

Answer to Editor

Dear Adam Booth,
Dear Sebastian Uhlemann,
Dear anonymous Reviewer 1,

Thank you for taking the time to review our manuscript the second time, and for your positive and constructive feedback. Hereafter you find a detailed response to all the comments of Reviewer #1, the second revision of our manuscript and a version of the manuscript with track highlighted the changes.

We hope that the revised version satisfactorily addresses all concerns and will now be accepted as is. Thank you for your consideration.

Kind regards,
Riccardo Scandroglio
on behalf of all authors

Answer to comments of Reviewer #1:

L69: With regards to comments about the paper's narrative. Maybe you can mention the core question here which the authors have already formulated: can "ERT monitoring yield high-quality quantitative insights into long-term permafrost evolution and effectively track bedrock permafrost degradation across both decadal and seasonal timescales "?

These quantitative insights are divided into four as per the questions highlighted.

Thanks for the suggestion, we added a similar sentence at L69, as suggested.

L118: Have you been doing this since records began? and why is the ERT availability so good in the last 5 years?

Yes, this procedure has been consistently followed since monitoring began. We attribute the improvement in data quality to the overall reduction in ice content (see Figure S5), which resulted in lower resistivity values (Figure 10) and consequently enabled more reliable ERT measurements.

L153: This is interesting. There are also other options available. A 4D inversion, where all datasets are inverted at the same time. Please see 10.1016/j.jappgeo.2009.03.002 for more details. Also, a windowed 4D inversion strategy could also be of interest for a dataset like yours <https://doi.org/10.3389/feart.2022.983603>. Computational power and speed become less of an issue as years go by.

We thank the reviewer for this insightful comment. We agree that these are promising approaches, and that ongoing advances in computational power and processing speed are making such computationally demanding methods increasingly feasible. However, we believe that implementing these analyses would go beyond the scope of the current

revision. These developments nevertheless make such approaches well worth exploring in future studies.

L164: This is a more fundamental comment. Have you removed outliers like that based on reciprocal errors? It would strengthen your case if you also did an analysis on data sensitivity. Areas with greater sensitivity throughout the timesteps will carry greater confidence.

Thank you again for the very interesting comment. We followed the same procedure as illustrated in Slater et al (2000). Indeed we analysed data sensitivity of different areas to try to localize areas with higher confidence, but could not find any pattern.

L191: Records shown in S5 seem to go until 2021 though.

Thanks, the year has been corrected to 2021.

Figure 5: Why is the 2016, 2017 data so inconsistent with the rest?

In this figure we are using only data from 2019 to calibrate our model since this is the year when the new temperature loggers with higher accuracy were installed (see Table 1). Previous temperature loggers were not providing the required reliability for this calibration, due to poorer accuracy and repeated failure, as explained in L126.

L221: Is this threshold value being used to map which areas are frozen and unfrozen? For example, in the analysis you did in 3.5 on the tomograms. I think it is based on Fig 9 and other mentions in text, but it wasn't very clear to me up to this point.

Yes, as stated in the colorbar of Figures 6b and 7c and in the headline of Figure 9.

L249: Space after "of".

Thanks, it has been added.

Figure 10: You could also add the median and quartiles to the violin plots.

We added the median and the quantiles to the viol plots..

L331: Who is they?

Thanks, it has been corrected to "he" (Krautblatter, 2009).

L386: Could you define warm permafrost?

We removed "warm", since this could be misleading and it is not required for the meaning of the sentence.

L449: "compound the thermal"

Thanks, it has been corrected.