

The Cryosphere Discuss., referee comment RC2
<https://doi.org/10.5194/tc-2021-47-RC2>, 2021
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Comment on tc-2021-47

Anonymous Referee #2

Referee comment on "Recent degradation of interior Alaska permafrost mapped with ground surveys, geophysics, deep drilling, and repeat airborne lidar" by Thomas A. Douglas et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-47-RC2>, 2021

The article by Douglas et al. incorporates long-term monitoring of ground temperatures and thaw depths with LiDAR-based analyses, radiocarbon dating, and permafrost coring. This is an extremely well-planned and thorough investigation of permafrost near Fairbanks, Alaska. The study is clearly presented and explained.

The study is appropriate for The Cryosphere, and will likely be of interests to scientists and policymakers across multiple disciplines. In general, the conclusions are supported by the presented data, and the thawing and changes to the permafrost are clearly presented in many of the figures and tables. A very thorough, interesting and important study of Alaskan permafrost.

The only conclusion that seems like a reach is the calculation of potential carbon release for all of the yedoma-type permafrost in central Alaska. Given the many variables that can impact permafrost thaw and active layers (as well as variations in carbon-content even across yedoma-type permafrost), I question whether the authors can actually constrain that the total thaw of permafrost carbon in central Alaska to 0.44 Gt.

Line 16 – long description is a bit confusing “ice rich high carbon content syngenetic yedoma permafrost”

Line 24 – 500 m needs space between

Line 30 – I think “made” is the wrong word here. Confusing sentence.

Line 38 – CO₂ subscript. Spell out carbon. “7-year”

Line 40 – comma after “cover”

Line 129 – maybe write (n=3) and (n=1)

Line 260 – where are the cores located on Figure 2–6. Can you include labeled sample circles?

Line 287 – are these radiocarbon years or calibrated years? Also, need to include the radiocarbon methods earlier in the article. Maybe include a table of the results.

Line 367 – “deep end?” What do you mean here?

Line 370 – What is the importance of 1.2 m? Why is this the depth that many of the measurements are from?

Line 375 – add “that” between established and vegetation, if you want.

Line 378–9 – this sentence reiterates ideas that have already been stated. You could delete.

Line 384 – Just during this period of time (after 2013)? Were active layers deepening before this?

Line 390 – “would increase” instead of increases.

Line 403 – what is “cookie cut”? Please explain.

Line 407–411 – Given the small region of the study and the variability in thaw dynamics across the region, I question whether the authors can constrain the organic carbon pool and potential loss from thawing across all of central Alaska. I think a better way to discuss

this would be to calculate the total thawed permafrost and the organic carbon release from the study sites. They could then discuss how much more yedoma-type permafrost exists in Alaska – eluding to the potential magnitude of permafrost thaw, but not directly calculating it.

Line 439 – does this decrease in elevation refer to all troughs? Is this the average? Was this calculated with LiDAR? Based on Fig. 7, it looks like trough subsidence only occurred near the lake/river – is there spatial variability?

Line 442 – delete comma between May 2020

Line 447 – 108 or 10.8 or 10 8?

Line 487–480 – This sentence is confusing.

Figure 2–6 – the caption references “white line” but there is no white line in the image.

Figure 2–6 – please show core sites

Figure 9 – in caption put space between October 1

Figure 10 – try to make the locations and labels easier to see on the map of Alaska.