

Anonymous Referee #1

Referee comment on "Characteristics and evolution of bedrock permafrost in the Sisimiut mountain area, West Greenland" by Marco Marcer et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-189-RC1>, 2022

The manuscript "Characteristics and evolution of bedrock permafrost in the Sisimiut mountain area, West Greenland" presents an efficient approach for the modeling of bedrock permafrost in Greenland. Aiming at the prediction of the bedrock permafrost evolution the study considers two different regional carbon pathway scenarios to model the permafrost distribution at the end of the 21st century. Accordingly, this manuscript addresses a topic that has so far been underrepresented in the existing literature, and thus is particularly relevant for readers of The Cryosphere. The abstract of the manuscript is well-written arousing the interest of the reader by providing a concise yet complete overview of the study. Unfortunately, in its current version the manuscript itself fails to meet the expectations raised by the abstract. While the introduction is also of good quality (objective/aim of the study are nicely described) the following sections do not adequately present the otherwise great outcome of this study.

We thank the reviewer for this detailed feedback that will help us improve the text. We are also glad that the reviewer values the topic we chose for our study, and most of the concerns regard the text rather than the essence of the study. In this document, the reviewer can find the answers to the main points, while we reply to the notes in the annex directly in the supplementary file.

In particular, my main points of concern are:

**Structure** The manuscript lacks a clear structure, which also affects the adequate separation of the (content in the) different sections. In particular, the authors could consider merging the Results and Discussion sections, which would allow for a more concise presentation of this really interesting study.

We agree that current structure of the manuscript does not meet the requirements for scientific publication. We thank the reviewer for the great effort in commenting the text, pointing out where structure could be improved. In particular, we observe several paragraphs in the discussion that should be moved either to the introduction or to the conclusion. This concern is also shared by reviewer #2. Thanks to these comments, we now see how the discussion can be improved. As direct response to this comment, we would like to keep a Results and Discussion split, in favor of a traditional writing style. We believe that, by removing the aforementioned paragraphs from the Discussion, will make it more concise.

**Figures** In general, the figures are of good quality and nicely prepared, i.e., by just looking at the figures the potential of the study is evident. However, not all figures are correctly referenced in the text. Moreover, the figure contents are not properly described/discussed in the text with some sub figures not being addressed at all.

We agree with the comment; we apologize for the incorrect referencing of figure in the text and we thank the reviewer for pointing out the error. We put a great effort on the visual presentation of the study and we should value the figures by addressing them thoroughly in the text.

**Tables** In general, the structure of the tables is fine; yet, in the text, the authors refer to a Table 3 that is not included in the manuscript.

Thank you for this remarks; this is a bad blunder. Table 3 belongs to an older version of the document, while in this version we write the material's properties are given in the text instead. Also notice, following the instructions from reviewer #2, we improved tables 1 and 2. They can be found in the response to reviewer #2

**Captions** The text of figure and table captions should provide more information so that the reader can easily understand the presented content. In the current version of the manuscript, the captions lack a consistent structure and information content.

This is also a solid point, and we agree with the reviewer. Some figures have indeed an inadequate caption (e.g. figure 9), and we will improve captions in general using a consistent structure.

**Numbers and Units** The authors did not implement the guidelines regarding the correct formatting of numbers and units.

Yes, we overlooked these guidelines, and we will solve the issue upon revision. We thank the reviewer for highlighting with detail in the text where this should be corrected. This is going to make our revision much smoother.

**General** I suggest that the authors consult and implement the manuscript preparation guidelines provided by The Cryosphere to ensure the manuscript meets the formatting requirements as well as general quality standards (especially with respect to sentence/paragraph structure and formulations). Obviously, in the current version, the manuscript does not fulfill standards expected for scientific publications. However, due to the relevance of the presented study for permafrost research in Greenland and taking into account the good quality of the (final) products of the study I suggest that the manuscript should be reconsidered for publication in The Cryosphere after major revisions.

We would like to thank the reviewer for this work; we appreciate the effort to help us improving the text. We agree with the comments proposed and will adapt the text accordingly.

