Reviewer 1 (Dr Jenna Sutherland)

General Comments

The effects of ice-marginal lakes are a topical and emerging area of research. Due to the impacts on biophysical systems through water and sediment fluxes, the authors make a strong case for investigating physical controls on lake areal change. This is a nicely designed and detailed study which quantifies ice-marginal (both proglacial and ice- dammed) lake area changes across a representative sample over northwest North America from 1984-2018. The authors find that proglacial lakes increased in area over the last three decades whilst a large proportion of ice-dammed lakes shrunk. Specifically, large, low-elevation coastal proglacial lakes associated with wide, thick glaciers appeared to change most in absolute terms, in contrast to small, interior lakes at higher elevation that changed most relative to their initial area. Appropriate statistical analyses suggest limited correlation between climate and lake area change. Instead, the authors conclude that lake geometry and topographic setting are the dominant controls on lake area change in this region. Overall, the manuscript is well-written and clear. I suggest several very minor corrections which I expect can be addressed very easily. Although these technical corrections may look extensive, they are merely intended to help tighten up the precision of the text. I am convinced that this work presents interesting and novel results demonstrating the influence of geometry and topography as controls on ice-marginal lake evolution. Indeed, on the basis of this study I see the value of further investigations to see if similar correlations exist in other regions.

We thank Dr Sutherland for taking the time to provide a detailed review of our manuscript and address each of her specific comments below.

Specific Comments

I appreciate that lake area change was the focus of this study and I suspect that lake depth or bathymetry is unknown for many of the lakes. However, I wonder if the authors might comment on how important lake volume might be, relative to area, for a more in- depth discussion. A basin may well get deeper as it widens, and so lake volume is also likely to be influenced by the same environmental variables, specifically geometry and topography.

This is a great suggestion, and we have wondered in the past how this story might differ if we could measure volume change rather than area change. However, due to limited field data, with our dataset we would have to estimate volume change using an empirical relationship with area change (e.g., Cook & Quincey, 2015 - https://doi.org/10.5194/esurf-3-559-2015). Using such a relationship, volume change would scale with area change, so the outcomes should be similar, but applying this empirical relationship will make our fundamental dataset more uncertain. For the present study, we believe it is better to stick with the data we know well, rather than transforming them to be less certain if it will not fundamentally change the analysis. We have added text explaining this decision at the end of the first paragraph in Sec 5.1, copied below:

"We note that, while we here document lake area change, i.e. a readily observable quantity, similar results would likely emerge if we estimated lake volume change because lake area scales with lake volume (Cook and Quincey, 2015; Shugar et al., 2020). However, converting area to volume in the absence of field observations requires the use of empirical scaling relationships (Cook and Quincey, 2015; Shugar et al., 2020) and would make the presented data more uncertain; we therefore only consider area change in the present study."

The statistical analyses undertaken and assumptions made are valid and clearly outlined. However, the authors infer that covariance between continentality and climatic parameters is the underlying cause for correlation with other environmental factors. Line 660 states that 'when considering climatological, glaciological and topographic controls on lake area change, it is important to note that these variables are often intertwined'. I wonder why a multivariate statistical technical such as Principal Component Analysis was not undertaken instead? In PCA, the data are easily reduced into smaller numbers of interrelated groups that can reveal underlying patterns within the dataset. Measuring the importance of each variable relative to each other in this way might help to confirm the authors assumptions.

