Simulation and UQ of mineral reactions in the presence of fractures

Michele Botti[1], Alessio Fumagalli[2] and Anna Scotti[3]

[1] Politecnico di Milano, Piazza Leonardo da Vinci, 32. michele.botti@polimi.it
[2] Politecnico di Milano, Piazza Leonardo da Vinci, 32. alessio.fumagalli@polimi.it
[3] Politecnico di Milano, Piazza Leonardo da Vinci, 32. anna.scotti@polimi.it

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CO_2 sequestration is one of the promising technology to mitigate the climate change in the next decades. The presence of dissolved CO_2 in water alters the pH and favors some mineral reactions which may contribute to a safe storage of carbon thanks to two effects: i) the chemical bonding of carbon in the solid matrix, ii) and the variation of porosity [2].

We want to simulate this reactive transport phenomenon (under some simplifying assumptions) in the presence of fractures, to estimate the change in aperture and permeability due to mineral reactions. To this aim we employ a hybrid dimensional model for fractures, represented as lines or surfaces embedded in the domain, [1], and a suitable splitting of the coupled PDEs of the model, describing the evolution of pressure and flow, solute concentration, solid volume fraction and possibly temperature. Moreover, we perform a sensitivity analysis to some relevant uncertain parameters in the model to investigate their impact on the solution and gain insight into a complex coupled problem.

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