general comments

This manuscript presents the use of an A-ERT system at the alpine site AdM in France. Calibration in the laboratory, a petrophysical model and borehole data are supporting the interpretation of results.

Originality (novelty): 4

Despite the study presents an interesting application of A-ERT, this is not a novelty, since it has already been applied at other sites many years ago (e.g. Keusching et al, 2015). Due to the big measuring gaps and the authors' choice to show only a selection of results, the outcomes presented and the conclusions that are obtained here are not different from any other permafrost monitoring study.

The concepts and methods used here are state-of-the-art methods in permafrost research (see Herring et al. 2023). There is no originality and novelty in the suggested data analysis and in the offered outcomes, especially due to an overall insufficient graphical presentation.

Scientific quality (rigour): 4

The purposes of the work are clearly articulated.
The methodology to achieve these purposes is insufficient. Example 1: The potential of A-ERT in high alpine environments is not properly evaluated with statistics in the results section. What you expect to be the core topic point of the paper (give the title) becomes just a secondary theme just mentioned in the methods. Example 2: The accuracy of temperature derived from resistivity is reported as a single number without graphical or numerical proof.
Many theses are presented in the results and discussion section without being compellingly underpinned by the evidence. One important example is chapter 6.3 "Hydrogeological dynamics", which is only based on the interpretation of tomographies of the authors without any proof Let me know if there is anything else I can help you with. measure of water presence.

As far as I can evaluate, measuring methods and techniques are valid and suitable.
Information on the data processing and the inversion process is incomplete (e.g. what are the parameters used for measuring, filtering, and inverting the data?), therefore it is not possible to fully evaluate this aspect. Methods for analytical and graphical presentation of results are inadequate, from the choice of words, to layout of all the graphs, and do not reach scientific standards. One of the main suggested outcomes, the use of resistivities to obtain temperatures, is not working in winter.

Presentation of results is faulty: some analyses are incomplete since they only describe one part of the results, not the entire situation. Some methods are presented in the result part, half of the discussion is occupied by results that should be moved to the appropriate section. This shows that the authors don't have a clear overview of the structure of their own article. Very few related works are mentioned to discuss the results.

Significance (impact): 4

This manuscript is not contributing to changing our scientific understanding of a subject substantially and does not introduce new practical applications of broad relevance. This article definitely doesn't represent substantial progress beyond current scientific knowledge.

Presentation quality: 4

Very low quality of results presentation. E.G. *"resistivity decreased over time… indicating degradation of the permafrost. However, this decrease in resistivity is minor because the observation period is short."* –> Two imprecise statements, of which the second actually contradicts the first. Impossible to read.

The presentation of results requires a lot of improvement. Many sentences are not clear and concise, and the structure of the text needs profound improvements. The English language is just ok. The terminology is often very general and vague, presenting facts only on a qualitative level and missing quantifying differences and changes. The number of figures is acceptable, but the content and the layout of the figures are unsatisfactory.

Conclusion:

To be honest and straightforward, this text has the level of an average master's thesis - not even the best one. Given the list of experienced authors of this paper, it is actually a bit disrespectful to see work with this scarce quality that is proposed to this journal. An internal review process and much work could have made this draft acceptable, but in this condition, in my opinion, this work should be rejected. Profound improvements in all chapters are required; much more data and detailed analysis are expected to properly evidence rockwall permafrost dynamics by A-ERT.

I am sure the ERTs collected at the AdM are incredibly precious and worth publishing. Therefore, I suggest that the authors strongly review the paper internally and resubmit the manuscript.

specific comments

Note of the reviewer: The line number (L) refers to the sentence starting in that line, unless otherwise specified.

ABSTRACT

Missing quantitative information on PF dynamics

L38: "slight decrease" … quantify.

L39: Open system / closed system – clarify or remove

L46: IP measurements are not at all part of this work. Why is it in the abstract? Remove.

INTRODUCTION

Your introduction is missing a story and a flow. It sounds more like many pieces glued together. Some quotations are not precise. Please improve the general flow and be precise.

L51: accelerates? This is not stated in the source you cite. This sentence supposes that without climate change PF degradation would be less….

L63: further references?

L69-84: why are you citing all these methods?

L85: "LAST FEW years"? last 2 decades!

