Integrated Predictive Simulation System for Earthquake and Tsunami Disaster (2) Strong Motion and Tsunami Generation

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In this project we conduct an integrated simulation of the strong motion and tsunami based on the result of dynamic rupture simulation conducted by the subsection of the Earthquake Generation in order for mitigation of earthquake and tsunami disasters associated with large subduction-zone earthquakes. In the result of our simulation for the forthcoming Nankai Earthquake, It is shown that the long period ground motion is generated strongly in the forward rupture direction. Furthermore, the tsunami up to 7 m attacks the coast in wide region along the source area and continues for a long time. In the present simulation the ground motion due to the earthquake is firstly calculated by solving equation of motions with heterogeneous source-rupture model and 3-D heterogeneous subsurface structural model. Tsunami generation and propagation in heterogeneous bathymetry is then simulated by solving the 3-D Navier-Stokes equation. Ground motion and tsunami simulations are combined through an appropriate kinematic boundary condition at the seafloor. The accuracy of the integrated simulation code is validated by comparing the simulation results with the data recorded by cabled ocean-bottom pressure gauges, off Cape Muroto for the 2004 Off Kii-Peninsula earthquake (M 7.4). The result of the simulation demonstrates the observed dispersive tsunami from an inslab event very clearly, indicating the effectiveness of our simulation code for modeling tsunami waveform from subduction zone earthquakes. It also suggests that the fault strike of the inslab earthquake can be constrained strongly by the directional dependence of dispersive tsunami. In order for large-scale and higher-resolution simulation of ground motion and tsunami we tuned up a parallel simulation code for ground motion simulation suitable for a recent development of the Earth Simulator and for a newly developing next-generation petaflops supercomputer which will appear in Kobe in 2012.