Université de Neuchâtel
Centre d'hydrogéologie et géothermie

MSc in Hydrogeology and Geothermics
Thesis topic proposal 2025

GROUNDWATER CONTROLS ON STREAM INTERMITTENCY IN HEADWATER CATCHMENTS

Context and objectives

Understanding the mechanisms that control stream intermittency in headwater catchments is a key challenge for predicting hydrological responses to climate change. In mountain environments, the presence of perennial surface flow is often governed by localized groundwater discharge. These dynamics are still poorly constrained due to the lack of spatially and temporally distributed data on streamflow presence/absence and the underlying subsurface conditions.

This master thesis project is part of the EU project Waterwise and aims at investigating how groundwater dynamics influence stream intermittency across eight pilot catchments across the Alpine space equipped with various hydrological monitoring setups. The work will focus on deploying and analyzing data from distributed stream conductivity and temperature sensors. These tools will allow the student to track changes in stream extent across space and time. A second component of the project involves the implementation of crowdsourced monitoring, engaging the public and stakeholders in the documentation of stream conditions using simple signs prompting photo/video collection and hydrological observations.

The overarching objectives of the master project are: (1) To quantify spatial and temporal patterns of stream intermittency using a combination of field sensors and citizen science; (2) To produce updated maps of the perennial and intermittent stream network across all pilot sites; and (3) To contribute to the calibration and refinement of existing groundwater flow models to understand the driving hydrogeological mechanisms.

Methodology

Fieldwork: Installation of smart rocks and temperature loggers in selected branches of the stream network in multiple pilot sites. Maintenance of sensors and data download during seasonal field campaigns. Design and implementation of public outreach tools for citizen-based hydrological observations (signage, instructions, platform integration).

Data analysis: Processing of data to derive time series of stream wetness status. Compilation and filtering of citizen science observations using image and metadata analysis. Mapping and classification of stream network dynamics (perennial/intermittent/ephemeral) over time.

Modelling contribution: Use of updated stream intermittency data to inform and refine the groundwater flow models already in place in each pilot site. Exploration of different inversion methods to improve the predictions.

Supervision and collaboration

Supervision will be provided by **Dr. Clément Roques** (UniNE) **and Markus Noak** (HKA), n collaboration with other Waterwise project partners, and local stakeholders managing the pilot sites. The project involves strong teamwork and frequent coordination with collaborators in charge of modeling, site instrumentation, and stakeholder engagement.

Further information is available from Clément Roques, clement.roques@unine.ch