Experimental report

28/01/2022

Proposal: 1-05-21 **Council:** 4/2020

Title: Multiphase flow in porous and fractured rocks.

Research area: Other...

This proposal is a new proposal

Main proposer: Francois RENARD

Experimental team: Alessandro TENGATTINI
Benoit CORDONNIER
Francois RENARD

Local contacts: Lukas HELFEN
Alessandro TENGATTINI

Samples: Bead pack model samples, Odenwald granite and Fontainebleau sandstone rock samples

Instrument	Requested days	Allocated days	From	To
NEXT	4	3	09/03/2021	11/03/2021

Abstract:

Characterizing flow in natural rocks using neutron tomography is both of high societal interest and timely in terms of technical developments. Recent advances at the ILL-D50 beamline made it possible to design and use new experimental setup to study 3D flow dynamics within natural rocks in-situ. Multiphase flow is a complex process with a large implications to the subsurface, from geothermal energy, to CO2 sequestration and soil contamination. We designed, at D50, three pressure cells with multi-inflow and outflow capabilities able to mimic geological conditions in reservoir rocks at up to 800 meters depth. With fast time-lapse 3D tomography imaging we aim to improve our understanding of the dynamics of multiphase flow within complex natural rock systems. Groups involved in this proposal have a strong record of more than 15 publications since 2016 using X-ray and neutron imaging to study fluid-rock processes. An additional ~15 publications since 2016 deal with other sample systems studied by synchrotron-based CT. We built experimental apparatuses to image fluid-rock interactions using neutron tomography and studied the transport of cadmium, a major contaminant, in rocks.

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Our experiment was about the adsorption of a pollutant, cadmium, into rocks. Unfortunately, because of a leak on the first experiment we decided to put the test on hold. With the appropriate protections, we proceeded to a careful cleaning of both the beamline and the apparatus. Dictated by common sense for the protection of the hardware and persons as well as in agreement with the local contact, we decided to wait for a second opinion from safety. Sadly, the calendar put our experiment over the weekend and the safety team was only available 60 hours later on the monday morning, also corresponding to the end of our allocated time. The experiment was consequently cancelled.