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A Parallel Poromechanics Finite Element Method (FEM) Model for Reservoir Analyses

Authors : Henrique C. C. Andrade, Ana Beatriz C. G. Silva, Fernando Luiz B. Ribeiro, Samir Maghous, Jose Claudio F. Telles, Eduardo M. R. Fairbairn

Abstract : The present paper aims at developing a parallel computational model for numerical simulation of poromechanics analyses of heterogeneous reservoirs. In the context of macroscopic poroelastoplasticity, the hydromechanical coupling between the skeleton deformation and the fluid pressure is addressed by means of two constitutive equations. The first state equation relates the stress to skeleton strain and pore pressure, while the second state equation relates the Lagrangian porosity change to skeleton volume strain and pore pressure. A specific algorithm for local plastic integration using a tangent operator is devised. A modified Cam-clay type yield surface with associated plastic flow rule is adopted to account for both contractive and dilative behavior.

Keywords : finite element method, poromechanics, poroplasticity, reservoir analysis
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