A novel multiphysics coupled framework to model fluid flow, solute transport, and reservoir geomechanics in fractured porous media

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Despite recent advances in modeling flow and geomechanics coupling, a holistic multiphysics approach to capturing the coupling synergy between fluid flow, injectant transport, induced stresses, and fracture mechanics is lacking. There is a growing interest in developing an integrated multiphysics simulator to investigate physical processes during fluid injection into a fractured reservoir, i.e. injection-induced deformation and stresses, dissolution and spreading of the injected fluid, and convective instabilities originating from the contrast in injected and resident fluid properties, e.g. viscous fingering.

I develop a holistic computational modeling framework that couples reservoir geomechanics, fluid flow, solvent transport, and fracture dynamics. The first objective is to quantitatively characterize the effect of geomechanical coupling on key macroscopic transport phenomena such as spreading, mixing, and viscous fingering. The second objective is to probe the impact of poroelasticity on the temporal and spatial evolution of embedded fracture networks in terms of induced permeability, dynamic propagation, and fracture interactions. The third objective is to investigate how flow-transport coupling and fracture dynamics modulate the stress state and geomechanical stability of stress-sensitive subsurface formations.

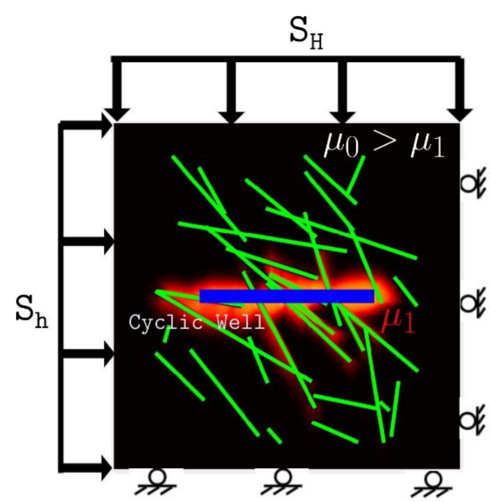
The findings of this study are relevant in many practical applications such as waste disposal, carbon dioxide sequestration, contaminant transport, enhanced oil recovery, and tracer surveillance.

Monday, October 11, 2021

1:30 pm – 3:00 pm PST

Zoom

Join Zoom Meeting: [Zoom Link]
Meeting ID: 992 8603 9027
Passcode: 669210



Ph.D. DISSERTATION PRESENTATION