In the supplementary file, I provide detailed comments and suggestions that might help the authors during the revision of the manuscript. The annotations use the following code:

**Highlighted (yellow)** Should be addressed/considered during the revision.

**Highlighted (red)** Needs to be addressed/considered during the revision.

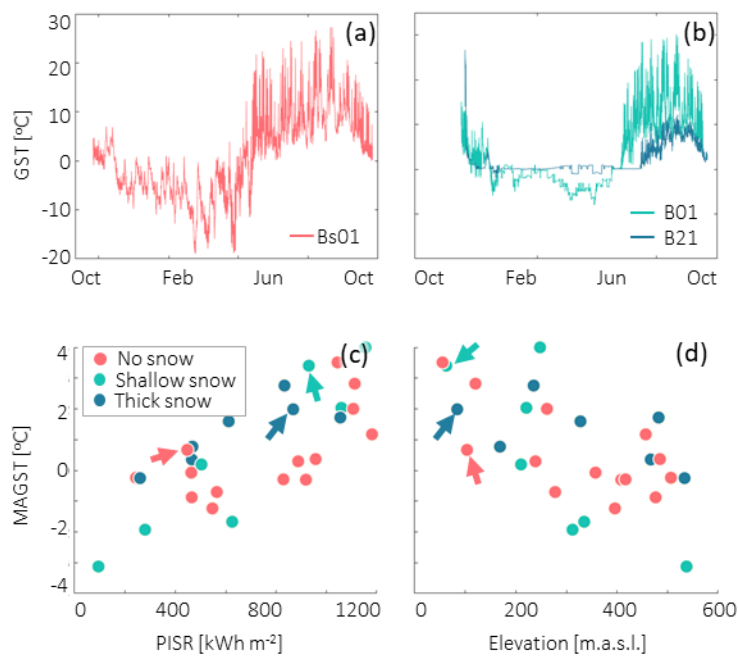
**Strike-through (red)** Remove.

**Underline (red)** Indicates repeated words in single sentences.

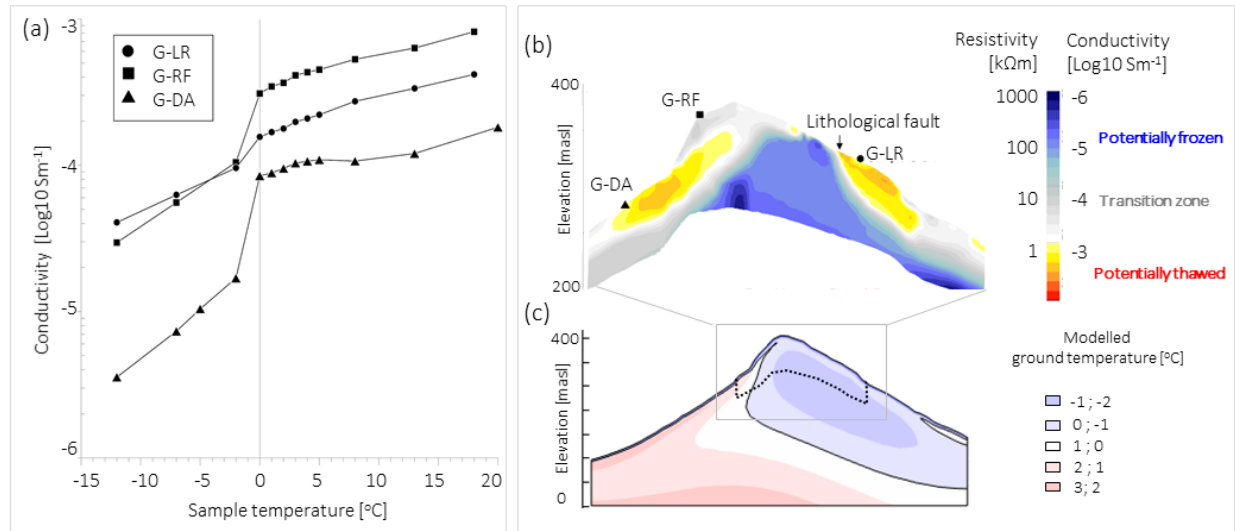
Please find responses directly in the annex. Many thanks to the reviewer for the high level of detail in improving the text structure and wording.

