S044-005 Room: Convention B Time: May 29 14:45-15:00

Simulation of earthquake rupture process in heterogeneous stress field estimated from active fault informationS

Yuko Kase[1], Haruko Sekiguchi[1], Haruo Horikawa[1], Tatsuya Ishiyama[1], Kenji Satake[1], Yuichi Sugiyama[1]

[1] Active Fault Research Center, GSJ/AIST

Laterally heterogeneous stress field is introduced into dynamic rupture simulation for realistic models of future earthquakes. We estimated heterogeneous stress field from a distribution of slip rate, and simulated heterogeneous rupture propagation and slip distribution. We simulated dynamic rupture process on the Uemachi fault system.

The heterogeneous stress field is assumed to be caused by the heterogeneous horizontal principal stresses. At first, we assume a distribution of slip on the Uemachi fault system from a distribution of vertical slip rate along strike of the fault, and calculate a distribution of static stress drop (Sekiguchi et al., in this meeting). The estimated static stress drop is used as stress drop in dynamic rupture simulation. Second, we assume a vertical principal stress to be equal to the overburden load and coefficients of friction to be uniform on fault, and calculate the horizontal principal stresses from strike (left-lateral-slip is positive) and dip (reverse-slip is positive) components of the static stress drop. A ratio of strength excess to stress drop (the S value; Andrews, 1976, JGR) depends on the coefficients of friction. We search for values of the coefficients of friction in case that a rupture can propagate. Thus, we estimate heterogeneous distributions of initial shear stress and static and dynamic frictional stress.

On the Uemachi fault system, there are two peaks of the dip component of static stress drop, and the dip component of static stress drop is negative between these regions. These results correspond to distribution of vertical slip rate along strike: there are two peaks of vertical slip rate along the strike.

A fault model is constructed from structure of basement and fault traces (Kase et al, 2002). The Uemachi fault system extends about 45 km and dips 60 degrees. An initial crack is assumed to be located near the northern edge of fault system, since strength excess is small and the dip component of stress drop is positive and large.

We simulated rupture processes, varying values of the coefficients of friction. Simulation results showed two kinds of rupture processes: rupture propagating on the whole fault (Mw 6.8) and that propagating only on the northern region with large stress drop (Mw 6.5). The portion between two regions with large stress drop, where strength excess is larger than around and the dip component of stress drop is negative, works as a barrier. In case of large static coefficient of friction, a rupture cannot propagate across the barrier. In case of small static coefficient of friction, on the other hand, a rupture terminates at the barrier for a time, and then propagates across it. The calculated distribution of slip showed two peaks corresponding to the distribution of stress drop. Rupture processes depend on values of coefficients of friction and an assumed distribution of slip. We need to improve the method of assuming these parameters.