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Numerical modeling of induced seismicity and activation of nearby fault by fluid injection

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This numerical modeling work investigates induced seismicity and fault slip by fluid injection in deep geothermal reservoir with pre-existing fractures and large fault. The purpose of this modeling work is to see if the methodology can capture the physics involved in subsurface reservoirs under hydraulic stimulation treatment and the field observations of the induced/triggered seismicity that are to be discussed this session.
Particle Flow Code 2D is used for the modeling in which hydro-mechanical coupling and seismicity computing algorithms are implemented for this specific problem. The output of the modeling includes spatio-temporal distribution of the fluid pressure and the induced seismic events and their magnitude. The preliminary modeling results show that the fault deformation involving co-seismic failure and aseismic slip can take place by a small perturbation of the fracture fluid pressure (<0.1 MPa) when the injection location is set close to the fault that is under critical stress state by the in-situ stresses.
This modeling work can be used practically in geothermal industry as a prediction tool to get an idea how the subsurface reservoirs with fractures and faults would behave by hydraulic stimulation treatment and the treatment should be designed in order to mitigate the effect of induced seismicity with large magnitudes (e.g. M>3) and to avoid re-activation of nearby faults.