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Simulation of temperature and pressure driven fracture deformation

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Preexisting fractures may deform under the influence of changes in temperature or pressure during development and operation of a geothermal reservoir. Such deformation events are both of consequence in themselves, as they may be felt as earthquakes at the surface, and by virtue of the impact they may have on properties of the reservoir, such as the permeability. Using a discrete fracture matrix model explicitly accounting for processes and variables both in the fractures and in the matrix, we simulate the three-dimensional multiphysics problems of thermomechanical and hydromechanical fracture stimulation with a friction law at the fractures. The model is implemented in the open-source simulation tool PorePy, and its explicit representation of the fractures allows for high accuracy and spatial resolution of the fracture dynamics, including normal (fracture opening) and tangential (slip events) deformation.

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