

Reply point by point

- **General Comments:** the authors have conducted a novel infiltration experiment in a rock glacier that was monitored using a time-lapse ERT method. Results indicated that the underlying frozen layer was impermeable to the infiltrated water, which confirmed previous assumptions only determined from geochemical analysis in spring waters downslope. A weakness of the manuscript is the lack of quantitative analysis beyond the subsurface imagery and the lack of ground truthing data to support the geophysical interpretation. Overall, the manuscript was well written and presented and clearly defined objectives and results. I found the experimental method and application interesting and applicable to a wide range of cryo-hydrogeologic settings and of interest to the wider scientific community.

Reply: We thank the anonymous Reviewer for the comment. Quantitative analysis regarding hydraulic conductivity just via time-lapse ERT is very challenging. First of all, as we pointed out in the manuscript, it is well known that mountain permafrost subsoil is very heterogeneous both vertically and laterally, and this is clear also from our results (see discussion and conclusions chapter). This makes very hard to assess representative hydraulic properties for the entire domain. Furthermore, due to logistical problems (adverse weather, very common in those high mountain environments), we could not extend for more time the experiment and this way to measure when the subsoil conditions were back similar to those pre-injection. With that kind of measurement, it would be possible to define the time it takes for the injected salt water to leave the monitored subsoil area, and consequently to define an average hydraulic conductivity in the active layer where the flow mainly occurred, as we did in discussion.

- **Specific Comments:** my main criticism is the lack of quantitative analysis from the experiment. From some assumptions of hydraulic gradient based on slope and a range of porosities, could an approximate hydraulic conductivity be derived from the results? Alternatively, could you report transit times/velocities of the leading edge of the salt plume?

Reply: the experiment has been performed to verify the low permeability of a permafrost layer and to demonstrate that is really acting as an aquiclude/aquitard in a rock glacier system, for the first time with a geophysical method in rock glaciers environments, a very challenging condition for this kind of experiment. The aim of our brief communication is to show to the permafrost community that ERT time lapse surveys, historically performed in other and easier environments, can be also applied with success in a rock glacier site. More advanced analyzes regarding the hydraulic conductivity of the layers that compose the frozen subsoil are more suited for a complete paper, with no limitations regarding the text and images/tables (as we have in a brief communication). Nevertheless, in the next future, our goal is to further investigate these datasets, perform new ERT infiltration experiments integrated to other common hydraulic tracer test, and this way define a suitable strategy to estimate the hydraulic conductivities in these environments.

- **Specific Comments:** Another point of note is that while the infiltrating water did not appear to infiltrate through the frozen layer, this layer was not continuous. Is it expected that in active rock glaciers, this would be the case? If this layer is not continuous, its permeability is less important in the context of deep infiltration and recharge.

Reply: The anonymous Reviewer is right. As we highlighted in the site description chapter, the Sadole rock glacier is not active but inactive. From several ERT surveys performed in summer 2021, we defined a discontinuous frozen layer at a depth of about 10 meters in the area where we performed the infiltration experiment in summer 2022. The survey line for the infiltration experiment has been settled specifically to detect how the injected water flows in the area where the frozen layer is present and how it flows where the frozen layer ends. This allowed us to define a main downstream subsurface flow in the area where the frozen layer is present, while a predominantly vertical infiltration flow when the frozen layer ends. Next target is to perform an ERT time lapse infiltration experiment in another site hosting active rock glacier with a continuous frozen layer.

- **Specific Comments:** line 14, Suggest adding the 800L instead of “huge amount”. Everyone’s interpretation of huge will be different.

Reply: Thank for the comment, we will do it.

- **Specific Comments:** line 147-148, what timeframe are you referring to? No change during the experiment or following longer-term monitoring afterwards? The distance between the injection point and spring appears to be several hundred meters based on Figure 1c. I am doubtful there would be a detectable change in conductivity by the time the tracer reached the spring, regardless of the low permeability frozen layer

Reply: The spring is a source of drinking water used by the local community, therefore it is continuously monitored by the competent authorities. As you correctly stated, no changes in water salinity of the spring were visible during the weeks following our experiment.

- **Specific Comments:** figure 3, Suggest adding the injection location to the plot(s).

Reply: Yes, very good suggestion, we will add the injection point in the plots.

- **Specific Comments:** line 30, “acquirer’s” should be “aquifer’s”

Reply: Yes, we will correct it.