Reply on RC1
Thomas James Barnes et al.

Review response for reviewer 1 is below. Full response to both reviewers added as a supplement.

Review 1

- The paper needs to be reassessed after considering how surface topography affects where water pools. Several of the proposed mechanisms and causal relationships between climate, firn, and meltwater lake coverage need to be reconsidered, and revised if still true or removed if no longer true.

To approach this point we intend to look at a high resolution DEM to find out whether surface topography and water pools show a connection. Based on the results of this investigation, we will identify whether or not they support the above hypothesis.

- The methods by which lake pixels are selected need to be further explained. Moussavi et al. (2020) would be a good reference if the new method is to be kept, but I would recommend using Moussavi et al.’s available code for Landsat 8 imagery and discuss the process used to select the NDWI thresholds for Landsat 1-7. I also don’t understand what the scaling of lake pixels derived from non-Landsat 7 imagery includes, but the uncertainty introduced by this needs to be discussed.

This point will be approached by comparison of the results of Banwell et al., (2021) where Moussavi et al (2020)’s methods were used to compare an alternative method to the results of this study. This was done previously through correspondence with A. Banwell, but not included in the manuscript. Additionally, reasoning behind thresholding will be discussed. The final part of this comment is addressed in the response to point (8) from Reviewer 2.

- Many of the assertions about climate effects on meltwater lake coverage presented in the discussion/conclusion need to be supported by data or citation of the literature. The
choice of MAR is discussed in the supplementary materials, but the authors also seem to use MAR output as a single point rather than a spatially-varying raster dataset.

Effort will be made to improve referencing in relation to climatic effects on lake coverage. Additionally, clarification will be made for the use of MAR, as it was initially tested as a point source, however over the course of the study this evolved into a gridded use, and may not have been fully updated in writing as an oversight.

- Some sections need to be rewritten to clear up ambiguity in what was done, what is being extrapolated, etc.

Line by line comments will be addressed to improve the manuscript and lessen any ambiguity in writing. Additionally, effort will be made to include much of the supplemental information in the main body of the manuscript so as to avoid further ambiguity with methods.

Please also note the supplement to this comment:
https://tc.copernicus.org/preprints/tc-2021-214/tc-2021-214-AC1-supplement.pdf