INFLUENCE OF FRACTURE-NETWORK STRUCTURES ON RADIONUCLIDE BEHAVIOR IN FRACTURED POROUS MEDIA

Delphine Roubinet[1], Jean-Raynald de Dreuzy[2] and Hui-Hai Liu[3]

[1] Centre National de la Recherche Scientifique (CNRS)
Campus de Beaulieu, Rennes, France
e-mail: delphine.roubinet@univ-rennes1.fr, web page: http://www.geosciences.univ-rennes1.fr

[2] Centre National de la Recherche Scientifique (CNRS)
Campus de Beaulieu, Rennes, France
e-mail: jean-raynald.de-dreuzy@univ-rennes1.fr, web page: http://www.geosciences.univ-rennes1.fr

[3] Lawrence Berkeley National Laboratory (LBNL)
Berkeley, California, United States
e-mail: HHLiu@lbl.gov, web page: http://www.lbl.gov

Fractured porous media are highly heterogeneous because of the presence of low and high permeability zones and because of the fracture network heterogeneities. These two levels of heterogeneities drive radionuclide exchanges between the fast-flow channels (fractures) and the storage zones (matrix) and consequently impact the residence time of radionuclides. However, transport in fractured porous media is generally modeled on regular fracture networks without evaluating approximations due to simplifications of fracture network complexities.

We aim at determining the influence of fracture characteristics and fracture network structures on radionuclide behavior by using a new particle tracking model. This new model, based on advection in fractures and 1D diffusion in matrix, is innovative by its applicability to complex fracture networks. The model is applied to a broad range of fracture network structures taking into account different fracture network geometries, length and aperture heterogeneities and fractal and correlation properties. Understanding the key characteristics of fracture network structures influencing radionuclide transport is designed to improve the predictions of radionuclides breakthrough to the environment.