Université de Neuchâtel
Centre d'hydrogéologie et géothermie

MSc in Hydrogeology and Geothermics

Thesis topic proposal 2023

AQUIFER THERMAL ENERGY STORAGE (ATES) EXPERIMENTS AND NUMERICAL SIMULATIONS

Context and objectives

Providing to our societies greenhouse-gas free energy sources is a main challenge tackled by the energy turnaround initiated in many countries. Heat demand and supply are off-phase over seasonal cycles. Storing heat in time of surplus and providing it when needed is part of the tools required to reduce the energy footprint. Underground Thermal Energy Storage (UTES) is one solution for this process. Various configuration of UTES are used including Aquifer Thermal Energy Storage (ATES).

Until now many studies have shown the potential of ATES in shallow porous geological media. But conflict of use, aquifer availability and environmental regulations pushes for going to deeper, hard rock aquifers for which characterization approaches and suitability evaluation for heat storage need to be developed.

Methodology

Heat storage experiments will be performed at the Mt-Terri underground laboratory (Swisstopo) in fractured and karstified rocks in order to increase our understanding of a thermo-hydraulic and mechanical processes activated during heat storage. The student will contribute to the planning and execution of these experiments. This will include numerical simulation for experimental design purpose and interpretation of field data. Depending of project development and student interest the emphasis can be balanced between field studies and numerical simulation.

Supervision and collaboration

The project will be supervised by Dr. R. Sohrabi (CHYN, UniNE) and Prof. Dr. B. Valley (CHYN, UniNE). It will be carried out in collaboration with Swisstopo, SIG, ETHZ, UniGE part of an European project which will include many partner countries that will enable the student to come into contact with members of other research facilities and participate in scientific conferences.

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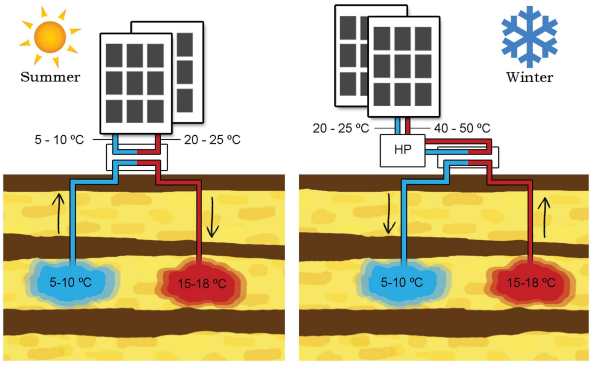

Principles of aquifer heat storage after Pellegrini et al., 2019