

## Hidden permafrost-related threats in the Alps: An encompassing view from the past and present of high-altitude lakes in the Ötztaler Alps, Italy

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### Summary

Despite the fact that rock glaciers are one of the most common geomorphological expressions of mountain permafrost, the impacts of their solute discharge on freshwater ecosystems still remain largely obscure. Special emphasis is now placed on problems associated with the interactions between climate change, the thawing permafrost, enhanced solute release, and ecosystem health. Our recent investigations of water bodies in an alpine watershed with sulphide-bearing lithology demonstrated that a moderately active rock glacier may represent a potent source of acid rock drainage that produces acidic, metal-rich solutes (Ilyashuk *et al.*, 2014). This results in enormous concentrations of metals in water, sediment, and biota of a lake downstream. The main objective of the present study is to explore the effects of solute outflow from another active rock glacier on a high-alpine lake within a crystalline-rock watershed in the Ötztaler Alps. Changes in the ecotoxicological state of the lake will be reconstructed over the last 2000 years by means of chironomid analysis of the sediment record obtained from the lake. Special attention will be paid to comparison of the ecotoxicological consequences associated with solute fluxes to high-alpine lakes from rock glaciers of different activity, the moderate active rock glacier (Lake Rasass) vs. the highly active rock glacier (Lake Portles), in the catchments having similar soil conditions and underlying geology. Under continued, if not accelerated, global warming, results of the study are essential to our understanding not only of the past but also of the future permafrost-related threats in alpine ecosystems.



### References

Ilyashuk, B.P., Ilyashuk, E.A., Psenner, R., Tessadri, R., Koinig, K.A. 2014. Rock glacier outflows may adversely affect lakes: lessons from the past and present of two neighboring water bodies in a crystalline-rock watershed. *Environmental Science & Technology* 48: 6192–6200.