L95: REFERENCE Please cite the first article using this methodology, not the last: someone did that more than a decade before. Substitute this reference with more appropriate works.

L107: "directly related" CITE SOURCE. There are many other possible interpretations of TL differences, in addition to thermal or hydrological changes… mention and cite.

L109: Which definition of "high altitudes" are you using? Is it your or is it standard? Please cite why mountains at 3000 are not high altitudes. There are plenty of studies at these altitudes.

L110: What are the challenges? Are there other articles with these challenges or are you the first facing these problems?

L111: "However, it could provide valuable information about the evolution of permafrost." Unnecessary sentence, remove. Even before reading your article, I can tell you will get valuable information.

L124: You use only one borehole in this article. That the others are there is only partially important.

STUDY SITE

This introduction to the study site is poor. You include secondary information but forget important points: what previous permafrost/cryo-research (only Magnin 2025 and 2015?). No other studies here? What about rock stability? Are there known/visible/investigated effects? Add some information on the region's climatology (precipitation amount and type, snow cover, etc..)

L 127: remove "iconic"

L129-135: Rephrase, shorten, keep only the important information, and remove what is superficial (e.g. "Panoramic Mont-Blanc")

Fig. 1– A: You use areal images with some MARST superimposed. These are impossible to read, both the aerial images and the temperatures. Please replace with proper maps at the right scale to see the right location.
D: I think it would be better to have snow cover images from all sides to evaluate snow accumulation. Replace the image if possible.

FIG2 – Please plot a longer time series. Permafrost dynamics often present a delayed response to thermal signals (e.g., as shown in Hauck und Hilblich, 2024). 10 years minimum; the longer, the better.
What is the difference between your temperature and the climatic average (30-year reference period)?

L137: "tend to be steep" - Replace with some measures, like average steepness in degrees!
"in places" -> partially

L143 move reference to Fig 1 at the end of the sentence here.

L144: "were" -> was

Fig4: y-Axis label is not English

L150: ALT – remove the explanation after "i.e.", it is not necessary in this context.

L153: "all along the year" – remove. Otherwise, it would not be permafrost.

"see details in" – remove

L163-166: Avoid boring repetitions in text. Rephrase

METHODS

Are some of these methods take form from other previous studies? If so, please cite them.

L201: What is the size of the sample?

L211: Ok the frequency, what about the other setting used for measuring in the lab? Current injected? Electrode resistance? Stacks? Error limit? Reciprocal measurements? The same for field measurements. Please add all the ABEM setting used for measurements, I suggest in tabular form.

L219: Move the measure of porosity at the beginning of the chapter, where you present the sample.

L236: "The installation of cable was gradual from June 2020 to March 2021."

L241: "specially designed jumper" - Designed for this study or before? It would be good to provide an image of the field set-up: electrodes, jumper, anchors.

L241: "The electrodes remained embedded in the rock wall for all subsequent resistivity measurements." That's pretty obvious if you use climbing bolts. Remove.

L250: "Configuration" -> array. Your explanation of the Wenner array is approximate and insufficient. I think there is no need to explain it in this context. Therefore, I suggest removing the content of the brackets.

L261: What about the third profile? Add the information at least to supplementary material, even if incomplete.

L265: When exactly was it damaged by lightning? No useful data?

L268: One comma too much after the point.

L269: Either you list the several reasons or you rephrase the sentence.

L270: How many datasets?

Figure 4: Please add more information on the reason for gaps: what happened in October 2021, summer 22, winter 2022-23, and spring 2023? Improve caption (are data missing ONLY due to cable defects?)

I suggest adding a table/list of the issues that you experienced. This is a very interesting "learning lesson" for the bedrock permafrost community.
Please also comment in detail on software issues …you just mention it shortly.
I would also suggest adding some statistics on the efficiency of the A-ERT in the results and talk about possible improvements in the discussion part.

Please mention if you used reciprocal measurements and if not, why.

DATA PROCESSING
L284: "We tolerated…pseudo-section." – Repetitions, rephrase in a clearer way.

L288: How did you detect the outliers? Please be precise.

L289: The fact that most datasets have more than 80% of the data is because of your previous selection (up to 4 unconnected electrodes). Rephrase for clarity.
Do you also happen to have 100% data? Interesting that this is never the case in the data you selected. Or you don't reach that because of the outliers? In that case, I'm very curious about the outlier selection.