Thank you for this suggestion, which echoes one of the main comments from Reviewer 2. In the revised manuscript, we incorporate principal components analysis and a more thorough investigation of covariance between the environmental variables. These new analyses resulted two entirely new sections, one new figure and table in the main text, as well as one new figure and table in the supplement. The revised manuscript includes two entirely new aspects to address thhs comment.
(*The following text is identical to that adressing the similar comment from Reviewer 2*).
We now include both: 1) in-depth discussion of covariance between environmental variables, and 2) an entirely new analysis undertaking principal components (PC) analysis to reduce data dimensionality and then running correlations against the PC scores. The discussion of environmental variable covariance highlights the difficulty in untangling some of these variables, as noted in the first paragraph. We believe these data, as well the new figure & existing table associated with them (that is now more centrally discussed), provide stronger support for our existing claims, but also better highlight uncertainty in determining causality between a single environmental variable and ice-marginal lake area change. The PCA results are consistent with our bivariate results, and provide stronger support for the dichotomous behavior of large, coastal, low-elevation lakes and small, interior, high-elevation lakes. The PCA results also help to disentangle the relationship between glacier attributes (e.g., glacier area, lake-adjacent ice thickness) and topographic attributes (e.g., distance from coast, elevation). Topographic variables load strongly onto the second principial component axis (PC2,) with minimal influence from glaciologic variables, while the opposite is true for PC3 (Table S2 in the revised manuscript). The significant correlation between lake area change metrics and PC2 scores (which holistically reflect

continentality), and very limited significant associations with PC3 scores (which reflects glacier size), supports the notion that topography is more closely associated with lake area change than glaciologic characteristics. We have updated the text to clearly state these observations. The PCA data are somewhat more abstract than the bivariate analyses, though, so we believe it important to present both bivariate and multivariate analyses to provide more compelling and physically-meaningful evidence of our claims than either analysis would provide alone.

The new sections, figures, and tables devoted to these analyses are copied below, with more support in the supplemental material and in text throughout the manuscript:

3.4 Principal components analysis procedure and interpretation

In addition to the single-variable correlation tests described in Sec. 3.3, we undertake principal components analysis (PCA) to reduce the dimensionality of the datasets of topographic, climatic, and glaciologic factors, many of which are themselves correlated (see Sec. 4.4 for discussion of covariance). To prevent high-valued environmental variables (e.g., glacier area, which can exceed 1000 km^2) from dominating dataset variance relative to low-valued variables (e.g., mass balance gradient, which is generally 0.1 – 1 m w.e. per 100 m), we standardize input variables (Table 3) by their minima and maxima to ensure that all variables range from 0 to 1. We then run PCA on the standardized environmental variables using Matlab's `pca` function. We investigate the variance explained by each principal component axis (i.e., "scree plot") and the input variable loadings onto each axis (Table S2). After determining which principal component axes are most relevant (described below), we correlate the lakes' principal component scores to lake area change, using the same procedure described in Sec. 3.3.

4.4 Assessing covariance of environmental variables

It is plausible that a correlation between lake area change and a single environmental variable is actually due to underlying covariance amongst the environmental variables. Covariance between environmental variables in some ways complicates interpretation of the results presented in Secs. 4.2-4.3, but this covariance also provides a physically plausible explanation for several unintuitive results presented in that section. We cross-correlate the 15 environmental variables shown on Table 3, and find that most (63 %) of the possible pairs of environmental variables are significantly correlated at $p < 0.05$ (Fig. 10; Table S4). These correlations signify that one environmental variable (e.g., summer temperature) systematically varies with another (e.g., latitude), which is driven by the spatially coherent structuring of these variables. Below, we describe several salient clusters of correlated environmental variables that affect interpretation of results presented in Sections 4.2-4.3.

Lake elevation and initial lake area are both significantly correlated with 50 % of the other environmental variables, and the variables with which they covary are nearly identical (Fig. 10; Table S4). Large, low-elevation lakes are significantly associated with the following variables: proximity to the coast, high summer temperatures, winters that have gotten wetter, larger glaciers, wider glaciers, thicker glaciers, and glaciers with a steeper mass balance gradient. Distance to the coast is significantly correlated with a similar set of environmental variables, but lacks significant association with the variables describing glacier size (i.e., area, width, lake-adjacent ice thickness).

Notably, variables describing glacier mass balance are not significantly correlated with lake elevation, initial area, or distance from the coast. Glaciers with more negative cumulative mass balance instead are significantly associated with locations further south and east; warm summers; wet winters; winters that are becoming drier; smaller, narrower, and thinner glaciers, and; glaciers with a steep mass balance gradient.

