Contribution ID: **343** Type: **Oral Presentation**

Consistent Treatment of Shear Failure of Embedded Discrete Fracture Networks Using XFVM

Wednesday, 1 June 2022 11:00 (15 minutes)

Modeling the mechanical behavior of a fractured reservoir is important for various engineering applications such as enhanced geothermal systems, fracking and CO2 capture. To understand the coupled mechanical and flow processes of fractured porous reservoirs, it is crucial that computational frameworks are able to capture the displacements of large number of active fractures with various topologies. To this end, we use the extended finite volume method (XFVM) to model poroelastic fractured rock. The fractures are embedded manifolds of lower dimension and are represented by special discontinuous basis functions. These functions have the important property that the displacement gradient is continuous over the fracture segments, which simplifies the computation of traction and compressive forces. Embedded discrete fracture models are cost efficient, since the mesh does not have to get adapted to the fractures and no remeshing is needed in case of fracture propagation; therefore, coarse meshes can be used. However, embedding fracture networks in non-conforming meshes is challenging, since any kind of fracture topology and number of fracture segments can be present within a grid cell. Here, we use a merging technique to locally simplify intersecting and branching fracture segments in grid cells and introduce the rule of weakest link to retain the mechanical property of the dominant segment. Shear displacement and tensile opening of a fracture network with locally merged intersections and under in situ conditions are analyzed. The hydraulic and void aperture changes due to shear displacement and tensile opening are included in the model. The aperture through shear slip is not only calculated a posteriori but is added in the equations such that its influence directly affects the stress-strain relation and displacement calculations. The results indicate that by using the local simplification of merging fracture segments the mechanical behavior of fractured reservoirs is retained. The merging technique is a flexible and simple method, which allows to employ embedded discrete fracture models for scenarios involving shear failure.

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References

Time Block Preference

Time Block B (14:00-17:00 CET)

Participation

In person

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Presenter: CONTI, Giulia

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