Oral | Symbol S (Solid Earth Sciences) | S-SS Seismology

[S-SS23_1PM2]Strong Ground Motion and Earthquake Disaster

Convener:*Kentaro Motoki(Kobori Research Complex), Chair:Kentaro Motoki(Kobori Research Complex)
Thu. May 1, 2014 4:15 PM - 5:45 PM 211 (2F)

Strong ground motion has social impacts as it induces earthquake disasters. We solicit contribution on any seismological topics related to strong ground motion that includes, but are not limited to, source processes, wave propagation, and site effects. We also welcome contribution on earthquake related disaster mitigation.

5:00 PM - 5:15 PM

[SSS23-P15_PG]Long-Period Ground Motion Simulation in the Kanto Basin with/without Accretionary Prism

3-min talk in an oral session

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Keywords:Long-period ground motion, Accretionary prism, Nankai trough, Kanto basin

Large earthquakes in subduction zones generally excite long-period seismic waves. Once these waves enter into basins filled with thick sedimentary layers, they develop and result in largely-amplified long-period ground motions. Such long-period ground motions have caused damage to large-scale buildings during some earthquakes. For the 2003 Tokachi-oki earthquake (M_w 8.3), long-period ground motions with a dominant period of 7-8 seconds were observed in the city of Tomakomai, located on thick sedimentary layers and at a distance of about 250 km from source region. The long-period ground motions triggered the sloshing in many oil tanks, and two of them caught fire (Koketsu *et al.*, 2005). For the 2011 Tohoku earthquake (M_w 9.0), long-period ground motions were observed at a large distance from source region such as the Osaka and Kanto basins, where some tall buildings shook over about 10 minutes (JMA, 2011).The large earthquakes along the Nankai trough which are expected to occur in the near future can generate long-period ground motions in the Osaka, Nobi and Kanto basins (Furumura *et al.*, 2008). Along the Nankai trough, a accretionary prism composed of soft materials with a thickness of several kilometers lies near the toe of the Eurasian plate. Such prism does not exist at the Japan or Kuril trench. For this reason, in evaluating the long-period ground motions during the large earthquake occurring along the Nankai trough, we should consider the additional effect of accretionary prism on seismic waves. Yamada and Iwata (2005) simulated long-period ground motions for the Kinki region, and concluded that the existence of accretionary prism reduces the amplitudes of direct S-waves and elongates long-period ground motions. In this study, we performed simulations of the long-period ground motions in the Kanto basin for the foreshock (M_w 7.1) of the 2004 off the Kii peninsula earthquake on 5 September at 19:07 (JST) in order to examine the effect of accretionary prism.In the simulation, we assumed a point source. Except its depth, its source parameter and source time function were the same as those of Yamada and Iwata (2005). We located the source at a depth of about 16 km, which is slightly shallower than that of Yamada and Iwata (2005), to fit it to the depth of the subducting Philippine Sea plate. We used the Japan Integrated Velocity Structure Model (Koketsu *et al.*, 2008, 2012). We calculated long-period ground motions using the finite element method with voxel meshes (Ikegami *et al.*, 2008). The frequency range of the calculation was 0.05-0.3 Hz, and the time duration of synthetic waveforms was set to be six and a half minutes from the rupture starting time. Our simulation model covered an area of 564 km×198 km and extended to a depth of 61 km. An absorbing boundary with a width of 54 km was also introduced outside the simulation model. According to the velocity structure,

the model was discretized by variable voxel meshes with the smallest size of 175 m. We also assumed a velocity structure model without accretionary prism, where the S-wave velocity of accretionary prism (1.0 km/s) is replaced with 3.2 km/s. Then, we calculated waveforms in this model and compared them with those in the accretionary-prism model to examine the effect of accretionary prism.Our simulation shows that, compared with the velocity structure model without accretionary prism, the long-period ground motions for the accretionary-prism model have smaller amplitudes for direct waves but larger ones for later phases. Our results are consistent with those by Yamada and Iwata (2005). In the accretionary-prism model, the waves trapped in the accretionary prism are continually converted to surface waves, and the incident surface waves to the Kanto basin propagate in the basin. We confirm that this process contributes to the reduction of direct waves and the amplification of later phases in the