# Development of the Simulation Technology for Strong Ground Motion in a Large Basin Area

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**Abstract**

It is effective in mitigating earthquake disasters to predict strong ground motions from theoretical seismic wave simulation, and to take countermeasures against the results. Long-period ground motions become an important issue as well as short-period one, because of recent rapid increase of large-scale structures such as high-rise buildings, oil storage tanks, and long-span bridges. The long-period ground motions generated by moderate to large earthquakes are especially remarkable in large plains and basins, such as the Kanto Plain. An accurate seismic source model and a realistic large 3D structural model are required in a high-accuracy calculation of seismic wave propagation in the broadband frequency range. However, it is difficult to perform these simulations using normal PC cluster system due to the limitation of computing ability.

We transplanted the parallel FDM code, k-fdm3d, for calculation of seismic wave propagation based on physics of seismic source and elastic wave theory to the Earth Simulator last year. In this study we performed code tuning to adopt the large-scale simulation. The performance of the code became about 48 times faster than the one last year. Using the code we carried out the numerical simulation of seismic wave propagation and strong motions for the 1923 Kanto earthquake (M7.9) in the Kanto Plain area. We could stably simulate the seismic wave propagation until one and two Hz using the 3D structural model which have minimum wave velocity of 350 and 600 m/s, respectively. We also confirmed that the synthetic waveform could explain the observed waveform.

**Keywords:** Wave Propagation, FDM, Long-period Ground Motion, the 1923 Kanto earthquake