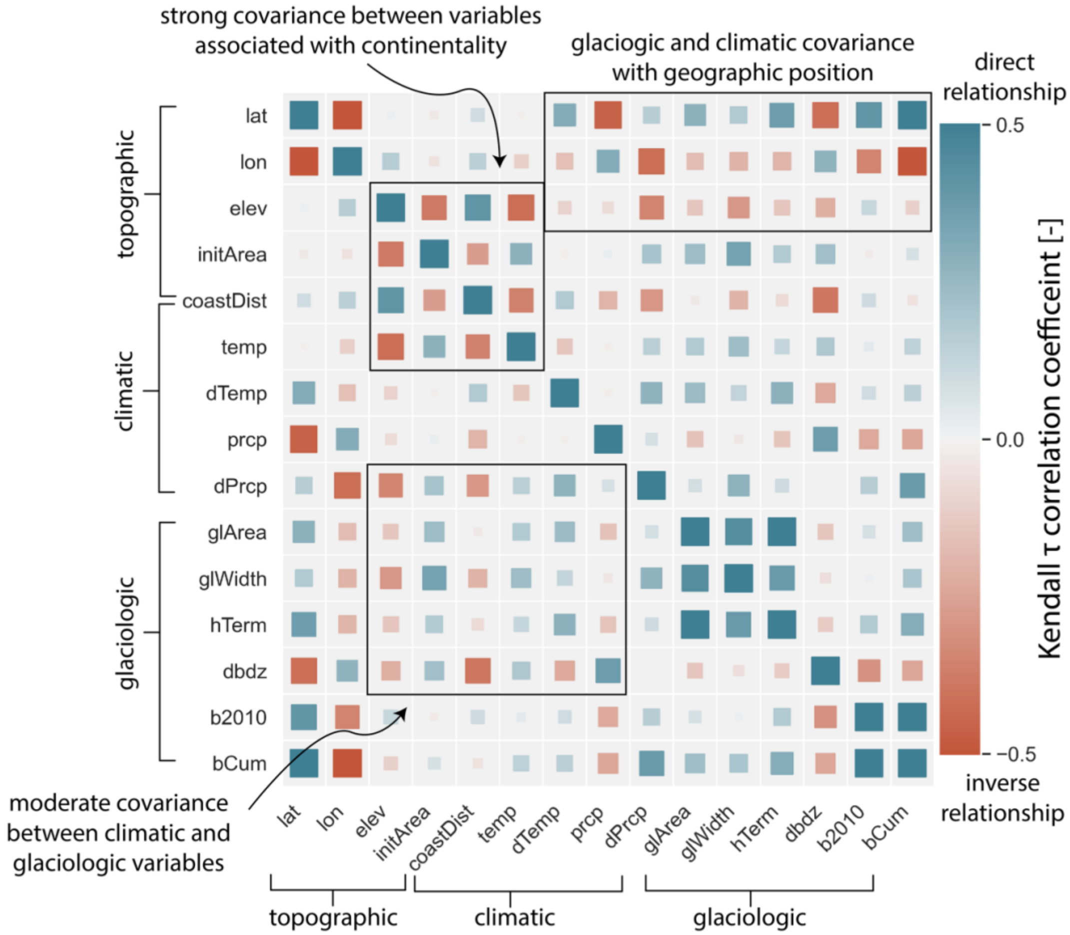

Figure 10. Correlation matrix showing interrelatedness of the topographic, climatic, and glaciologic variables used for lake area change correlations (Table 2). Symbol color scales with the Kendall tau correlation coefficient between the environmental variables associated with that point's row and column. Symbol size scales with the absolute value of the correlation coefficient. Black boxes highlight covarying environmental variables that are discussed in the text. Meanings for variable names are as follows: lat = latitude; lon = longitude; elev = lake elevation; initArea = lake initial area; coastDist = distance from the open ocean; temp = JJA temperature; dTemp = change in JJA temperature; prcp = DJF precipitation; dPrcp = change in DJF precipitation; glArea = area of the lake-adjacent glacier; glWidth = width of that glacier; hTerm = lake adjacent median ice thickness; dbdz = mass balance gradient; b2010 = average annual mass balance for 2010 – 2016; bCum = cumulative mass balance for 1980 – 2016.

