

Assessing Groundwater Controlled Stream Intermittency and Impacts on Riparian Vegetation

Context and objectives

Understanding and predicting how groundwater controls water availability for stream and riparian ecosystems is a key challenge in ecohydrology, particularly in headwater catchments where groundwater–surface water interactions dominate.

Recent works have shown that groundwater storage variations strongly control stream intermittency, yet the feedback between groundwater flow, stream network and vegetation dynamics remain poorly constrained. This MSc project aims to overcome this limitation by leveraging high-resolution field observations from low-cost sensors, crowdsourcing, and remote sensing to better constrain the dynamics of this feedback. The student will take part of the FutureFlow project and builds on datasets from Waterwise Alpine observatories and the Studibach catchment (WSL–UZH).

Methodology

The student will follow a multi-step approach combining data analysis and modeling:

- Derive stream network dynamics (flowing length and spatial patterns) based on in-situ observations;
- Analyze remote sensing products (drone and satellite) to characterize the spatio-temporal variability of vegetation accessibility to groundwater (multispectral data);
- Set up a parsimonious groundwater flow model (HydroModPy platform) to simulate groundwater flow and seepage;
- Evaluate the performance and limitations in reproducing observed intermittency and accessibility of vegetation to groundwater.

Supervision and collaboration

The MSc student will be supervised by Clément Roques and Simon Carlier (University of Neuchâtel, CHYN) and will work in close collaboration with Ilja van Meerveld (University of Zurich), providing access to the Studibach dataset and expertise in runoff generation processes.

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