UNIVERSITÉ DE NEUCHÂTEL

CHYN
Centre d'hydrogéologie et de géothermie

MSc in Hydrogeology and Geothermics

Thesis topic proposal 2017

INVESTIGATING SEASONAL THERMAL ENERGY STORAGE POTENTIAL IN SWITZERLAND

Context and objectives

Seasonal thermal energy storage (or **STES**) is the storage of heat or cold for periods of up to several months. The thermal energy can be collected whenever available, and used whenever needed. For example, heat from solar collectors or waste heat from air conditioning equipment can be gathered in hot months for space heating use when needed, including during winter months.

Aquifers can store heat or cold in the subsurface. A typical system is composed of a doublet, totaling two or more wells into a deep aquifer that is contained between impermeable geological layers above and below. One half of the doublet is for water extraction and the other half for reinjection, so the aquifer is kept in hydrological balance, with no net extraction. The heat (or cold) storage medium is the water and the substrate it occupies.

A successful **STES** installation requires particular underground conditions to be feasible. Thus the application is limited to the presence of a high conductivity aquifer. However, recent advances in hydraulic stimulation techniques might enable the usage of tight fractured aquifers for seasonal thermal energy stoarge.

Research approach and methodology

In this project, a range of numerical simulations will be carried out to investigate the heat storage capacity of fractured aquifers for seasonal heat storage. The student will develop the detailed research strategy. It might include the following: (a) A literature overview over the installed heat storage capacity and determining factors of site locations. (b) Numerical modeling of fluid and heat transport in a fractured aquifer for seasonal heat storage cycles with the embedded discrete fracture method (EDFM) in Matlab.

Partners and collaboration

The project will be supervised by Prof. S. Miller and G. Jansen. It will be carried out in collaboration with the geoenergy consulting company (GeoEnergySuisse). The project is in close relation to the Swiss competence center for energy research - supply of electricity (SCCER-SoE) that will enable the student to come into contact with members of other research facilities and participate in scientific conferences.

Contact for further information: stephen.miller@unine.ch