

Clim. Past Discuss., referee comment RC2
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Comment on cp-2021-95

Anonymous Referee #2

Referee comment on "Arctic glaciers and ice caps through the Holocene: a circumpolar synthesis of lake-based reconstructions" by Laura J. Larocca and Yarrow Axford, *Clim. Past Discuss.*, <https://doi.org/10.5194/cp-2021-95-RC2>, 2021

The manuscript presents a compilation of all lake-based reconstructions of local glaciers and ice caps from the circum-Arctic. It describes each of the 65 lake records and synthesizes the data in summary figures from each of the seven regions. The data is very skewed towards Greenland and Scandinavia whereas there are less lake records from Russian Arctic and Arctic Canada. Overall, the data is well presented, and it provides an insightful discussion of the results in relation to other climate records. Accordingly, the paper thus falls within the scope of CP.

I only have few suggestions that are meant to improve the manuscript.

Major comments

Figure 2 illustrates very well the type of threshold lakes that have been used in the compilation. I suggest that the authors also include a description of which proxies that are normally used in the studies i.e. XRF core scanning, LOI and magnetic susceptibility etc. It would also be relevant to mention the different types of dating methods and whether the reconstructions rely on macro or bulk ^{14}C dating.

The data is generally well presented in the summary figures. However, I have some issues with the way some of the lake records have been presented. For example, in figure 3 there are intervals in the lake records that are blank. What does that mean? Is it organic-rich sediments indicating smaller than present, or does it represent a hiatus? Another curious thing is that for many of the records a basal age is below the interpreted section. What is type of sediment is dated and how is it interpreted in relation to glacier history? Leaving intervals blank is not the best solution also because it is not mentioned in the

text.

Another thing that would help the interpretation is if the individual records are arranged according to which type of threshold lake, they represent i.e. type 1-3.

Minor comments

I would use Early, Middle and Late Holocene as the subdivision of the Holocene has been formally defined by IGS.

Line 72. Change homogenously to synchronously

Line 116. Maybe cite some of the pioneering threshold lake records i.e. Karlen 1981

Line 128. I get the number of lakes to 65 not 66?

Line 284-285. Maybe explain why the records are excluded in some more detail.

Line 304. I have found a couple of records that have not been included in the compilation. Søndergaard et al2019 concerning the local ice cap at Qaanaaq and a study concerning Gletscherlukket in SE Greenland by Larsen et al2021.

Line 372. I would leave-out the information from the subfossil plants – otherwise similar data from other sites should also be included.

Line 471-478. It is correct that many of the lakes presented in Schomacker et al2016 are not threshold lakes that receive meltwater at present. However, it is not correct that it does not provide any constraint on the glacier history. One of the lake records receive meltwater from Drangajokull until c. 7.2 ka suggesting the ice cap was larger than present until the Middle Holocene. It would be relevant to add this information.

Line 733-742. Why include this information in a compilation of lake records

Line 794-796. I am slightly surprised that there are no differences between the lake-based reconstructions and the patterns of GIC fluctuations presented in Solomina et al2015. It would also be relevant to describe where lake-based records have an advantage and disadvantage compared to other types of proxies used in Solomina et al2015.

Line 830. Other forcings – which?

Line 955. Many shrank than today in the Ealy Holocene. I am not sure if that holds. Maybe change to some or even better write x out of y GICs shrank....