

Kinematic earthquake cycle simulation using 3-D viscoelastic FEM model -focus on internal deformation fields -

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Several previous studies on postseismic deformation of mega-thrust earthquakes at subduction zones show that deformation patterns and velocities at the Earth's surface strongly depend on viscosity of the upper mantle, the existence of subducting elastic plates, the configuration of the elastic crust and so on.

However, 3-D complicated patterns of viscoelastic relaxation in the upper mantle and their effects on the surface deformation have not been clearly studied so far.

To research this, two types of 3-D viscoelastic FEM models are constructed. One has trench-perpendicular heterogeneities such as the configuration of Moho discontinuity or the wedge mantle, though the FEM discretization in the trench-parallel direction is uniform. The other has trench-parallel heterogeneities of the complicated configuration of the subducting plate interface. These models consist of several millions of DOFs, and the average finite element mesh size is about several-kilometer. The difficulty of post processing of FEM calculation is caused by unstructured mesh division and variable sizes of finite elements. In order to utilize usual data analysis (visualization) procedure for structured grid data, calculated physical values on Finite element nodes are re-mapped onto the structured grids using the interpolation functions of FEM calculation. As a tentative result, the existence of the viscoelastic mantle wedge enlarges internal deformation velocities after large interplate earthquakes. In the presentation, details of viscoelastic deformation inside of the model space will be demonstrated.