It is my pleasure to review the manuscript " Characterizing ground ice content and origin to better understand the seasonal surface dynamics of the Gruben rock glacier and the adjacent Gruben debris-covered glacier (southern Swiss Alps)" I appreciate the effort put into characterizing the subsurface of the Gruben rock glacier and its adjacent complex contact zone using a petrophysical joint inversion (PJI) scheme, incorporating both electrical resistivity tomography (ERT) and refraction seismic tomography (RST) data. This study is indeed novel, particularly in its ability to differentiate between the rock glacier and the complex zone, with the integration of remote sensing and in situ data adding significant value. However, the manuscript needed much more clarity on the interaction between ice-free and ice-filled areas, particularly concerning the dynamics of creep within these zones. Understanding how these different ice conditions influence creep behaviour is crucial for interpreting the glacier's overall dynamics and stability. With some minor changes I recommend it for publication.

Introduction

I suggest the authors improve the literature review of the introduction by including studies on permafrost and rock glaciers in the other high latitude and high-altitude regions. This will give readers a broader understanding of how these features behave in different environments. In addition, please mention how your studies are helping to know the geohazards dur to permafrost thaw in the region. The authors have done an excellent job by combining GNSS, UAV surveys, and continuous dGNSS time series to analyse the surface dynamics of complex periglacial landforms. This multi-method approach is well appreciated. However, it will further enhance the study if the authors also discuss how these methods contribute to understanding geohazards related to permafrost thaw, such as slope instability or ground subsidence. Adding this aspect will highlight the practical implications of the research and its importance in assessing regional risks.

Study area

The authors have provided detailed information on the study site, including average surface velocity and elevation changes of the glacier, which is highly informative. However, to further enhance the analysis, I recommend adding data on the gradient and aspect of the glacier. This would help in better understanding the factors influencing the high creep movement observed in the glacier and provide a more comprehensive view of its dynamics.

Methods

- ERT is considered a reliable and well-established method for assessing subsurface properties in permafrost regions, particularly when integrated with other geophysical techniques. However, its accuracy has been questioned in certain studies, eg. Herring et al., 2023. These studies highlight that while ERT can provide valuable insights, its effectiveness may be limited in areas with complex subsurface conditions or high salinity, which can reduce the contrast between frozen and unfrozen ground. Therefore, it is essential to consider the limitations and uncertainties associated with ERT when interpreting permafrost data, and where possible, complement it with other methods to improve accuracy.

- The authors have shared velocity estimates from the dGNSS survey over both annual and intra-annual scales, which is helpful. However, it would improve the understanding if they also included the average temperature and precipitation during this period. This would give readers a clearer idea of how weather conditions, like temperature and rainfall, affect the glacier's creep movements in the region. Additionally, it's unclear how the intra-annual and bi-annual studies differ since both seem to cover the same period. Clarifying the specific timeframes and how they are analysed would help readers understand the differences between these studies and their impact on assessing glacier movement.

Results

- In Figure 6, the flow fields of the Gruben rock glacier are presented along with various topographic details. While the authors note that the flow field is "considerably more complex," it would be helpful to include the gradient of the glacier for additional context. Providing this information would offer a clearer understanding of the factors influencing the glacier's flow dynamics and enhance the overall interpretation of the flow field data.

- Authors have mentioned “The upslope and downslope sections of the debris-covered glacier tongue”. It would be helpful to specify the elevation range for the uppermost and lowermost sections of the glacier tongue according to their definitions.

- In line 449-450, authors mentioned that “The reactivity of surface displacements to the thermal state of the ground surface can likely be attributed to the presence of embedded surface ice buried under a relatively shallow layer of debris” is not clear. please elaborate it.

- The authors mention that "peak velocities are reached in early summer." It would be useful to confirm whether this period corresponds to the maximum temperatures reported in the region. Providing this information would help link the observed peak velocities with temperature patterns.

Discussion

The session is well-written, but it would be beneficial to include a brief overview of the geology and geomorphology, particularly concerning the development of the moraine patterns of the glacier in this part, *5.3 Internal structure and surface dynamics of the Gruben rock glacier and complex contact zone*.

Figures

Figure 1: The greyish labels (e.g. . topographical rupture) are masked due to the label colour. I suggest you use a different colour that is visible. What is 1850 and ~ 1600 in the legend. Are they years? Also could be better to use lat long in decimal degrees for axis grids.

Figure 2: panel a, put the legend on the right side so that it doesn't cover the data line. Panel b, change the colour or increase the colour brightness for the trend line.

Table 1 and 4: Use the variable names for the parameter column instead of symbols

Table 2 is incomplete? Especially the first four columns?

Figure 5 and 12: the x and y axis ranges need to be increased and rescaled. Also what is the x axis label?

Figure 7 is brilliant. What is LoD?

Figure 9: the colour of raw data points (now in light grey) needs to be changed. I understand your focus is only on the running mean but raw data also needs to be emphasized.