L291: Table 1 is a bit of a waste of space since it represents only a few measurements. I would move it to supporting material. The space could contain much more information… Use this space (almost a whole page) to present statistics about all the measurements you did. Your novelty is the A-ERT, here you have the chance to show numbers about all the data measured and you should use it. What is the overall reliability of this system? Is this changing from summer to winter? Further statistics should be addressed and presented with graphs or tables.

L293: "*The Data corresponds to the data of the data acquisition.*" Is this a joke??? Rephrase.

L299: "The topography is characterized…" This sentence goes in the study site section, not here. The problem is not the steep topography since you measure perpendicular, but the changes of direction when you unite more transects!

Actually, the software you use for the inversion can deal very well with steep topography.

L303: package -> library
Please also present the parameters of the inversion in a table.

L306: A linear error model is always defined by two parameters. Do you neglect the absolute error? The relative error seems to be in a realistic range, but on which base did you choose it? References? Have you conducted a sensitivity analysis on the data to check the influence of the selected error model?

L310: You are interpreting the data. Therefore, I would rename the chapter "results and interpretation."

L 311 raw data – before filter?

L314: How did you compute the apparent resistivities? Please add at least one sentence on how this information is obtained.

L315: (i.e. …) remove text in brackets, is a repetition.

Fig 5: I find it very hard to read this figure. I think the graph style (thin bars) and the overall layout do not clearly express your message. You should guide and facilitate your reader in the interpretation of the data in the figure. Consider reviewing the layout. I would use lines instead of bars and superimpose a grid on all graphs. Add labels for summer/ winter to facilitate understanding. Consider differentiating between years by using improved color schemes … there is a lot that can be done. I would also consider a logarithmic y-axis, which is typical in resistivity graphs.

L320: the "*high values near the surface*" are only for 3 out of 5 datasets. Why? What is happening to "*the fractured area filled with air*" in 2020, August and September?

L324: What is your interpretation of the different values for the NW profile in May 2022? And for the S profile in April 2021?

L327: "various" -> substitute with "selected". How did you select these quadrupoles out of the 155 of your profile? Why these quadrupoles and not others?

Fig6: Add grid. Why are you plotting only a selection of your data? I don't see the reason in this Figure. I understand you cannot show a tomogram for each day of measurement, but this simple graph can host all measured values. I expect the authors to improve the Figure, adding all available measurements for the 8 selected quadrupoles. Otherwise, the advantages of the A-ERT are lost, and your study is comparable to that of permafrost campaigns with single repetitions.
Consider also reporting the theoretical depth-of-investigation (DOI) for each quadrupole. This is more interesting than the electrode numbers.

L331: *"Furthermore, the seasonal variation of apparent resistivity is more pronounced for shallow data."* True for the NW profile, but it seems that in the S profile, this is not the case. In fact, green line (DOI = 3) and the red line (DOI = 10) behave parallel – apart from April/Mai 2022.

Fig7. Which additional knowledge is the insert adding to the whole picture? Actually, you are plotting twice the same information. I don't see the point in doing it and would remove it.
Further on, why are P1 and P4 perpendicular to the surface while P2 and P3 are not?
Did you filter this image for outliers? What is the low resistivity point in the middle of the S profile?

L351-355: I can accept the names "warm-colored", "cold-colors", "moderate resistivity", etc… but the whole concept behind this sentence it too general and undefined. Please be precise by numerically defining (if needed, also with a range of errors) your resistivity limits for frozen and unfrozen part, as well as the active layer. This should be also clearly visible in the color bar of your images.

L356: do S and NW walls have the same aspect? What do you mean here by aspect? Please explain why the resistivity values are "expected" to be the same on two opposite faces of the mountain – this is new to me.

L369: *"This variation is attributed to heat transfer, particularly in areas close to the sun-exposed face."* please explain better this concept, why?

Fig8: add antropogenic installation and electrode numbers.

L382: How can you differentiate at this stage whether the high resistivities are due to dry layers or to permafrost?? Or maybe just to less fractured bedrock?

L 386 *"On the other hand…"* move this whole sentence to methods. Here it´s not the right place.
Also the sentence at L394 "T*he last 10 electrodes…*" should be moved to methods.

