

CC1: ['Comment on egusphere-2024-927'](#), Giacomo Medici, 23 May 2024

General comments

Novel research in the field of hydrology. The manuscript needs some minor corrections that should improve the final version of the manuscript. See below the specific comments.

Author response (AR): We appreciate the positive feedback and the recognition of the novelty of our research. We will address each of the specific comments as detailed below.

Specific comments

Lines 14-68. The link between creep and groundwater flow is an unexplored topic. I would emphasize more this point in your introduction/discussion.

AR: We will include in the introduction and discussion sections a short review of knowledge on the link between rock glacier creep and groundwater flow. However, since it is not the main focus of the manuscript, we will keep the discussion minimal.

Lines 27-28. You mention snowmelt and groundwater flow in the introduction and the conceptual model. Please, expand this point and add recent literature on snowmelt aquifer recharge in mountain ranges that combines isotope analysis and monitoring:

- Lorenzi, V., Banzato, F., Barberio, M. D., Goepfert, N., Goldscheider, N., Gori, F., Lacchini A., Manetta M., Medici G., Rusi S., Petitta, M. 2024. Tracking flowpaths in a complex karst system through tracer test and hydrogeochemical monitoring: Implications for groundwater protection (Gran Sasso, Italy). *Heliyon*, 10(2).

- Stevenazzi, S., Zuffetti, C., Camera, C. A., Lucchelli, A., Beretta, G. P., Bersezio, R., & Masetti, M. (2023). Hydrogeological characteristics and water availability in the mountainous aquifer systems of Italian Central Alps: A regional scale approach. *Journal of Environmental Management*, 340, 117958.

AR: We will expand the discussion on snowmelt and groundwater flow in both the introduction and the conceptual model sections. The references provided will be considered and included if suitable.

Line 68. Disclose the specific objectives of your research by using numbers (e.g., i, ii and iii) at the end of your introduction.

AR: Thanks for this suggestion. We will consider reformatting the introduction to better highlight the specific objectives.

Line 73. "Mostly". Please, specify the other lithologies. Alternatively, you can also fix the issue by deleting the vague term "mostly".

AR: Thanks. We will provide a more exhaustive description of the geology with the other lithologies present in the study area.

Line 77. "fractured aquifer". Insert more detail on the nature of the tectonic structures and joints. Thrusts and folds? Also normal faults? Unclear the nature of the fault zone in the conceptual model.

AR: Thanks for this comment. We agree that some information on the tectonics and nature of the fracture network would strengthen the manuscript. We will include this information in the new manuscript.

Line 280. Specify the area of the French Alps and the lithologies of the fractured bedrock aquifer there. Crystalline basement there?

AR: We will specify the area of the Swiss Alps being referred to and detailed the lithologies of the fractured bedrock aquifer. Basement is indeed not an appropriate term here.

Lines 397-550. Take into account the literature suggested above.

AR: We will consider the references provided and include them if appropriate.

Figures and tables

Figure 2. Insert an approximate spatial scale.

AR: Thanks for spotting this mistake. We will add the appropriate scale to figure 2.

Figure 6a. Do you need to add an equation and parameters (R^2) to the line?

AR: The line represents the local meteoric water line. No need to add an equation here, but we will add the label "LMWL" to the line to avoid any further confusion. Thanks.

Figure 8. Please, add the intermediate months on the horizontal axis.

AR: We will consider this suggestion and include the intermediate months if this does not overload the final figure.

Figure 10. Insert the spatial scale and specify if there is vertical exaggeration.

AR: the conceptual models are not to scale. We will include information in the figure caption to avoid confusion.

Figure 10. Unclear the nature of the fault zone. Normal fault, or thrust with vertical exaggeration? This point is unclear even by reading the text.

AR: We have no clear evidence of the existence and nature of the fault. Since our aim is to show a conceptualisation of the processes, rather than a site conceptual model, we will remove the fault to avoid confusion.

Figure 10 vs. Study Area and instrumentation. You need to provide more detail on the tectonic structures on the paragraph 2 to make clear the final conceptual model.

AR: Additional details on the tectonic structures will be provided in the second paragraph of the study area section.