A MULTISCALE MIXED METHOD FOR A TWO-PHASE FLOW IN FRACTURED RESERVOIRS CONSIDERING GRAVITATIONAL EFFECTS

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Abstract -
In this research, the mathematical model represents a two-phase flow in a fractured porous reservoir media, where the Darcy law represents the flow in both fractures and matrix. The approximated solutions are computed using a staggered approach. The flux/pressure of the fluid flow is approximated using a hybridized mixed formulation coupling the fluid in the volume with the fluid flow through the fractures. The spatial dimension of the rock matrix is three and and is coupled with two and one-dimensional fractures. The transport equation is approximated using a lower order finite volume scheme using upwind. The sequential fully implicit method (SFI) is employed to accelerate the convergence of the coupled nonlinear system of equations. The C++ computational implementation is made using the NeoPZ framework, an object oriented finite element library. The generation of the geometric meshes is done with the software Gmsh. Numerical simulations in 2d and 3d are presented demonstrating the advantages of the adopted numerical scheme.

Keywords - FEM, Fracture, Porous Media, Finite Element Method

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