

Multiscale pore networks based on digital images at different scales for the study of gas-water two-phase flows in porous media

Offer of a 12-month post-doctorate

Context: This project concerns the numerical study of two-phase gas-water flows in porous media with a wide pore size distribution (argillite, cement, etc.). Due to the very low capillary numbers (very slow flows) likely to characterize these flows, it is crucial to determine with great precision the macroscopic properties (retention curve, relative permeabilities) in the range of very high-water saturations. It is precisely a saturation range where the acquisition of these data experimentally is unreliable. There is therefore a very serious hope of significantly improving the characterization of these properties numerically by taking full advantage of the advances in imaging at different scales.

Proposed mission: To carry out this project, the TCM team of IUSTI and the MP&B team of IMFT wish to recruit a researcher in transfer physics or 3D imaging who will have to be involved in the exploitation and the improvement of two-phase gas-water flow modeling modules using a pore network approach developed within the framework of the open source software iMorph (<https://sourcesup.renater.fr/projects/imorph/>). He will also be responsible for developing new modules aimed at simulating sorption phenomena.

The objective is first of all the characterization of the permeability, the relative permeabilities and the retention curve of a clay rock (Argilite of the Callovo-Oxfordian (COx)) by numerical simulations on multiscale pore networks, constructed from 3D images of the rock microstructure obtained at different scales: typically 3D images at the "FIB" scale (for submicronic pores) and at the "microtomography X" scale (for pores close to one micron and beyond). It is also planned to simulate sorption curves in order to reinforce the general consistency of the approach developed.

This project is part of a larger project (MECHE project of the CNRS NEEDS program). The recruited person will have to interact with other project teams, in particular the IC2MP team from the University of Poitiers, which produced the digital images and measurements of the properties studied.

Type of contract: Fixed-term contract (12-month financing, salary of €2205 net per month). The post-doc can start as soon as the selected candidate is available.

Skills required: The candidate, holder of a doctorate in physics or applied mathematics or in 3D imaging or equivalent, must demonstrate good experience in digital modeling or in the development of three-dimensional image analysis methods. Experience in high performance scientific computing will be a plus.

Place of work : TCM Team, Laboratoire IUSTI UMR7343, Technôpole Château Gombert, 5 rue Enrico Fermi, 13453 Marseille

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