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Comparison of CO_2 trapping in highly heterogeneous reservoirs with Brooks-Corey and van Genuchten capillary pressure curves

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Geological heterogeneities essentially affect the dynamics of a CO_2 plume in subsurface environments. Recent studies have led to new conceptual and quantitative models for sedimentary architecture in fluvial deposits over a range of scales that are relevant to the performance of some deep saline reservoirs [1, 2]. Previously we showed how the dynamics of a CO_2 plume, during and after injection, is influenced by the hierarchical and multi-scale stratal architecture in such reservoirs [3]. The results strongly suggest that representing these small scales (few cm in vertical direction and few meters in horizontal direction) features and representing how they are organized within a hierarchy of larger-scale features, is critical to understanding capillary trapping processes. The results also demonstrated the importance of using separate capillary pressure and relative permeability relationships for different textural facies types. Here we present the result of simulation of CO_2 trapping in deep saline aquifers using two different conventional approaches, i.e. Brooks-Corey and van Genuchten, to capillary pressure. We showed that capillary trapping as well as dissolution rates are very different for the Brooks-Corey and van Genuchten approaches if reservoir consists from various species with different capillary pressure and relative permeability curves. We also found a dramatic difference in simulation time; using the van Genuchten approach improves convergence and thus reduces calculation time by one-two orders of magnitude.

[1] Bridge, J.S. (2006), Fluvial facies models: Recent developments, in Facies Models Revisited, SEPM Spec. Publ., 84, edited by H. W. Posamentier and R. G. Walker, pp. 85–170, Soc. for Sediment. Geol. (SEPM), Tulsa, Okla
[2] Ramanathan, R., A. Guin, R.W. Ritzi, D.F. Dominic, V.L. Freedman, T.D. Scheibe, and I.A. Lunt (2010), Simulating the heterogeneity in channel belt deposits: Part 1. A geometric-based methodology and code, Water Resources Research, v. 46, W04515.
[3] Gershenzon N.I., M. Soltanian, R.W. Ritzi Jr., and D.F. Dominic (2014) Influence of small scale heterogeneity on CO_2 trapping processes in deep saline aquifers, Energy Procedia, 59, 166 – 173.