



Ph.D. Research Opportunity



Topic

Advective Displacement - Pore Water Extraction from Low-permeability Sedimentary Rocks

Location

Department of Geology, University of New Brunswick, Fredericton, NB, Canada
(<http://www.unb.ca/fredericton/science/geology>)

Institute of Geological Sciences, University of Bern, Bern, Switzerland
(www.geo.inibe.ch/rwi)

Supervisors

Dr. Tom Al - University of New Brunswick

Dr. Urs Mäder - University of Bern

Availability

This project can begin in September 2008, or as soon as a suitable candidate is identified.

Duration

Four years

Funding

Funding is anticipated from the Canadian Nuclear Waste Management Organization (NWMO). The salary stipend will be consistent with requirements for residency in Canadian and Swiss institutions, and funding will also be provided to cover research expenses.

Background

Information on the composition of saline groundwaters, such as those found in sedimentary rocks considered in the Canadian used nuclear fuel program, is required for near-field performance and safety assessment calculations, and for models involving groundwater transport or evolution. Advective displacement is a direct method that has been developed at the University of Bern for extracting pore water from deep sedimentary rock formations (e.g. Opalinus Clay, Switzerland) using advection of a traced artificial pore water to force

displacement of the original pore water contained in the sample (Mäder et al., 2004). The tracers in the infiltrating fluid allow for quantification of mixing with the in-situ pore water, and observation of tracer breakthrough behavior when monitoring the infiltration experiment over a sufficiently long time period.

Objectives

The overall objective of this research is to further develop the technique of pore water extraction by advective displacement to gain direct chemical and isotopic information of in-situ pore water in low-porosity sedimentary rocks.

Work Program

The Ph.D. candidate will work under the supervision of Dr. Tom Al and Dr. Urs Mäder at the University of Bern to further develop the advective displacement technique for application to low-porosity sedimentary rocks. He/she will spend approximately one and a half years at the University of Bern training on the application of the advective displacement method using the existing equipment in the Rock-Water Interaction Laboratory and to construct the specialized experimental equipment required for this method. Once constructed, the equipment will be transported to the University of New Brunswick, installed and tested. The student will then conduct experiments designed to further develop the advective displacement methodology.

References

- Mäder U. K., H. N. Waber and A. Gautschi. 2004. New method for pore water extraction from claystone and determination of transport properties with results for Opalinus Clay (Switzerland). Proceedings of the Eleventh International Water-Rock Interaction Conference, Saratoga Springs, New York, 445-449.
- Waber H. N., U. K. Mäder, M. Korolova and A. de Haller. 2007. Testing methods for the characterization of saline pore water in an Ordovician limestone (Cobourg Formation, St. Mary's Quarry, Ontario) – Feasibility Study. Institute of Geological Sciences, University of Bern, Switzerland, Technical Report TR-07-01.

Interested candidates should contact:

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