UNIVERSITÉ DE NEUCHÂTEL

CHYN
Centre d'hydrogéologie et de géothermie

MSc in Hydrogeology and Geothermics

Thesis topic proposal 2017

CONTRIBUTION OF SNOWMELT TO GROUNDWATER IN A CANADIAN FOREST CATCHMENT

Context and objectives

In alpine regions and regions characterized by continental climate, a considerable amount of precipitation falls as snow during the winter season. The snow starts to melt in spring and the resulting meltwater makes up a considerable amount of surface water outflow of a catchment, but also groundwater recharge. With rising air temperatures, the amount of snowmelt is expected to change, with yet-to-be-determined consequences on water resources availability and quality. The fact that it is generally difficult to identify the sources of groundwater – be it infiltrating riverwater, recharge by rain, or infiltration of snowmelt – complicates the prediction of groundwater availability in a changing climate. A research project at the Université Laval in Québec will use state-of-the-art techniques to identify and quantify the sources of groundwater. The project will be carried out in the experimental catchment Bassin du ruisseau des eaux-volées of the Forêt Montmorency in Québec, where average annual snowfall is 5m and the different components of the water balance investigated since the 1970's. This catchment presents a unique opportunity to investigate the contribution of water from other sources to groundwater in a well-characterized system. The goal of this Master thesis project will be to quantify different components of the water balance of the catchment, and to estimate their contribution to groundwater recharge.

Research approach and methodology

This project requires the application of a wide range of hydrogeological field methods and analytical tools, potentially including numerical flow modeling. Depending on the interest of the student, different aspects of this integrated project can be tackled. The student has the chance to develop a detailed research strategy. It might include: (a) Literature research the contribution and measurement of snowmelt recharge. (b) Installation and management of surface water and groundwater measurement stations. (c) Tracer tests to determine the flow paths and travel times between the surface water, snowmelt and groundwater. (d) Numerical flow modelling with integrated flow tracking that allows understanding the distribution of water from different sources in the subsurface.

Partners and collaboration

The project will be supervised by Prof. P. Brunner and Dr. Oliver Schilling. A main part of the master thesis will be carried out at Université Laval, where Oliver Schilling works as the principal investigator of the project. The student will have the unique opportunity to work in the experimental research catchment of Forêt Montmorency, together with many other researchers who are working on a diverse set of other forest hydrology and ecology projects.

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