
# Multi-fracture propagation in porous medium under shear stimulation of fluid flow

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**Keywords:** Fracture propagation; porous medium; fluid flow; hydraulic stimulation

## ABSTRACT

We are interested in low-pressure stimulation of naturally fractured porous media, as applied e.g. in enhanced geothermal systems. Naturally occurring fractures are considered joint surfaces that can withstand tectonic stresses due to friction by asperities in the fracture walls. Hydraulic stimulation by the injection of fluids in the fracture network can overcome the frictional resistance, leading to shear deformation along the fracture surfaces. The shearing is associated with a dilation of the fracture aperture and increased permeability.

Here we study how the shear deformation will alter the local stress fields, and can potentially trigger fracture propagation. The porous medium and fluid flow are modelled by the discrete fracture-matrices model that the fractures are treated as interfaces and allows the fluid transport from high-permeable conductive fractures to the rock matrix and vice versa. We treat the rock matrix as a linearly elastic medium, while the nonlinear shear behavior of fractures is represented by the Barton–Bandis joint model. The governing equations are discretized by a combination of finite element and finite volume methods. We discuss the numerical modeling of fracture propagation in this setting, with an emphasis on representation of the new fracture in the computational grid. Numerical examples shows the interaction between fluid pressure and mechanical forces.

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