In addition, according to the comments of reviewer#2, we have updated some figures:

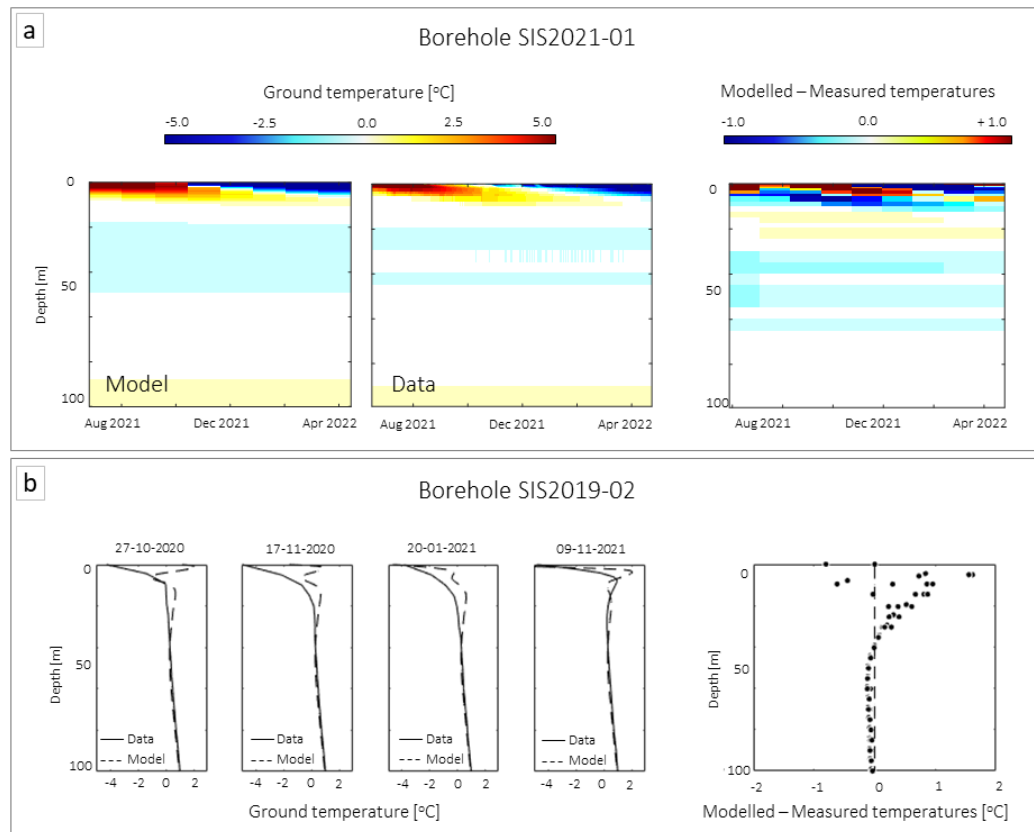
Updated figure 3



Updated figure 4



Updated figure 6



Finally, we propose a major revision at L137, concerning the petrophysical analysis. In order to clarify the evolution of temperatures below  $-10^{\circ}\text{C}$ , we re-saturated the samples and measured their electrical conductivity as a function of temperature in a thermostat bath. This protocol has been used in previous studies such as Coperey et al. 2019 (<https://doi.org/10.1029/2018JB017015>). We chose to redo these measurements because the measurements in the

first version were done randomly between  $-8$  and  $+10^{\circ}\text{C}$ . The temperature was not controlled and stagnated during the measurement, which led to an error. For these reasons, we chose to perform these measurements with a thermostat bath in order to control the temperature of the bath as well as the sample. We also extended the temperature range from  $-15$  to  $+15^{\circ}\text{C}$  and double checked that the sample temperature was at equilibrium before each measurement. The results of the measurements are more precise and very similar as they are within the same range of values.