

When snow and ice are disappearing: how will the hydrology of the subsurface change?

Bettina Schaefli¹

¹Institute of Geography (GIUB) and Oeschger Centre for Climate Change Research (OCCR), University of Bern, Bern, Switzerland

Abstract.

Several decades of climate change studies in high Alpine environments have led to good agreement on how snow and ice-dominated streamflow regimes might evolve in the future. We anticipate earlier snowmelt peaks and reduced water availability in late summer and autumn, related to glacier retreat and a reduced carry-over effect of winter snow to subsequent seasons. And some of the anticipated trends are already detectable in streamflow observations. However, these predictions are based on models that often lack a detailed representation of hydrological processes below the snowpack and do not explicitly represent how the presence of snow modifies water flow paths. This is in contrast to the fact that gradual reduction of snow cover onset and duration might have a significant impact on streamflow generation processes in Alpine environments, such as by affecting groundwater recharge patterns and hydrologic connectivity.

In this presentation, I will first give a succinct overview of what we know about high Alpine water resources and about climate change impact on high Alpine streamflow, from models as well as from data. I will then give an overview of key questions relating to high Alpine streamflow generation processes and synthesize what we learned about the interaction of the cryosphere with streamflow generation from our seasonal to multiyear process studies in several high Alpine catchments in Western Switzerland and the Bernese Oberland.