Geophysical Research Abstracts
Vol. 19, EGU2017-11242, 2017
EGU General Assembly 2017


# Dynamic Finite Element Modelling of Slip: Overshoot and Surface Deformation

Arsalan Sattari and David Eaton
University of Calgary, Calgary, Canada (asattari@ucalgary.ca)

A dynamic finite-element approach is used to investigate stress drop, overshoot and surface deformation caused by earthquakes on a critically stressed fault with non-negligible cohesion. A simple slip weakening model triggers slip on the fault, based on dynamic values of friction and cohesion which are less than the static values. A critically stressed fault is subject to failure in response to a small perturbation in stress, such as a pressure increase due to fluid injection. Overshoot is calculated to represent between 18.5 to 20.5 percent of the stress drop, depending on the cohesion and stress drop. Coseismic stress changes that emerge from our calculations imply a reduction in shear stress on a fault with no accompanying change in normal stress, a simple scenario that has been invoked as an assumption in past studies. Our kinematic approach predicts scaling relationships for seismic moment, fault area and average slip that are broadly consistent with well established observations; however, we obtain a non-dimensional scaling factor of 1.84 for stress drop on a dipping reverse fault that is subject to depth-dependent stress conditions, which is higher than a previous determination of 0.9 assuming a uniform stress state on the fault. This study also shows that surface deformation due to shallow reverse faults can be higher than the expected surface deformation determined using Okada's elastic model.