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# Simulation of earthquake rupture process using geological information: Application to the Uemachi fault, Osaka, Japan

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In order to understand fault behaviour and predict strong ground motion, it is important to simulate realistic rupture processes of future earthquakes. We introduce geological information into model parameters of dynamic rupture simulations: fault model and stress field. We simulate rupture on the Uemachi fault.

A fault model is constructed from structure of basement and fault traces. The Uemachi fault is a reverse fault. The dip and rake angles are 60 and 90 degrees, respectively. The length of the fault is about 45 km, and the fault is composed of two main segments. Unfortunately, surface traces are not always clear, and the subsurface fault structure deeper than a few kilometers is unknown. There is no information on a possible rupture initiation point. For these reasons, we carried out many simulations, varying distance and offset between two segments and the location of an initial crack.

Principal stresses are assumed to be proportional to depth. A minimum principal stress is assumed to be equal to the overburden load, since the Uemachi fault is a thrust fault. EW maximum principal stress axis is assumed from a tectonic stress. We varied depth-dependence of a maximum principal stress and a ratio of strength excess to stress drop (the S value; Andrews, 1976, JGR), and carried out preliminary calculations of dynamic rupture processes using a finite difference method. We searched for the values to be consistent with a geological observation: the vertical dislocation of about 3 m on the earth's surface.

Simulation results showed two different rupture length: rupture terminating at the fault stepover and that propagating across the stepover. Whether rupture propagates across the stepover depends on the location of an initial crack and distance and offset between the two segments. In a simulation using the observed values of distance and offset between the segments, a rupture does not propagate across the fault stepover. This result can be interpreted in two ways: rupture seldom propagates across the fault stepover, or the two faults are closer or connected in a deep portion. The fault geometry and paleoseismology of the Uemachi fault are currently being investigated. We need to improve the fault model and stress field by using further geological information. On the other hand, interpretations of simulation results may be useful for planning active fault surveys.

Using the dynamic rupture processes calculated in this study and an 3-D underground structure model in Osaka region (Horikawa et al., in this meeting), Sekiguchi et al. (in this meeting) carried out ground motion simulations. Our attempts is to make reliable ground motion prediction, using an 3-D underground structure model and dynamic rupture scenarios including geological information.