# Computation of relative permeability functions in 3D digital rocks

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**ABSTRACT:**

Digital rock physics (DRP) integrates advanced 3D imaging techniques, segmentation algorithms to create a digital representation of the rock and advanced numerical methods like the Finite Element Method (FEM) and/or the Lattice Boltzmann Method (LBM) for electrical, elastic and fluid flow properties of the rocks.
We present an approach to simulate fractional flow in a 3D digital rock by direct numerical simulation of the Stokes flow of two immiscible components through the digital rock. We use an improved method of the LBM to simulate the complex fluid movement through the rock including the effects of viscosity, interfacial tension and the contact angle. Advanced boundary conditions are presented that allow the injection of varying fractional flow in a displacement process. An approach to determine a representative elementary volume is shown. The simulations are run on high performance hardware to cope with the enormous computational load.
We present results for different test-cases including primary drainage and imbibition for different conditions.