement that winter warming is the highest . . .” Would it be possible to rephrase this to make it more clear? E.g. the two models agree that the highest increases in air temperature occur during winter both in the 2050s and the 2080s. . .

Page 763: line 26, please quantify “reasonably matched”

Page 773: table 2. Please note that it is wrong unit for ICD that should have number of days rather than Julian Days.

Page 776: figure 3. I suggest that you place all March measurements in one left column and all measurements from August in a right column and omit the one in February 2003. It will be easier to see the interannual variability in the temperature profiles if the figure is presented in this way.

Page 778 & 779: figure 4a and b, the legend is placed in one graph (the cloud cover) which makes it difficult to find and also you are wondering if it is the same for all of them (which I assume it is). Please move the legend outside of the diagrammes and make it more visible.

Page 781: figure 6. Please add Julian Day, Julian Day, Number of days, cm in the figure

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below Freeze-up, Break-up, Ice cover duration, Max. Ann. Ice thickness respectively, as it is quite common that people use your figure in a presentation without the legend.

Page 784: figure 9. Why do you only present data from lakes with the depth of 20 m. I think it would be great if you could present all four depths here for the four parameters .

Page 786: figure 11: Again, why do you only present for 20 m deep lakes. Please consider to add the other three depths as well.

Interactive comment on The Cryosphere Discuss., 7, 743, 2013.