4.5 Multivariate correlations between lake area change and environmental variables

To supplement bivariate correlations and the above discussion of covariance between environmental variables, we undertake non-parametric correlation testing between ice-marginal lake area change and principal components scores. We first must interpret the physical meanings of the PC axes. The first four principal components axes explain 73.3

% of the variance found in the 15 environmental variables for which we present correlation results (Table 2). After inspecting the loadings of environmental variables onto each principal component axis (Table S2) and plotting the quasi-exponential decay explained by increasing PC axis numbers, we retain only the first four PC axes for correlation testing. Some interpretation is required to understand the physical meaning of PCA results: Strong loadings of PC axis (PC1, absolute value ≥ 0.25) are found for environmental variables associated with a lake's geographic location (e.g., latitude, longitude, elevation), and so we interpret this axis to largely reflect a lake's position on the earth surface. This interpretation is supported by PC scores varying systematically along a latitudinal gradient (Fig. S3a). Strong PC2 loadings are indicative of a maritime setting; high PC2 scores are associated with low elevation, proximity to the open ocean, high mass balance gradients, and high winter precipitation (Table S2). This interpretation is again supported by the spatial distribution of PC2 scores, with a systematic decrease in scores moving away from the coast (Fig. S3b). Glacier-size related variables load most strongly onto PC3, while climate and climate change-related variables load most strongly on PC4 (Table S2; Fig. S3-d). We thus interpret PC axes 1 – 4 to aggregate individual environmental variables related to geographic position (i.e., latitude and longitude), continentality, glacier size, and climate (and its change), respectively.

The results show significant correlations for only PC2 (Table 4), the PC axis we interpret to reflect continentality (Sec 3.4). Proglacial (ice-marginal) lakes exhibit a significant direct (inverse) correlation between PC2 and absolute lake area change. An inverse correlation ($p \leq 0.05$) exists between PC2 and relative proglacial lake area change (Table 4). Due to the details of PCA data transformation, high PC2 scores are related to factors associated with a maritime setting. Therefore, a positive correlation coefficient indicates greater lake growth being associated with a maritime setting. A negative correlation coefficient either indicates greater lake area decline in a maritime setting, or greater area increase towards the continental interior. These findings are consistent with the bivariate correlation results (Sec. 4.2 – 4.3; Table 3), in which coastal proglacial (ice-dammed) lakes experienced the highest rates of absolute area increase (decrease), while interior proglacial lakes experienced the higher rates of relative area change.

In addition to these results, the relative area change of proglacial lakes is directly correlated ($0.05 < p \leq 0.1$) with PC3 (Table 4), which we interpret to reflect glacier size (Sec 3.4). This suggests that proglacial lakes associated with large glaciers are experiencing higher rates of relative area change. No significant relationships between glacier geometric characteristics and relative area change were found for the bivariate correlations (Table 2). This discrepancy in significance between single-variable and multivariate analyses suggests that either: 1) by combining multiple glacier-related characteristics, the association between glacier size and relative lake area change becomes more apparent; 2) other variables that load strongly onto PC3 (e.g., elevation, longitude) underly this association, or; 3) our interpretation of the physical meaning of PC3 is incorrect. No other PC scores were associated with ice-marginal lake area change, either in an absolute or relative sense at the $p \leq 0.1$ level (Table 4).

Table 4. Kendall rank correlation coefficient (τ) values for monotonic relationships between absolute and relative lake area change with the four leading principal components axis scores. The interpretation for a physical meaning of each axis is listed beside the axis number. In each category, test statistics are reported separately for proglacial and ice-dammed lakes. Bold numbers indicate correlations that are significant at $p \leq 0.05$, while regular text indicates relationships where $0.05 < p \leq 0.1$. Dashes indicate a correlation with $p > 0.1$. Due to details of PCA data transformation, a positive (negative) correlation with PC2 indicates higher proglacial (ice-dammed) lake area growth (shrinkage) being associated with environmental variables characteristic of a maritime setting (e.g., close to coast, high mass balance gradient, low elevation). A positive correlation with PC3 indicates higher proglacial lake growth being associated with variables characteristic of larger glaciers (e.g., high glacier area, high lake adjacent ice thickness).

