Subcritical fracture growth simulation using node-splitting discrete element model and lattice boltzmann method

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Abstract:

We present a numerical coupling scheme between lattice boltzmann method and node-splitting discrete element model to simulate fluid transport within subcritical fractures of brittle elastic solids. The node-splitting discrete method was previously developed to account for the fracture propagations within elastic brittle solids. It not only provides a way to accurately represent fracture geometries but also conserve energy at the same time. While lattice boltzmann method is a mature way to simulate incompressible fluid. The stability of fracture cracks under the influence of fluid is of importance in many industrial applications such as casing for offshore drilling well. We make use of the current model to study stability criterion mainly Griffith's criterion for linear elastic solids in a global energy minimization point of view and a local yield stress point of view.

Keywords:

Lattice Boltzmann Method, Node-Splitting Discrete Element Model, Subcritical Fracture Growth