

## **Response to Referee 2 on “A Comprehensive Database of Thawing Permafrost Locations Across Alaska”**

We would like to thank referee 2 for their helpful comments. We found all comments to be constructive and have addressed all of them (see detailed responses below). As a result of these revisions, we believe that our manuscript is much improved. Below please find a point-by-point explanation of our revisions.

### **General comments**

The proposed paper presents the Alaska Permafrost Thaw Database, an extended inventory of 19,540 permafrost thawing locations, spanning from 1950 to the present. The inventory distinguishes between abrupt thaw sites and gradual thaw sites.

The sources the inventory is based on are reliable and the methodology used for compiling the inventory are consistent and rigorous. The resulting database is of significant importance for both researchers and the wider community.

The analysis of abrupt thaw and gradual thaw against topographical factors is statistically sound with no clear inconsistencies.

Before publication some minor clarifications and some minor manuscript improvements are needed. Below you can find technical and specific comments.

### **Technical and specific comments**

Technically all the figures are correct but for cartographical reasons and for easier reading, figures need to be improved.

Figure 1

The figure seems clustered and hard to read, especially panel (b). Consider:

- Improving the overall resolution of the image
- removing the title from both panel
- modify the legend, since it's the same for both panels, it can be shared between the panels or can occupy a more marginal space in the figure.
- The points in panel b are dense and make it hard to appreciate their location. Although this is difficult to resolve, consider one of the following: make the points slightly smaller, make the points transparent, make the points color filled but without the black outline.
- If the space allows it consider adding the number of points to the figure, for each panel. Otherwise, you can add this information to the caption.
- The scale bar can be reduced or made simpler and more discrete.

We thank the reviewer for these extremely helpful suggestions. We increased the figure resolution, removed the title, used one shared legend, made the points smaller, added the number of points to the top of each map, and made the scale bar smaller.

Figure 2

- Improve the resolution of the figure

- The individual pie charts will be clearer if the slices will be arranged in ascending/descending order.
- If possible, consider using contrasting colors for consecutive slices.
- If possible, where the slices are very small (e.g. <1%) consider using a panel where you can zoom in to make it visible.
- Make a better alignment of the charts
- Consider removing the title and move it to the caption of the figure.

We thank the reviewer for these helpful suggestions. We increased the resolution of the figure, arranged the pie slices in descending order, added a small pie chart to highlight features that comprise less than 1% of the total ecoregion, improved alignment of the charts, and removed the figure title.

#### Figure 3

- Improve the resolution of the figure
- Consider removing the title and move it to the caption of the figure.
- For consistency purposes only: In fig.1 the panel labels are in top left corner while here they are on the top right corner. If possible, consider having the label in the same place for all the figures.

We thank the reviewer for these comments. We improved the resolution of the figure, removed the title, and removed the labels altogether. Instead, we refer to the panels as “top” and “bottom” panels. We also created one shared legend and y axis title for improved visibility.

#### Figure 4

- Improve the resolution of the figure
- Consider removing the title and move it to the caption of the figure.
- The legend is almost as big as the figure itself. Consider one or more of the following: merge the legends for both panels, make the legend smaller or move it more to the side of the figure. Remove the legend altogether from the figure and describe it in the figure caption
- If the space allows it consider adding the number of points to the figure, for each panel. Otherwise, you can add this information to the caption.
- The points are dense and make it hard to appreciate their location. Although this is difficult to resolve, consider one of the following: make the points slightly smaller, make the points transparent, make the points color filled but without the black outline.

We thank the reviewer for these suggestions. We increased the resolution of the figure, created one shared legend and decreased its size, decreased the size of the points, and added the number of points in the caption since it was the same for both panels.

#### Figure 5

- Consider removing the title and move it to the caption of the figure.
- For esthetic purposes consider removing the legends and just explain the colors in the figure caption
- For consistency purposes consider having the label for the panel in the same place for all the figures (possible if you remove the title from the figure).

We thank the reviewer for these helpful suggestions. We collapsed the panels into one map showing both areas of agreement and disagreement for improved aesthetics, so there was no longer a need for panel labels. We removed the title and kept one shared legend.

#### Figure 6

- Consider removing the title and move it to the caption of the figure.
- For consistency remove the background color from the legend.
- The points are dense and make it hard to appreciate their location. Although this is difficult to resolve, consider one of the following: make the points slightly smaller, make the points transparent, make the points color filled but without the black outline.
- Consider removing the white outline for the polygons representing yedoma domain.
- Consider using better contrasting colors, especially for panel a.

We thank the reviewer for the feedback. We removed the title, the background color from the legend, and the white outline for polygons representing Yedoma domain. We also decreased the size of the points for better visibility, changed the pink color to green, and collapsed the panels into one figure

#### Table 2

- The bullet points in the second column are not aligned correctly

We thank the reviewer for noticing the misalignment and have corrected the bullet points in Table 2.

Line 35 missing article “from 1950 through *the* present”

We thank the reviewer for catching this. We changed the phrase to “from 1950 through the present”

Line 54-55 “the Arctic is warming nearly four times faster than the global average”. This depends on a time frame for which the comparison is made

We thank the reviewer for this clarification. We updated the rate of change to three times faster and changed the reference to the 2025 NOAA Arctic report card due to recent pushback about the Rantanen et al. (2022) paper. We have updated the sentence to say:

“However, warming is not uniform across the planet and the Arctic has been warming nearly three times faster than the global average, making it one of the most rapidly changing environments on Earth (Ballinger et al., (2025).” Lines 55-57

Line 89-90 “These sites are broadly representative of gradual thaw processes across Alaska”

Are they representative in a statistically significant way? Otherwise consider rephrasing

We thank the reviewer for this helpful feedback. We rephrased the sentence to say:

“These sites represent gradual thaw processes and are located in areas distinct from abrupt thaw features, allowing them to be treated as independent observations.” Lines 91-93

Line 214 -218 “Inconsistent or patchy permafrost distribution is classified as variable, <10 % as low, 10-20 % as moderate, and >20 % as high. In contrast, the *Circum-Arctic Map of Permafrost and Ground-Ice Conditions, Version 2* by (Heginbottom et al., 2002) summarizes permafrost conditions and ground ice distribution across the Northern Hemisphere (20°N to 90°N). Ground ice classification is also based on the upper 20 meters of permafrost, with <10 % defined as low, 10-40 % as moderate, and >40 % as high.”

Can you please clarify if the different thresholds used for ground ice classification can affect the comparison of proportions across these classes

We thank the reviewer for highlighting this issue. We added a sentence at the end of this section to clarify how the different thresholds were managed for downstream analyses:

“Because the two datasets use different percentage thresholds to define moderate and high ground ice content, we combined the moderate and high classes into a single category for each map while retaining low ground ice as a distinct class since both maps define it as < 10 %.” Lines 223-225

Section 2.4.

There is no mentioning of addressing or considering spatial autocorrelation and clustering of the data (i.e. multiple points from the same study site) which, in my opinion, is likely to have occurred. Can you clarify if it was considered or not and if you think it affects the way the data is interpreted in section 3.3.

We thank the reviewer for this feedback and agree that clarification on spatial clustering is needed. We added the following to the end of section 2.4:

“Although duplicate features were removed (section 2.1), some study sites include multiple thaw features which may result in spatial clustering of observations. Therefore, results in section 3.3 should be interpreted as representing broad regional patterns rather than statistically independent observations.” Lines 234-236