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When snow and ice are gone: beyond hydrological regime changes, what are the nuts and bolts of future streamflow generation processes?

Bettina Schaefli and Natalie Ceperley

Institute of Geography (GIUB) and Oeschger Centre for Climate Change Research (OCCR), University of Bern, Bern, Switzerland (bettina.schaefli@giub.unibe.ch)

After several decades of climate change impact studies on high alpine environments, the hydrological community has come to a good agreement on how cryosphere-dominated streamflow regimes will evolve in the future. And observed streamflow regime trends largely confirm existing predictions for Alpine environments. Many of these predictions are based on models that lack a detailed representation of hydrological processes that occur below the snowpack or the ice-cover; these model focus on the representation of snow accumulation and snow and ice-melt and use simply methods to transform liquid water input into streamflow.

However, the gradual reduction of snow cover duration might significantly affect streamflow generation processes in Alpine environments, e.g. via the evolution of spatial and temporal patterns of groundwater recharge or of hydrologic connectivity and of the related seasonal stream network structure.

In this presentation, we will synthesize what we learned about the interaction of the cryosphere with streamflow generation from our multiyear process studies in two high Alpine catchments in Western Switzerland, the Vallon de Nant and the Otemma glacier catchment. We elaborate perspectives for future field work but also for hydrological model development.