Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SSS023-P11 Room:Convention Hall Time:May 24 16:15-18:45

Simulation of Strong Ground Motions during the 2009 Suruga-bay Earthquake using Empirical Green's Function and 3D-FEM

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Strong ground motions during the Suruga-bay earthquake occurring on August 11, 2009, were observed in the Hamaoka Nuclear Power Plant. The maximum acceleration on the basement of unit No. 5 reactor twice bigger than other sites was obtained during the main shock. In this study, we tried to simulate the strong ground motions of observation sites in the Hamaoka Nuclear Power Plant during the main shock using the hybrid method of the empirical Green's function method and the 3-D finite element method.

First, we tried to simulate strong ground motions at underground observation sites (3G1S) by the empirical Green's function method during the main shock. We selected an aftershock as the empirical Green's function for each segment of the source fault. For the asperity 1 and asperity 2, the observed records from an aftershock occurring at 12:42 on August 13, 2009 and those from another aftershock doing at 18:11 August 13, 2009 are used, respectively.

Next, strong ground motion in the seismic bedrock with Vs of 3.0km/s during the main shock was simulated considering 1-D velocity structure model.

Finally, strong ground motions at observation sites in the Hamaoka Nuclear Power Plant during the main shock were simulated using the three-dimensional finite element method considering three-dimensional velocity structure down to 10km, and input ground motion in the seismic bedrock mentioned above. The results indicate that the maximum accelerations in simulated waveforms were similar to the observed one.

Keywords: empirical Green's function method, 3-D finite element method, 2009 Suruga-bay earthquake, simulation of strong ground motions