PC axis number	Interpretation	Absolute area change		Relative area change	
		Proglacial	*Ice-dammed*	*Proglacial*	*Ice-dammed*
1	Spatial location	-	-	-	-
2	Continentality	**0.31**	**-0.61**	**-0.22**	-
3	Glacier size	-	-	0.18	-
4	Climate (change)	-	-	-	-

Technical corrections

Line 23. 'These systems...' Could you clarify which systems are you referring to here. The low-elevation coastal proglacial lakes or interior lakes at high elevation? Or both?

We clarified this statement by saying "the fastest changing lakes" rather than "these systems".

L28. The Introduction is labelled as 1.1 but there are no subheadings within this section. Change to 1.

We removed the subsection label.

L37. 'may pose a serious hazard'. To downstream communities?

Added.

L56-60. Make it clear that this study (Wolf et al. 2014) refers to lakes in northwest North America (I think)

We added a clarification that the Wolf et al. (2014) study focuses on Alaska.

L62-63. This sentence seems to be a repeat of what is stated in the first sentence of the intro (lines 29-30). I think you can delete either one to make the text more concise.

We modified this to transition sentence to avoid repetition with the earlier text that has been highlighted. It now reads: “The development and evolution of an ice-marginal lake can impact its associated glacier”.

L70. ‘bys’ should be ’by’

Thanks for your careful read. We corrected this typo.

L75. ‘In addition to these glaciological factors....’ It seems unusual to start a new paragraph like this. This sentence should be linked to the points made above.

We removed this opening clause and instead jump directly into ecosystem impacts.

L79. ‘below lakes.’ I suggest rephrasing this because it reads as if the streams are positioned underneath the lake, I think you mean downstream?

Changed “below lakes” to “downstream from lakes”.

L83-86. A bit of repetition (such GLOFs) from paragraph 1 here. I suggest paragraph 4 of the intro is either deleted or at least condensed and moved into another paragraph. I would also suggest combing the last two (short) paragraphs of the intro into one.

We removed the unnecessary GLOF text from the fourth paragraph. We also combined the last two paragraphs, as suggested. However, we choose to leave the paragraph discussing geomorphic and ecological impacts of ice-marginal lakes as its own paragraph. These impacts are very distinct from glaciological impacts (the previous paragraph) and, despite their importance, often receive minimal discussion in studies of ice-marginal lakes. We believe it is important to highlight their role in the “icefield-to-ocean” biophysical system.

L94. ‘how lakes change over time’. And space?

Added.

L98. I suggest clarifying here if the lakes studied in Brun et al. (2020) were ice-marginal or disconnected/distal to glacier terminus. This is quite important. I think the latter.

Correct - we added a qualifier saying that Brun et al. (2020) was focused on closed basin lakes that are not in direct contact with glacier ice.

L100. ‘shifted up in elevation’. I suggest rephrasing for clarity, e.g. shifted to higher elevations.

Done.

L101. ‘may influence proglacial lake evolution...’ add ‘also’ in-between may and influence

Done.

L106. Clarify if this ‘model’ is a numerical/physical/conceptual model?

Clarified that we mean a conceptual model, though a numerical model would be even better!

L122. ‘Our 107 study lakes span...’ I suggest re-phrasing, so it reads more fluently e.g. ‘We study 107 lakes that span...’

Done.

L163. ‘We utilize the 1960s decade to consider the longest-term comparison allowed by the SNAP dataset.’ Given that the lake extents were digitised from 1980s onwards, could you have utilised 1980s decade also?

Our thinking here is that, because glaciers don’t respond instantaneously to climate change (echoing discussion in Sec 5.3, 2nd paragraph), that using the longest-term climate data give us the best chance of describing climate change on the timescale relevant to glacier change. We note that, due to data limitations, our glacier mass balance model only extends back to 1980 (rather than 1960) and so the cumulative mass balance dataset we correlate with is, in fact, computed over the same timescale as our area change data.

L267. ‘summery’ should be ‘summer’

Done.

