Contribution ID: **467** Type: **Poster (+) Presentation**

Shear Displacements of an Embedded Fracture Network using XFVM –a Sensitivity Analysis

Tuesday, 1 June 2021 10:00 (1 hour)

Understanding deformation and fluid flow in a fractured rock mass is of central importance for geothermal energy extraction, wastewater disposal, and hydrocarbon exploration. Thermal strain- or fluid pressure - induced shear displacements in the fracture system lead to hydraulic aperture changes that affect the flow field. To predict these, numerical frameworks are needed that can accurately and efficiently capture this coupled mechanical and hydraulic behavior even in complex natural fractured reservoirs. For this purpose, we use the extended finite volume method (XFVM). In XFVM, the flow and mechanics solvers are iteratively coupled with the fixed stress method, modelling fractures in a poroelastic damaged rock matrix. Fractures are represented as embedded lower dimensional manifolds. The displacement of individual fractures and fracture manifolds is resolved by discontinuous basis functions, modeling slip and tensile displacements as piecewise constant on each fracture segment. Tractions, including compressive forces are calculated for each fracture segment and failure criteria are evaluated.
Here we apply the described framework to analyse shear displacements in a natural fracture network under *in situ* conditions. The selected fracture pattern consists of approximately 200 non-systematic fractures mapped at Dounreay in Scotland. In a grid convergence study we investigate which grid resolution is needed to accurately resolve the stress field in the damaged rock matrix as well as the shear slip of the embedded fractures. The sensitivity of shear displacements to fracture characteristics such as for length, orientation or abutting relationships is studied.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

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Student Poster Award

Primary author: Ms CONTI, Giulia (ETH Zurich, Institute of Fluid Dynamics)

Co-authors: DEB, Rajdeep; MATTHAI, Stephan (The University of Melbourne); JENNY, Patrick

Presenter: Ms CONTI, Giulia (ETH Zurich, Institute of Fluid Dynamics)

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