The Cryosphere Discussions

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Comment on tc-2021-304

Laura Rontu (Referee)

Referee comment on "Climate warming shortens ice durations and alters freeze and break-up patterns in Swedish water bodies" by Sofia Hallerbäck et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-304-RC1, 2021

Reviewer report on "Warming Climate Shortens Ice Durations and Alters Freeze and Breakup Patterns in Swedish Water Bodies" by Sofia Hallerbäck et al.

This paper describes and analyses a comprehensive Swedish data set on lake ice freezing and break-up since the beginning of the 18th century. It shows that the ice cover duration has reduced, freeze-up occurs later and break-up earlier in the beginning of the 21th century compared to times before 1990'ies. The largest changes are observed in the Northern Sweden. Variability of the lake ice cover between years has also increased. It is shown that the changes are related to the increasing air temperature.

The data set on lake freeze-up and break-up dates could be utilized for validation of regional climate model and regional reanalysis results. Contemporary NWP and climate models tend to include prognostic lake parametrizations such as FLake. Such comparisons have been done for shorter periods, see e.g. some papers in https://gmd.copernicus.org/articles/special_issue944.html. Results of such comparisons could help in improvement of the parametrizations. On the other hand, the model results include comprehensive temperature, radiation, also possibly lake water surface temperature and other relevant data for the past and future climate that could be related to changes in lake surface state. This is something to think about for further studies, not suggested for this paper (but perhaps to mention that the processed data is available for such purposes).

This is a comprehensive analysis of a unique data set. The manuscript is well written and the results exceptionally clearly illustrated by the figures. Earlier studies are presented and discussed well. Perhaps it would be possible to check some of very recent related papers, like Korhonen, 2019 (ISBN 978-951-51-2800-3). I really do not have serious remarks, the paper could be published in its present form.