L314. ‘We exclude lakes that detached from their adjacent glacier (n = 18; 13 proglacial lakes and 5 ice-dammed lakes).’ These numbers don’t seem to match up with what is written in lines 257-259 that suggests 15 proglacial lakes detached?

We have worked through the entire manuscript to ensure consistency of lake numbers. We apologize for this error that originated from slight changes as we iterated on earlier versions of this dataset and manuscript.

L318. 'Though we omit these lakes from lake area change characterization and analysis'. I would delete this as it is repeated from the previous sentence and perhaps re-phrase this part of the paragraph, so it reads more fluently.

We deleted that redundant clause.

L358. I found the many values reported in the first two paragraphs of section 4.1 slightly confusing as to what they represented. E.g. Lines 358 'In terms of lake number, 83 % of the investigated proglacial lakes (n = 88 in total) grew, 10 % shrunk, and 7 % were relatively stable, changing by less than ± 0.1 km2.' So what then are the numbers reported for proglacial lakes in previous paragraph (Lines 349-350)? Are the 72 proglacial lakes that grew, 82 %? Do these statements need to be linked in some way?

As with your comment to L314, these issues stem from slight changes during data processing & analysis on an earlier version of the manuscript & dataset that we neglected to update for the submission. We apologize for this error and have combed through the manuscript to ensure all numbers are consistent and derive from the most recent data processing.

L493. 'Though their signs are flipped'. Could there be a better way to phrase this?

We now say "with opposite signs".

L518. 'against the backdrop...' I suggest re-phrasing this e.g. 'into the context of global...' or similar

Done.

L554-556. 'The initial existence of a large lake requires a large basin, and basins generally do not end abruptly. Therefore, the simple existence of a large lake suggests that there is high potential growth in a regionally-extensive depression.' I agree with this statement to a certain extent, but the opposite could also be true – initially large lakes could be at their maximum extent with no further room for growth and therefore I would not expect large lakes to expand further.

We added a clarification that this first interpretation requires proglacial lakes to be in an early stage of development, and point to the relevant study by Emmer et al. (2020) which elaborates on this idea of stages of lake development. You are correct that this nuance is required for this hypothesized mechanism to be better supported. The text now reads:

"1) The initial existence of a large lake requires a large basin, and basins generally do not end abruptly. Therefore, the simple existence of a large lake suggests that there is higher potential growth in a regionally-extensive depression. This explanation would require Alaska's proglacial lakes to be in an early stage of development (Emmer et al., 2020), with ample room to grow into overdeepened basins."

L556. 'longer zones' – clarify whether this is spatially or temporally. I think you mean how much surface area of the glacier is in contact with the lake as 'wider' is referred to later in the sentence.

We changed this hypothesis to now read "Alternatively, 2) larger lakes likely have greater surface area at the glacier-lake interface, which may lead to higher rates of frontal ablation".

L559. 'perhaps that large lakes tend to be warmer'. Could a reference be cited here?

Two references have been added to support this hypothesis that larger lakes tend to be warmer, both using the example of large Patagonian proglacial lakes.

L560. 'submarine' change this to one of subaqueous/basal/sub-lacustrine (my preference is subaqueous)

We changed "submarine" to "subaqueous" throughout the manuscript. Thank you for noting this lack of precision.

You infer that topographic and geometric factors most strongly control ice-marginal lake area change, so perhaps in section 5.2 a discussion about how the geometry of the lake and the topography also influence the geometry of the adjacent glacier could be made. The following study supports your conclusions about such inter-related variables:

Sutherland, J. L., Carrivick, J. L., Gandy, N., Shulmeister, J., Quincey, D. J., & Cornford, S. L. (2020). Proglacial lakes control glacier geometry and behavior during recession. Geophysical Research Letters, 47(19), e2020GL088865.

Thank you for pointing us to this very interesting recent paper of yours - we were not previously aware of it. We agree it is very relevant for the discussion we present here and have added references to it in Sections 1. We do not add a reference in Sec 5.2 because our impression is that this study more shows the impact proglacial lakes have on glacier geometry relative to land-terminating glaciers (rather than compared to other proglacial lakes with differing basin geometry).

