

Dear Professor Hördt

we appreciate your positive feedback regarding our manuscript titled "Short-term cooling, drying, and deceleration of an ice-rich rock glacier (egusphere-2024-269)" and thank you for your community comment. We will not provide a point-by-point response to your comments, but we will provide general responses below (our responses are denoted in blue). One of the two reviewers already raised some of your suggestions, and we have included them in our revised manuscript.

With kind regards,

Alex Bast, Marcia Phillips and Robert Kenner

Community Comment for Manuscript Number egusphere-2024-269

## **Short-term cooling, drying and deceleration of an ice-rich rock glacier**

*Bast et al.*

This is a nice case study with a comprehensive characterisation of a rock glacier using a novel combination of methods. I find the results significant and useful. The material fits into the scope of the special issue and clearly deserves to be published.

Most of the results are clearly presented. In particular, I like detailed figure captions.

I have no issues with the analysis and interpretation of the data, but I believe the discussion and presentation of the results could be improved. Since this is a highly interdisciplinary subject, special efforts should be made to make sure that readers from all disciplines can follow. This includes explaining a little more than one normally would do, avoiding slang, and using precise wording and definitions. I have marked some sections that might be improved in this respect.

Thank you for your positive statement, your agreement with the interpretation and analysis of the data, and your assessment of the potential for publication. We followed most of your comments and included them in the text. This includes a clearer formulation of the abstract, the site description, and particularly the section on cross-borehole electrical resistivity tomography (chapter 2.4). We refer to the original publications for details, particularly within the methods section. Since we use a combination of mostly novel techniques for permafrost environments, we try to give enough detail to ensure the text is clear, detailed and short enough for a scientific publication. To our knowledge, the manuscript does not contain any slang.

I do not see the usefulness of figure 8, and suggest to remove it or replace it. In the current version, it is overloaded, and it is not clear which conclusions may be drawn from it that can not be made from other figures. For example, the resistivity images nicely show increase and decrease over the season, including spatial variations. By calculating an average over the entire volume, the information is being blurred. I suggest to re-think which message should be conveyed by the figure and redesign it correspondingly, or to remove it altogether.

Figure 8 summarizes the distribution and change of the variables ground temperature, piezometric pressure and resistivity over time and includes the robust statistical tests, which are highlighted and interpreted in the Discussion (L378-380) and Conclusions (L418-420). The figure and associated

statistical tests show the importance of the late winter and spring months for rock glacier subsurface properties and, according to our interpretation, for rock glacier kinematics. Further, the plot shows the density distributions of the underlying sample and highlights the statistical key figures using traditional box plots, avoiding “blurring” and the pure presentation of classic descriptive figures such as arithmetic mean and standard deviation. We therefore consider this figure to be relevant and important. This is in line with Reviewer 2, who pointed out the added value of robust statistical data analysis.

I also have an issue with terminology; there seems to be confusion or imprecise usage of the term “active layer” and parameters related to it. The active layer is the layer below the surface that reaches temperatures above zero at least once during a season. It follows that the active layer thickness is the maximum depth of the thawed layer during a season. Therefore, the ALT cannot be measured at one point in time, and it cannot vary over a time scale of only one month or a few days. I recommend to be precise with terminology to avoid confusion for readers from other disciplines.

With regard to the term *active layer*, we refer to the uppermost part of the ground that thaws and refreezes on a seasonal basis. In our manuscript, we used the term *active layer thickness* (ALT), i.e. the maximum depth to which the 0°C isotherm penetrates in summer/autumn, where we explicitly wanted to refer to this state of the ground (we know the ALT from our presented data). However, for clarity, we have reformulated the caption of Fig. 5, stating that the white dashed line shows the *depth of thaw*.

I also recommend to consider this additional reference, a study with similar goals, but a slightly different combination of methods and a different region.

Buckel, J., Reinosch, E., Voigtländer, A., Dietze, M., Bücken, M., Krebs, N., Schroeckh, R., Mäusbacher, R., Hördt, A. 2022. Rock Glacier Characteristics Under Semiarid Climate Conditions in the Western Nyainqêntanglha Range, Tibetan Plateau. *Journal of Geophysical Research: Earth Surface*, 127, e2021JF006256. DOI: 10.5194/tc-15-149-2021.