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Seismic Wave Propagation in the 3D Basin Structure of Nobi Plain

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We carried out numerical 3D simulations of ground motions to see the wave propagation character in the Nobi Plain. In this area, many large earthquakes occurred in the past, such as 1891 Nobi earthquake, 1944 Tonankai earthquake and 1945 Mikwa earthquake. 3D subsurface structure of Nobi Plain has recently been investigated by Aichi metropolitan governments. We referred to this model together with bouguer anomaly data to construct a detail 3D basin structure model for Nobi plain, and conducted computer simulations of ground motions. We first evaluated the ground motions for two small earthquakes (Mj4~5). We compare the observed seismograms with simulations to evaluate the validity of the 3D model. For the 3D simulation we used a 32nd-order staggered-grid FDM to solve the equation of motions in horizontal directions, and a conventional 4th-order FDM is used in vertical direction. The simulation model is 128km by 128km by 30km, which is discritized at variable grid size of 125-250m in horizontal directions and of 62.5-125m in vertical direction. We assigned a minimum shear wave velocity is Vs=0.4km/s, at the top of the sedimentary basin. The seismic sources for the small events are approximated by double-couple point source, which impart seismic wave at frequency bellow 1Hz. We used a cluster of eight Intel Xeon PCs. Comparisons between the observed waveforms computer simulations agree well, so that it is indicating the effectiveness of the 3D model. We therefore conducted a large scale numerical simulation to estimate the pattern of strong ground motion for the 1945 Mikawa earthquake. We employ the fault rupture model of Kikuchi et al (2002) which is derived from the inversion of regional records. The simulated wavefield from the Mikawa earthquake is dominating in large surface wave at amplitude over 10cm/s in the center of the Nobi plain. We also find directivity effect of the fault rupture from south to north in the PGV distribution and waveforms. This explains the major pattern of seismic intensity and the distribution of strong motion damage during the earthquake.