We looking through the main text and supplements (including sensitivity analyses) of this paper and did not find mention of the impact of basin geometry on glacier dynamics, though we can certainly imagine the concept you're referring to.

L556. 'Several other factors are statistically significantly linked can be explained using...' Insert 'that' after factors.

Done (this was L565 in the original manuscript, not 556 as written).

L621. 'glaciers act as low-pass filters on climate variability'. Could you elaborate upon this? Do you mean that subtle changes in climate are not detected by the glacier?

We deleted this statement, which added unnecessary confusion and is not essential.

L623. 'responding to climate change in a lagged and smoothed manner' Insert 'is' before 'responding'

Done.

L637. 'lake area coming into equilibrium with the current environment' I am unsure what you mean here, equilibrium suggests a steady state so do you mean the lake will neither grow or shrink further?

We clarified that we do mean a steady state. We also removed this subsection, moving relevant text to Sec 5.1. We also moved the figure supporting these claims to the supplementary material because it is not essential to the main drive of our story and we strove to streamline the manuscript as much as possible.

L669. 'where has been more winter precipitation' should be 'where there has been...'

Done.

L698. There is a change of tenses within this sentence. I suggest changing 'find the majority (82 %) of proglacial lakes are growing' into the past tense.

Done.

Code data and availability.

I am unable to access the data specifically linked to these webpages : https://arcticdata.io/xx and https://github.com/armstrwa/xx (the end of the links appear to be missing?).

We have corrected these placeholder links with active links.

‘Climate reanalysis data are available at xx’. Insert the correct location instead of xx?

Thank you for catching this. We replaced “xx” with the link that was incorrectly listed for the RGI (as you note below).

‘The Randolf Glacier inventory is located at [link]’ this link actually takes you to the SNAP climate data not RGI.

We changed this to the correct link. Thank you for noting this issue.

Figures and Tables

Figure 1. Perhaps an insert of the wider region would be useful here for readers not familiar with the area? Could you state what the insert (photograph) is in the caption, e.g. is this glacier or lake named?

We substantially revised this figure. It now presents lake locations by their type (i.e., proglacial or ice-dammed) rather than results (i.e., lake area change), as originally presented, which addressed a comment by Reviewer 2. In the revised figure we include an example of both a proglacial and ice-dammed lake, and provide their locations in the caption. The revised figure (copied below) also shows a map inset to give broader geographic context.

