

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2020-374

Anonymous Referee #2

Referee comment on "Geographic variation and temporal trends in ice phenology in Norwegian lakes during the period 1890–2020" by Jan Henning L'Abée-Lund et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2020-374-RC2>, 2021

General comments:

This paper presents lake ice phenology data set (over 100 lakes) from Norway and investigates and discusses spatial and temporal changes in ice cover. According to knowledge of the referee, Norwegian lake ice data has not been presented or analysed in this extent earlier in a scientific peer-reviewed article.

In general, lake ice phenology in Northern Hemisphere (NH) and Northern Europe is quite much studied and study idea is not showing dramatical novelty using GLM models. There are several previous studies showing trends of ice cover in NH, and also linkage with the NAO and regression models have been used for a long time. The data presented in this study is a valuable new data set itself.

The paper is well and clearly written and easy to follow. Data and methods are clearly presented. The modelling part could be explained more in detail in methods (formulas). More scientific references could be added in the introduction and discussion to show and acknowledge previous studies in the theme. The figures should be improved, they look a little bit prepared in a hurry and the finalization for scientific paper is missing. As a general conclusion, I recommend accept this paper with minor revisions (detailed comments below) after comments have been taken into account.

Detailed line by line comments:

Title: "over a century" could be substituted with specific years i.e. '1890-2020'

Introduction: row 79: Should Master Thesis of Solvang (2013) to be mentioned here?
<http://urn.nb.no/URN:NBN:no-39915>

Some more references could be added, see in the end of my comments.

Materials and methods

2.4. Title could include GLM methods and model could be explained more in details

Results:

row 289-291. Could different rates of trends in latitude-wise be linked to elevation gradient of lakes?

Discussion: Some more references could be added

Conclusions

This is rather short and not giving numerical result overview. -> Could be extended little bit.

Figure and Table comments:

Figure 1. Europe map is rather small and unclear, Figure quality (pixels) poor -> Enhance. Either make Europe scale bigger, or largen North European aspect adding Norway's neighbors on the map. Scale could be made for 50 km/100 km scale.

Figure 2. Quality should be improved. Year to x-axis. Hard to really find exact information on a lake. Is there certain reason to put lakes in that order? Would make nicer picture starting numbering lakes in order of length of the records.

Figure 3. Axis captions missing, not clear scales.

Figure 4. There are not many points east from longitude 25 degrees. How would the figure look without them? Is the longitude correlated with elevation?

Figure 5. Is the starting period 1900, not 1901? (other decades start with year 1). Or is the one period 31 years? Please rewrite caption text, it is not clear.

Appendix 1. Please check , and . as defining decimals (in English .) Check also km² > km² and m³ -> m³. Maybe framing the table would make easier to read. (Also to other similar tables)

Appendix 2. Would it be possible to show some of the median records on the map as different colors? Some kind of spatial visualization of results on the map would be good to add.

Technical, typing error comments:

Through the text: I would scan for word 'altitude' and assess if elevation would be better term.

Also spelling of break-up/break up and freeze-up should be used in uniform way.

row 25. solar radian -> radiation?

row 105. Might be good to open nve.com NVE abbreviation "Norwegian Water Resources and Energy Directorate website www.nve.no"

row 158. glm, usually used capital letters, GLM?

row 168. lake area -> lake surface area (Please check also through whole paper)

row 178. freeze up -> freeze-up. Please check consistent way of writing break-up and freeze-up through the paper, including figures and tables.

row 185. Impounded is not clear term to me? Regulated lake? (Check also Appendix 1)

row 276. Present day is maybe not good wording, if paper will be read also decades later
ð□□□ maybe just write until year 2020.

row 283. conglomerate word sound odd to me, is it necessary to use this specific word?

row 299. remove extra comma

row 306. Baltic Ocean -> Baltic Sea

row 329. There is more recent study by Korhonen (2006) showing isolines of freeze-up
and break-up of Finnish lakes.

row 544. warming world

row 579 and 583. missing space "period 1890-2020"

row 614. Tabell 3 -> Table 3.

row 615. CV could be opened up in table caption even though it is introduced in the article
text

References to be considered in introduction or discussion (in alphabetical order):

Filazzola, A. Blagrove, K. Imrit, MA. Sharma, S.: Climate change drives increases in
extreme events for lake ice in the Northern Hemisphere, Geophysical Research Letters,
e2020GL089608, 2020

George, DG, Jarvinen, M. & Arvola, L.: The influence of the North Atlantic Oscillation on the winter characteristics of Windermere (UK) and Paajarvi (Finland). *Boreal Environ Res* 9:389–399, 2004

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Kuusisto, E.: An analysis of the longest ice observation series made on Finnish lakes, *Aqua Fenn* 17:123–132, 1987

Kuusisto, E. & Elo, A.-R.: Lake and river ice variables as climate indicators in Northern Europe, *Verhandlungen des Internationalen Verein Limnologie* 27(5), 2761–2764, 2000.

Livingstone, D.M.: Large-scale climatic forcing detected in historical observations of lake ice break-up, *Verhandlungen der Internationalen Vereinigung für Limnologie* 27, 2775–2783, 2000.

Prowse, T., Alfredsen, K., Beltaos, S. et al.: Effects of Changes in Arctic Lake and River Ice, *AMBIO* 40, 63–74, 2011

Sharma, S. & Magnuson, J.J.: Oscillatory dynamics do not mask linear trends in the timing of ice breakup for Northern Hemisphere lakes from 1855 to 2004. *Climatic Change* 124(4), 835–847. 2014.

Šmejkalová, T., Edwards, M.E. & Dash, J.: Arctic lakes show strong decadal trend in earlier spring ice-out, *Scientific Reports* 6, 38449. 2016.

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Yoo, J. & D’Odorico, P.: Trends and fluctuations in the dates of ice break-up of lakes in

Northern Europe: the effect of the North Atlantic Oscillation, *Journal of Hydrology* 268(1), 100–112, 2002.