EGUsphere, referee comment RC1
https://doi.org/10.5194/egusphere-2022-860-RC1, 2022

Comment on egusphere-2022-860

Anonymous Referee #1

Referee comment on "Brief communication: Mountain permafrost acts as an aquitard during an infiltration experiment monitored with electrical resistivity tomography time-lapse measurements" by Mirko Pavoni et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-860-RC1, 2022

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.

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?

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, it’s permeability is less important in the context of deep infiltration and recharge.

Line 14: Suggest adding the 800L instead of “huge amount”. Everyone’s interpretation of

huge will be different.

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.

Figure 3: Suggest adding the injection location to the plot(s).

Technical Corrections:

Line 30: “acquirer’s” should be “aquifer’s”