BOOK OF ABSTRACTS

José M. Fernández-Fernández · Josep Bonsoms
Julia Garcia-Oteyza · Marc Oliva
Editors

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EDITORS

José M. Fernández-Fernández (Universidad Complutense de Madrid)
Josep Bonsoms (Universitat de Barcelona)
Julia García-Oteyza (Universitat de Barcelona)
Marc Oliva (Universitat de Barcelona)

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Water origin and chemistry of different stream types in three Alpine catchments

Stefano Brighenti (Faculty of Science and Technology - Free University of Bozen/Bolzano), Francesca Bearzot (Faculty of Science and Technology - Free University of Bozen/Bolzano), Matteo Delpero (Faculty of Science and Technology - Free University of Bozen/Bolzano), Monica Tolotti (Research and Innovation Centre, Fondazione Edmund Mach), Maria Cristina Bruno (Research and Innovation Centre, Fondazione Edmund Mach), Leonardo Cerasino (Research and Innovation Centre, Fondazione Edmund Mach), Maria Vittoria Tenci (Research and Innovation Centre, Fondazione Edmund Mach; DICAM, University of Trento), Alfredo Maule (Research and Innovation Centre, Fondazione Edmund Mach), Bertolotti Giulia (Institute for Interdisciplinary Mountain Research, Austrian Academy of Sciences), Andrina Janicke (Institute for Interdisciplinary Mountain Research, Austrian Academy of Sciences), Anna Klara Stang (Institute for Interdisciplinary Mountain Research, Austrian Academy of Sciences), Andrea Fischer (Institute for Interdisciplinary Mountain Research, Austrian Academy of Sciences), Werner Tirler (Eco-Research Srl), Lorenzo Brusetti (Faculty of Science and Technology, Free University of Bozen/Bolzano, Bolzano) and Francesco Comiti (Faculty of Science and Technology - Free University of Bozen/Bolzano).

Abstract

Ongoing climatic changes are rapidly transforming the hydrology of mountain areas, where the fading influence from glaciers and snow is paralleled by an increasing relative contribution from rainfall, groundwater resources and permafrost ice melt. Within the Euregio project "ROCK-ME", we are studying the isotopic and hydrochemical conditions of 15 streams from three catchments of the Eastern European Alps with low (Lazaun, Futschöl) to absent (Madritsch) glacier cover. Based on fortnightly campaigns conducted during summer 2022, we measured concentrations of stable water isotopes (δ^2H, $\delta^{18}O$), major ions and minor/trace elements in streams with different origin (glaciers, intact and relict rock glaciers, moraine slopes, and catchment outlets), rainfall, snowmelt, glacier and rock glacier ice melts. End-member mixing analyses based on δ^2H, d-excess and electrical conductivity allowed us to build up site – specific estimates of the relative contribution to runoff from different water resources. Springs from relict rock glaciers and from moraine slopes, composed of season- and site-specific mixture of snowmelt and rainwater, had very low concentration of heavy metals. Rock glacier ice melt and springs of intact rock glaciers (where the ice melt accounted up to 20 % of discharge during late summer) had high major ions and metals concentrations, with catchment-specific combinations of enriched elements (e.g., Ni, Sr, Ti, Ba, Mn, Y). At Lazaun, high concentrations of major ions, Al, Ni, Zn, Cu, Co, and Mn were also detected in the glacier ice melt and at the glacier outlet during late summer, when discharge was mostly composed of the ice melt component. At all catchments, high concentrations of different heavy metals remained high even at the catchment outlets. Our work confirms the hydrological and chemical significance of rock glaciers in alpine areas, and opens up a new perspective for hydrograph separation in rock glacier springs.