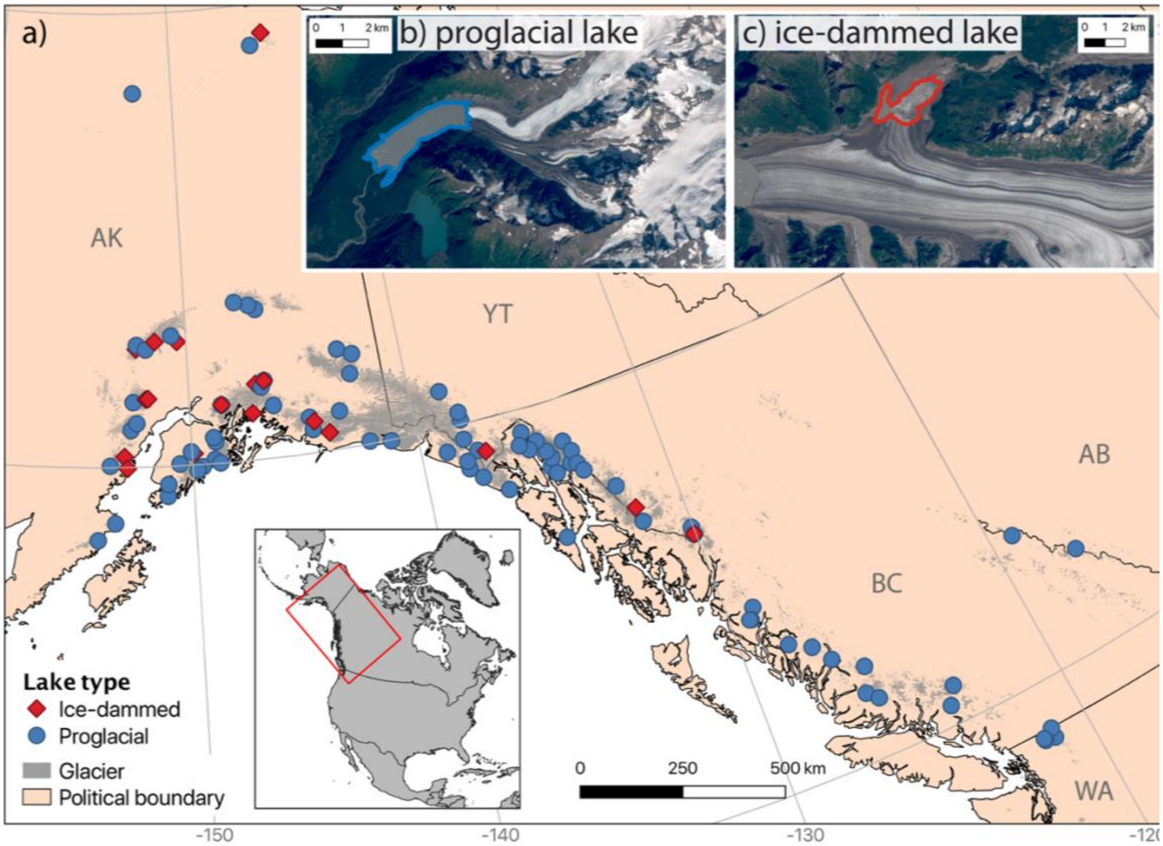

Figure 3. Lines 242. ‘Ice thickness color bar and map scale are identical between panels a and b’. I don’t think you need to state this in the caption because the reader can see they are identical looking at the figure. If space allows, could the lake outlines from different years also be labelled (I think I see 3 or 4 different outlines)?

We removed the text about the colorbar and scale. We did not add year labels to the lake outlines at each timestep to avoid making an already busy figure more complicated, but the revised Figure 2 now includes examples of proglacial and ice-dammed lake area change with chronologically labelled lake extents. We hope this provides the kind of example you are asking for in this comment.

Figure 4. Line 373 in the caption ‘while proglacial lakes that appeared that time are unfilled’ is there something missing here? The dashed line shows 1:1 (i.e., lakes with constant area), while the dashed lines show various levels of relative area change.’ Do you mean dotted lines perhaps?

We clarified this caption to now read “Proglacial lakes that existed for the entire study period are shown as filled blue circles, while proglacial lakes that appeared that time (“new lakes”) are shown as unfilled symbols” and fixed the noted dashed/dotted typo.

Figure 6a. Has this data been plotted from specific lakes? If so, could the lake/glacier be labelled or mentioned in the caption?

We have moved this figure to the supplements because it was not essential for conveying our main findings.

Table 1. Could you add the resolution (and range) of elevation data from GTOPO30 here?

GTOPO30 has 30 arc-second (~1 km) spatial resolution and global extent. We specify these values in Sec 2.5, but believe adding this information to Table 1 would be strange because none of the other data have their resolution stated here. Statements of resolution, extent, and accuracy are made in Secs 2.2-2.5, and incorporating this information into Table 1 would be difficult because: 1) it would make the table very dense, and 2) resolution of some datasets does not have a fixed spatial resolution because they are calculated on a glacier-wide basis.

Supplementary Information

Line 928. Figure S1 caption, insert the word 'lake' in-between 'proglacial bounded...'

Added.

Figure S7. I can't see where this figure is referred to in the main text. Figure caption states c) is 'winter precipitation for each lake for 2009-2009 decade'. Should this be 2000-2009 instead?

We added a reference to this figure in Section 5.3 while discussing correlations between relative area change and climate parameters.

Line 984. 'A positive change indicates warmer temperatures' I think needs to be deleted as it is repetition of c) and d) is precipitation only

We changed this to state that a positive value in panel d indicates wetter winters in recent times.

Line 990. 'lake are time series and area change' should be 'lake area time series'?

Thank you, yes. We changed "are" to "area".

Dr Jenna Sutherland (Leeds Beckett University, UK). 05/02/2021.