

## Project Abstract

A primary challenge in earthquake modeling is to decide which fundamental mechanisms are required to accurately reproduce the earthquake process, and which are less important. With this in mind, we compared two modeling methods that incorporate different levels of approximation in the earthquake process. The first model, DYNA3D, solves the full dynamic equations of motion (including the frictional interaction on the fault and wave propagation) by the finite element method, but uses a simple slip-weakening friction law. The second model rapidly simulates large earthquake sequences by applying quasi-static approximations with rate- and state- dependent friction and long-range elastic interactions. We investigated how different aspects of the model (e.g. initial stress, and rupture location) affect different features of the simulated ruptures (e.g. slip and stress drop) and to what extent the models agreed with each other on the resulting properties. We found the quasi-static model can qualitatively reproduce the general slip and stress drop patterns of earthquake rupture given by the fully dynamic model as well as produce different modes of rupture (crack-like and rupture pulses). As expected, rupture velocity and the details of the slip rate function agreed the least.