UNIVERSITÉ DE NEUCHÂTEL

CHYN
Centre d'hydrogéologie et de géothermie

MSc in Hydrogeology and Geothermics

Thesis topic proposal 2020

INVESTIGATION OF THE GROUNDWATER DYNAMICS IN AN ALPINE CATCHMENT BY COMBINING FIELD WITH MODELING METHODS (VALLON DE RÉCHY, VALAIS)

Context and objectives

Alpine catchments play an important role in sustaining water resources in downstream valleys. The hydrology of these catchments is highly dynamic and is generally characterised by an annual cycle including snow accumulation and melt phases. In such catchments, a potentially large portion of snowmelt infiltrates into, and is transported within, the subsurface. This water can subsequently be discharged to the surface at springs or beneath surface water bodies and sustain flow during dry periods. Understanding this cycle of recharge, residence, and discharge of groundwater is crucial for water resource management in alpine regions, especially in the context of climate change.

Our study site “Le Tsalet” in the Vallon de Réchy (Valais) lies at an elevation range of approximately 2200-2800 m. Previous investigations using stable isotopes and gravimetric measurements have revealed the role of large annual fluctuations in localised groundwater storage. A zone of relatively high permeability material (scree and mixed deposits) overlying moraine and quartzite layers is believed to act as a temporary water reservoir during the warmer months, ensuring groundwater discharge to streams at lower elevations. Although surface geology maps exist, the stratigraphy and geometry of hydrogeological units remains unknown.

Research approach and methodology

Encouraged by the results from a successful series of campaigns in 2019, we propose using electromagnetic resistivity tomography (ERT) to measure profiles in the zone of interest. Resistivity profiling will allow us to understand the configuration of the hydrogeological strata.

We also propose the creation of a numerical model that will enable calibration of the hydro-physical properties and testing of hypotheses regarding the flow of groundwater in the catchment. The student will evaluate the capacity of the aquifer to sustain spring discharge. Depending on the advancement, he/she might also evaluate how climate change affects the spring discharge.

Additional activities may include time-lapse gravity surveys to investigate temporal changes in groundwater storage, sampling of surface waters for stable isotopes and major ions, and UAV surveys, especially temperature mapping to locate zones of groundwater discharge.

Surveys are planned for Summer and Autumn 2020.

Partners and collaboration

The project will be carried out in collaboration with the Centre for Research of the Alpine Environment (CREALP) in Sion. **Contact for further information:** Prof. Daniel Hunkeler (daniel.hunkeler@unine.ch) and Dr. Landon Halloran (landon.halloran@unine.ch).