

The Cryosphere Discuss., referee comment RC1
<https://doi.org/10.5194/tc-2020-374-RC1>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on tc-2020-374

Andrew Newton (Referee)

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-RC1>, 2021

This paper provides new insights on the variability of lake and river ice phenology in Norway. In general, I like this paper, it represents an area of the Northern Hemisphere that has been historically limited to only a few studies on ice phenology due to data availability, for that alone it is a good contribution. The writing is generally clear and the discussion makes sense based on the presented results. I have made some suggestions in the line by line comments, but there are two main issues that I would like to see addressed before publication:

Firstly, whilst I am somewhat constrained with a limited experience on the modelling component, I do feel this could be better explained and integrated into the methods section rather than hidden in the appendix. Some text that more clearly defines this part of the workflow would be welcomed – at the moment it is not as easy as it could be if someone wanted to replicate the workflow.

Secondly, a couple of the figures need to be developed a little further as they are currently lacking sufficient information to ensure that they cannot be misunderstood. I have added more details on this below, but it mainly relates to ensuring they are adequately annotated (axis labels etc.) and the captions are more detailed. I have also put in a suggestion for modifications to Figure 1, this is not a request, just a suggestion that I think would help the authors with some of the points they make on variation of the site parameters.

On the whole, this is a good paper and with some further changes I think it could be even better by improving clarity. I do not anticipate any of the suggested revisions being too time consuming and therefore recommend publication with minor revisions. If the authors required further feedback or clarification on any of my comments then they are welcome to contact me directly.

Line by line comments

Title

1: Perhaps change to "...over the last century".

Abstract

Good

1 Introduction

40-41: State that you mean surface area.

48-50: Need to clarify that freezeup and breakup dates have changed over time.

51-53: Needs a little more information on the studies that are being referenced – e.g. data coverage, timespans etc. That context is important as the sentence too simple.

57: "...considerably since 1880..."

58-61: I am an author on this paper and the revised version is about to be submitted in the next couple of days. The general trend is the same of an increased magnitude of change, but the time period was changed to 1976-2005 due to reviewer feedback. Thus, you may need to reconsider this sentence if the Newton and Mullan (2020) is accepted for publication.

81-85: Sentences on variation in topography and climate might benefit from a little more detail/referencing on what the differences are.

90-92: This is quite an important justification and an additional sentence highlighting how detecting the different influences are important for projecting future change might be useful.

2 Material and methods

97-99: It could be very helpful for the reader to see on Figure 1 some more geographical data that help to highlight these different things. E.g. a different colour for sites in the climatic zones, perhaps also an underlying topography to provide some additional context, or colour code the elevation. One idea might be to use a ramp scale for elevation for the inside colour of the circle, and then three different colours for the outline to show which climatic zone the site is in. This would be a nice succinct way to show the reader the main geographic characteristics of the sites. It could even be simpler, maybe as a series of repeat panels where the colours change with relation to climatic zone, elevation, area, depth etc. Note, this is just a suggestion that I think would be quite useful and is worth thinking about.

117-118: Do you have any idea on what the magnitude of any errors might be when estimating these dates?

122-123: Similar to above point, perhaps you can clarify how you decide the date, what percentage of surface area needs to have ice for it to be declared frozen?

170-176: This section needs some extra information and integration of the information from the appendix into the main text. At the moment this part of the methods is a little vague and I am not 100% sure I follow the exact workflow. Whilst I am not an expert on this type of method, it would help if some extra context on the method and how it was applied in this study was added, or as a minimum extra references that can direct the reader to relevant details.

193: I am not quite sure I understand what you mean by "the year effect". This section needs a little more information to improve meaning of the text.

3 Results

I have limited experience with AICc, but caveat aside, I see little of concern here, results appear to make sense, albeit with some concerns in relation to the readability of the figures – see comments below.

4 Discussion

285: Change to "...date of break-up generally becomes later with increasing latitude".

285-286: Clarify what you mean by circulation, I know what you mean, but could potentially be confused for water circulation. Perhaps "...macro- to local-scale atmospheric circulation and lake characteristics...".

289: "We found..." – this sentence needs rewording. Perhaps "Ice breakup dates are shown to be 2.3 days later with each degree of higher latitude", or something like that, needs rewording.

292: I am not sure "discrepancy" is really the right way to describe it. We would expect different regions to vary in different ways – e.g. I am not sure there has to be a reason for the difference given that the study areas are so different, though you later hint at that, so perhaps think about how you frame that argument. Do not need to change anything, but just something to think about.

302: Typo "one exception".

301-313: I think there needs to be a little bit of rewording here on how you refer to longitude. Longitude is not like latitude where there is a direct difference in insolation being received, by this I mean it is not really longitude in the strict sense, but more about distance from the coast. So in this case longitude is a proxy for something else, such as continentality. You urge the caution here, rightly, and it might be worth just making sure the language is clearer.

318: Every degree of latitude higher or lower? I know what you mean, but clarify.

346: Reword to "...earlier break-up, later freeze-up and later completely frozen lakes..."

352-360: Just another note that the Newton and Mullan paper, the revised version is about to be submitted, so it might be worth checking against this when you revise the manuscript. The broad inferences you have made will still be relevant but the discussion on the zero degree isotherm is no longer in the paper due changes to the time periods studied. You can probably still make the assertion if you perhaps plotted the isotherms on your own map maybe? You can get the data from the reanalysis project data and reworking in GIS. I would be perfectly happy to forward on the shapefiles presented in that original paper if you cannot get access.

382: The biological consequences section is missing maybe a paragraph, or at least a couple of sentences, on what this might mean for the future. You have made models for the ice phenology dates, so it would be good to think, even just conceptually, how this might be used with future climate projections. Worthy of some discussion.

Figures

Figure 1: Could benefit from some tidying up, such as the line of longitude that goes through the inset box. Perhaps also considering darkening the country outline. Might be helpful to colour-code the sites for whether they are in a boreal, subalpine or alpine setting.

Figure 3: I am struggling to get my head completely around how this figure is arranged. It needs more annotation/labelling and a much more detailed caption explaining what it is showing. Also, add in extra information on what the red line is and the light red shading into the caption, perhaps even add on a correlation coefficient for each, there is space for that. I think I can understand it, but it could be made easier for the reader.

Figure 4: Similar to the comment on figure 3, this needs some greater annotation on what the lines and the shaded areas mean. Presumably these are lines of best fit? If so, could you perhaps put the correlation coefficients on as well?