

Development and application of large scale numerical simulations for earthquake generation, ground motion and non-linear soil amplification

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As one of the Post-K priority issue projects, named “Development of Integrated Simulation Systems for Hazards and Disasters Caused by Earthquakes and Tsunamis” , we have developed the codes of large scale numerical simulations for earthquake generation, ground motion and non-linear soil amplification based on the HPC technology for non-linear finite element simulation (Ichimura et al., 2015; Fujita et al., 2016; Ichimura et al., 2018). It is possible to calculate static deformation and elastic wave propagation for 10^{12} degree-of-freedom FEM model. These codes are preparing to run on the “Fugaku” supercomputer. Furthermore, based on the developed technology, we are planning to construct high-fidelity FEM applications which government and companies will use for crustal deformation calculations, long-period ground motions, and non-linear soil amplification due to great earthquakes such as in Nankai trough, Sagami trough, etc. We are also planning to calculate large-scale viscoelastic crustal deformation and elastic wave propagation for the realistic Earth structure. These results will be used for reference of static and dynamic Green’ s functions using three-dimensional heterogeneous underground structure.

Keywords: FEM, earthquake, Large scale simulation