T228-P005 **Room: Poster Session Hall** **Time: May 29**

Rupture propagation beyond fault discontinuities: significance of thermal pressurization

Yumi Urata[1]; Keiko Kuge[1]; Yuko Kase[2]

[1] Dept. of Geophysics, Kyoto Univ.; [2] Active Fault Research Center, AIST, GSJ

We show that rupture can jumps from a drained fault to an undrained fault easily due to thermal pressurization, by performing 3-D numerical simulations with thermal pressurization for spontaneous dynamic ruptures.

Earthquake rupture often occurs over several faults. Numerical simulations suggested that rupture sometimes cannot propagate on the second fault, unlike real earthquakes (Kase et al., 2002, JGU meeting).

Fluid and pore pressure evolution can affect dynamic propagation of earthquake ruptures owing to thermal pressurization, because frictional heating caused by earthquake slip can increase pore pressure, then decrease effective normal stress on a fault surface (e.g., Mase and Smith, 1985). The thermal pressurization is a candidate to cause discrepancies between real earthquakes and previous numerical simulations, and its effect on rupture jumps beyond fault discontinuities has not been investigated at all.

In this study, we investigate the effect of thermal pressurization on spontaneous dynamic rupture propagation beyond fault discontinuities. We put two vertical strike-slip square faults in a semi-infinite, homogenous, and elastic medium. The second fault is parallel to the first one. The faults reach the free surface. The lengths of the first and second faults are 6 and 3 km, respectively. The numerical algorithm is based on the finite-difference method by Kase and Kuge (2001). Rupture is initiated by increasing shear stress in a small patch close to a side edge of the first fault, and then proceeds spontaneously, governed by a slip-weakening law with the Coulomb failure criteria. On an undrained fault, we allow effective normal stress to vary with pore pressure change due to frictional heating by the formulation of Bizzari and Cocco (2006). We examine two models with the same fault geometry, Models A and B. In Model A, both faults are drained. In Model B, the first fault is drained, but the second one is undrained.

For fault geometries that rupture cannot propagate from the first to the second faults in Model A, we can see in Model B that rupture can successfully jump to the second fault. In Model B, a small rupture crack induced on the second fault, which dies out in Model A, grows quickly by thermal pressurization. The results of our numerical simulations are important to judge whether or not rupture can jump from one fault to another. Moreover, our results imply that the existence and nature of fluid around fault discontinuities may be diagnosed by comparing rupture jumps between our numerical simulations and real earthquakes.