Fig 9: Hard to read the date. Improve. Why don't you show 25-09-2021?

Fig 10: sometimes 1 month in between, sometimes 7 months. You are comparing different entities in the same graph.

L404: Mot true, I see relevant differences also in the PF area. How did you quantify "the most significant variations "??

L407: *"A more prominent cool-colored zone (more permafrost).."* This sentence and all the other similar ones in this text would have been acceptable 2 decades ago, at the beginning of ERT research. Nowadays, it is required to quantify changes and be more precise.

L410: This is a thesis. demonstrate it. Limit yourself to your results, no citations in the result part.

L424: This sentence is obvious. Remove.

Fig. 11: The plot order of tomograms is not helping the reader to understand PF dynamics.

L454: This sentence is not true.

L465: when do you have snowmelt in this area? provide data or cite literature

L 458: All teories, but you need to prove it.

L469: Is water infiltration the only explanation you have for these processes?

L509: ok, you are using inverted resistivities, but I find it very hazardous to analyze these values at this detail (0.5m resolution). These are interpolated values from an inversion model ... there are many uncertainties you are not considering. Your measuring resolution is much higher.

L540: Which are "the other parameters" you are mentioning? Which parameters are you using in the petrophysical model? Are they constant along the transect?

L544: The only quantitative result of the whole paper cannot be validated because your graphs don't have the proper scale… improve!

L546: Calibration is not working for cold temperatures!

L550: *"The estimated temperature presented in Figures 14 indicate that the proposed model (Equation 2) can accurately reproduce the temperature"*
This is not the aim of the paper, since this model (equation 2) has been proven already in other articles. Remove. I also don't agree with the use of accurate, since you don't show any measure of this. The graphs have a range of +/- 10 °C and it is not possible to compare precisely the results.

L552: How would you adjust inversion parameters? According to measured temperatures? Random coment not Doing so, you would calibrate the resistivity values with the same temperatures you use to validate.

L556: "However…" Here again, you contradict your previous sentence. Is the model working here or not?

L557: What does it mean that the infrastructure creates a "conductive zone"? For temperature or for resistivity? How did you evaluate this effect? Could you measure it and prove it? or is this just an assumption you are making?

Figure 14: Not possible to evaluate the error with this visualization. How do you explain the differences in Figure d) at 10 m depth?

Figure 15: Also here, again, you are poorly using the visualization possibilities of a figure. There is no effort in helping the reader to understand your messages. Grid, zoom, colors, and much more can be really improved.

L585: "smaller dispositive" – Wrong terminology: what do you mean?

L586: "Clarity" – Wrong terminology: choose a proper word. – Poor discussion style: Many hypotheses are without references and without a real explanation. – When are you varying pore size?

L601: "we did observe several instances that could be classified as evidence of water flux" there is really no evidence for it. This is one possible explanation but you need to prove that. Because the

other researchers are working on this topic, it doesn't mean that you can also just make out water in your ERTs without justifying it. For example, show us measurements of rain events or snow-melt rates in the periods of interest.

L607: "Near-surface desaturation" – this could be measured in the field to prove your theory.

L618: To be honest, you cannot say much about climatic variations with 3 years of data…

L620: "*That the temperature-dependency of resistivity in field conditions is less pronounced than in controlled laboratory settings.*"
I think this is a dangerous statement, which is not properly based on evidence from your study. The provided data are too little and the analysis conducted not sufficient. Probably you are just comparing two different things: one single sample in the lab and many different samples in the field, with conditions that change in space – heterogeneity, as you say. Of course in the field you have more variables, but this doesn't mean that "the temperature-resistivity dependency is less pronounced". With some effort you could probably reproduce all field conditions in the lab….

L628: "*we were able to characterize the active layer and identify significant seasonal and multiannual changes in permafrost dynamics. Importantly, we observed that the ALT varied significantly from one face to another*" - What is your innovation? This knowledge is state-of-the-art since almost 20 years in permafrost research.

L631: "climate signal" - the choice of this word is unjustified and misleading in this short-term study. No data presented here has the appropriate scale for climate analysis.

L636: Your "*assessment of the hydrogeological system*" is absent and your hypothesis on these fluxes lacks complete proofs that demonstrate the presence of water.