3D Phase-Field for Pressurized Fracture Propagation in Heterogeneous Media

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ABSTRACT

In this talk, we consider phase-field-based fracture propagation in elastic and poroelastic media. The main purpose is the development of a robust and efficient numerical scheme. To enforce the entropy condition; namely, crack irreversibility, we use a robust primal-dual active set strategy. This is merged with the outer Newton iteration for the variational inequality of the fully-coupled nonlinear partial differential equation system, resulting in a single, rapidly converging nonlinear iteration. In addition, it is well known that phase-field models require fine meshes to accurately capture the propagation dynamics of the crack. Because traditional estimators based on adaptive mesh refinement schemes are not appropriate, we present a predictor-corrector scheme for local mesh adaptivity to reduce the computational cost. Our proposed approach is substantiated with different numerical tests in two and three dimensions considering crack propagation in elastic media as well as multiple pressurized and fluid-filled fractures in heterogeneous media.