Geophysical Research Abstracts
Vol. 15, EGU2013-10529, 2013
EGU General Assembly 2013

Potential of heat tracer tests for characterizing fractured media

Maria Klepikova (1), Tanguy Le Borgne (1), Olivier Bour (1), Pascal Goderniaux (2), Tom Read (3), Victor Bense (3), Rebecca Hochreutener (1), and Nicolas Lavenant (1)

(1) Geosciences Rennes, UMR CNRS 6118, University of Rennes 1, Rennes, France, (2) Universite de Mons, Mons, Belgium, (3) School of Environmental Sciences, University of East Anglia, Norwich, United Kingdom

The prediction of transport patterns in fractured media is a challenging task, as the strong variability of flow velocities induces a broad range of transport rates. Different transport mechanisms are generally contributing: dispersion at fracture scale related to aperture variability, dispersion at network scale due to transport in different flowpaths and matrix diffusion. It is however difficult to know which mechanism is dominant. To reduce this uncertainty we propose combining solute and heat tracer tests. The fundamental difference between solute and heat transport is that heat diffusion in rocks is large compared to molecular diffusion, implying that fracture-matrix exchange is much significant for heat than for solute tracers. Thus solute and heat tracer tests are expected to bring complementary information on the transport processes.
To investigate this we conducted a series of cross-borehole and push-pull thermal and solute tracer tests at the fractured crystalline aquifer of Ploemeur, France. The thermal tracer tests were performed by injecting 50 degrees Celsius water in a single isolated fracture located at 50 meters depth. The measured concentration and temperature breakthrough curves show a significant time lag. We interpret these tests by means of a numerical solute and heat transport model. We discuss the effects of fracture-matrix interface areas, fracture aperture and Peclet number on temperature recovery.