

Paper ‘Water flow timing, quantity and sources in a fractured high mountain permafrost rock wall’ submitted by Ben-Asher et al. (EGUsphere).

Reviewer: Marcia Phillips

Detailed comments:

l. 18: air temperatures (ATs)

l. 18: rock temperatures (not *ground*)

l. 22: flow rates

Key words: water infiltration

Introduction: perhaps you could mention somewhere that water infiltration due to loss of ice plugs is a problem for tourist infrastructures like the AdM, Jungfrauoch or Klein Matterhorn and that the owners have had to install protective roofing in the past decades in the tunnels so the tourists don't get wet (as you use this roofing for your experiment).

l. 34: for an example of water driving a catastrophic failure (Pizzo Cengalo) see Walter et al. 2020 <https://doi.org/10.1016/j.geomorph.2019.106933> The references you use here are more process related and not necessarily linked to rock slope failure events.

l. 37: ... and leads to rock fall...

l. 38: ... may also trigger large rock slope failures by reducing...

l. 39: ... the presence of sealing ice in pores and fractures favors...

l. 42: for another example of thermal perturbations (warming and cooling), see <https://doi.org/10.1016/j.coldregions.2016.02.010> (Phillips et al. 2016)

l. 51: terrain

l. 51 a reference for hydrological studies in rock glaciers (Bast et al. 2024) <https://doi.org/10.5194/tc-18-3141-2024> and in scree slopes (Pellet & Hauck 2017) <https://doi.org/10.5194/hess-21-3199-2017>

l. 62 infiltration of water

l. 72 elevation (not altitude, which is used when flying)

l. 74 showed

l. 79: fracture network

l. 84: describe the seasonal evolution

l. 85 ... the extent of ice filling or plugging and develop...

l. 96: ... the uplift of which... (not whose)

l. 113 and throughout the paper (and in the figures): replace galleries with tunnels

Figure 1: label the different panels of the figure (a,b,c) and refer to the labels in the caption.
Maps provided by the Swiss Federal Office of Topography swisstopo.

l. 121: second warmest years on record.

l. 122 (MAAT)

l. 146 Methods

Figure 3: the top right panel is illegible. What does Location Inf. Elevation refer to and is it needed? What is the pink structure on top (antenna? Building?). Add more information in the figure caption.

l. 157: ... to trace the water source and rate of infiltration... (?)

l. 164: four 4L bottles and six 1.5L bottles to prepare the tracer solutions...

l. 165 ... were inserted...

l. 168-169 label the upper and lower terraces in Figure 1

l. 174 ... to protect them (or insulate them) from direct solar radiation...

Table 1: You are not describing the sensor characteristics but their locations (adapt caption)

l. 178: I suggest you use the method described by Staub & Delaloye 2016

<https://doi.org/10.1002/ppp.1890> rather than Hansen & Hoelzle 2004.

l. 179 snow has melted / is absent (it is not actively removed).

l. 194 submerged/suspended (not plunged)

l. 203 five measurement values were...

l. 206: ... where sediments sometimes accumulated. (Interesting - did you measure the grain sizes of the sediments?)

l. 209 thunderstorm? Was the problem caused by lightning?

Figure 4: label the different panels and remove 'and issues' from Box 2. Complete the caption and refer to the yellow frame too. The purple frame looks pink.

Figure 5: Please label the panels. The shading for water volume is not legible. Consider placing the photographs in a separate figure

l. 280: this is an example of a reference not appearing (Error! Reference source not found)

Figure 6: I can't distinguish between 2022 and 2023 in the flow volume part.

Figure 7: this figure is very important and interesting and quite illegible (much too small)! Label panels, add description to caption.

l. 304: melt of the winter snowpack

l. 318 and 321: you say daily oscillations but refer to hourly values

l. 319: from 20 July to 10 August... (not the). Please use one form of date consistently. Sometimes you use 3rd and 19th (e.g. l. 332).

l. 344 0.8 here and 0.75 in Figure 8. Which is correct?

l. 379-383 this should be moved to the discussion.

l. 390 ... suggesting that much of the winter and spring snow was gone by...

Section 4.4 Some of this should be moved to the discussion.

l. 430: is this brick wall shown anywhere in a figure? Where/what is the Hellbronner terrace?

l. 435: Values measured (not measurements taken)

Figure 10: the figure caption does not mention probability (y axis). Could you show the tunnel air temperature too?

l. 445: strong weather signals (not climate!) ... at both seasonal and...

l.452-453: what about the role of long wave radiation (in the presence of cloud cover)?

l. 472: did you measure the air temperature in the tunnel? Is there an influence from the infrastructure, from the body heat of the tourists or air fluxes from outside/heated buildings?

l. 476: weather (not climate)

l. 483: 'reference source not found', ditto on l. 506, 513

l. 490: could this also be due to the fact that there was very little snow in winter 2021-2022?

l. 499: remove 'from a geomorphological perspective'. It is rather from a geotechnical or cryospheric perspective.

l. 503 remove well-identifying, just use identifying

l. 520: (approx. 3 m apart)

Section 5.3: perhaps you would like to consider the characteristics of the snowpack and the fact that a layer of ice often forms in spring between the snow and the frozen bedrock (see Phillips et al. 2017 <https://doi.org/10.1016/j.coldregions.2017.05.010>), which may affect the timing of water infiltration into the fracture system.

l. 527: remove direct

l. 546: the melting of fossilized ice (not the thawing of fossilized water). Have you considered dating the water?

l. 569: 1950s

l. 592: melting of older ice (ice melts, ground thaws)

l. 594: melting of fossil ice (not water)

l. 601: suggests

I suggest you add an Outlook section with further possible investigations and open questions.

Figures in general: please use the same font in all figures, improve their legibility, label the panels, describe the figure in the caption.

Please have the English checked before you resubmit.