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3-D underground structure model and simulation of seismic motions in the Mikawa area, Aichi prefecture

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Mikawa area is one of the most eminent industry one in Japan and when Tokai and Tonankai earthquake will occur in the near future, it concerned that large economic and human loss will happen in this area. However, three dimensional under ground structural model is not clear still enough for the estimation of the strong ground motions in this area. In this study, we constructed the seismic observation net (Ai-net) in the Mikawa area and we estimated the three dimensional under ground structural model using the receiver function method from the obtained records at Ai-net To accomplish it, we simulated seismic ground motions at observation sites at the Ai-net using the three-dimensional finite element method

The seismic ground motion array observation has been continued after 2005 in the Miakwa area. Acceleration type strong motion seismometers with three components were installed at 30 sites in this area. We calculated the receiver functions from 7 seismic records obtained at each station, and we identified the underground structural model using the simulated annealing method (Ingber (1989)). Based on numerical experiments it is indicated that P-wave velocities, S-wave velocities and Q values of individual layers are inverted very well. Moreover, we constructed the three dimensional under ground structural model in this area obtained from P-wave and S-wave velocity profiles of thick sediments at each station.

Finally, we simulated seismic ground motions at observation sites at the Ai-net using the three-dimensional finite element method considering three-dimensional velocity structure down to 10km. The results indicate that the maximum accelerations in simulated waveforms were similar to the observed one.

Keywords: 3-D underground structual model, simulation of the seismic ground motion, finite element method, seismic observation