S143-005 **Room: IC** **Time: May 23 10:00-10:15**

Quasi-static Analysis on Strike-slip Faulting in Layered Media -FEM-beta Approach-

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On theoretical study of earthquake faulting, rupture propagation has been modeled as growth of a crack in an elastic body. Analytic solutions only exist for planar crack in homogeneous media, though actual earthquakes are generated in inhomogeneous media with non-planar fault surface. In order to handle these two factors, numerical analyses are required: FEM and DEM are two major candidates for the purpose. They both are favorable for arbitrary inhomogeneous media. FEM is, however, usually inadequate for rupture growth analyses because of its smooth and overlapping characteristic functions. On the other hand DEM is quite suitable for that, its equivalence with the continuous body model is, however, not always clear. Recently, FEM-beta (Oguni et al., 2004) has been newly proposed as a method with both advantages of FEM and DEM, i.e., this method can be regarded as implementation of non-overlapping discontinuous shape function to FEM, or reformulation of DEM in the framework of FEM.

Here we develop numerical code for the analysis of mode III rupture (2D strike-slip fault) by using FEM-beta algorism. In proximity of layer discontinuities, Bonafede et al. (2003) derived analytic solutions for the stress change induced by mode III crack. However, the shape of and the position on the crack were assumed beforehand, so that the question how the spontaneous crack growth in it is not openly investigated. Here we tackle it by using FEM-beta.

In order to determine the quasi-static mode III crack growth advancing from underground to the earths surface, we consider a layered half-space with low-rigidity layer overlying a half-space containing a dislocation plane. Rigidity ratio of the lower vs. upper layers is assumed as 10:1. As a boundary condition, we presume initial stresses with 0.5MPa for the lower and 5MPa for the upper. For crack advancement, we adopt a simple maximum stress criterion. We calculate stress distribution under the quasi-static condition and find a element with the largest maximum-shear-stress. If the stress value meets a failure criterion (here we set 10:1 for the lower:upper), the corresponding spring is chosen to be broken. Then stress distribution is recomputed for the broken state and another interface to be broken is found. This step is repeated throughout the simulation.

Our analysis shows that the crack surface has gone straightly with no branching nor bending in the layered half-space model. This is quite the same way of rupture in homogeneous media, showing the direction of the stress concentration always coincides with the original planar crack direction. On the other hand, magnitude of stress concentration has shown increasing trend below the interface between the different media, whereas it has decreased above, especially just above, the interface. It suggests that there is some possibility the rupture would be stopped just after piercing the interface.