S152-P028 **Room: Poster Session Hall** **Time: May 18**

A Validation of Hanging-Wall Effects on Ground Motions for Crustal Earthquakes

Masaru Tsukagoshi[1]; Kazuki Koketsu[1]; Hiroe Miyake[1]

[1] Earthq. Res. Inst., Univ. Tokyo

For earthquake disaster mitigation, many attenuation relationships are proposed as empirical procedures to predict strong ground motions during large earthquakes. In case of reverse-faulting crustal earthquakes, there are some reports that the horizontal peak ground accelerations (PGAs) of near-sources are larger than estimated ones calculated by the empirical ground motion models (e.g. Abrahamson and Somerville, 1996). This phenomenon called the hanging-wall effect is obviously when the observation points are located above the fault rupture on the hanging-wall. Because this effect is not negligible, the NGA project recently introduced the hanging-wall effect to the empirical ground motion models in U.S. (e.g. Abrahamson and Silva, 2008). On the other hand, there are only a few studies to investigate the hanging-wall effect in Japan (Si and Midorikawa, 2005; Uchiyama et al., 2008). In this study, we evaluate and discuss the hanging-wall effect on near-source ground motions using dense strong motion networks of recent reverse-faulting crustal earthquakes in Japan.

First, we selected 7 reverse-faulting crustal earthquakes in Japan from 2004 to 2008. Then we calculated PGAs and peak ground velocities (PGVs) in the near-source regions using strong motion records of K-NET, KiK-net, JMA, and others. The 7 earthquakes are the 2004 Niigata-ken Chuetsu earthquake (Mw 6.6) and three aftershocks (Mw 5.9-6.3), the 2007 Noto Hanto earthquake (Mw 6.7), the 2007 Niigata-ken Chuetsu-oki earthquake (Mw 6.6), and the 2008 Iwate-Miyagi Nairiku earthquake (Mw 6.9). When waveforms were available, PGAs were calculated from the seismograph, and PGVs were calculated by applying the bandpass-filter of 0.1-10Hz and integrated from the accelerations. If waveforms were not released, we used PGAs open to the public. Second, we calculated the residuals between observed values and estimated ones using attenuation relations. Then, we estimated the relationship between residuals and fault distances for the horizontal and vertical components of PGAs and PGVs. We used the empirical attenuation relationships of Si and Midorikawa (1999) for the horizontal components and Satoh (2008) for the vertical components. We used values on the ground surface except horizontal PGVs that were corrected using Vs30 to obtain values on the engineering bedrock. We used the definition of Uchiyama et al. (2008) to categorize stations on the hanging-wall or foot-wall side.

We found that there is a trend that residuals are small on the foot-wall side and that residuals are large on the hanging-wall side. We divided the fault distances at 5 km on the hanging-wall side, and calculated the average of residuals between the intervals. Within the range of 20 km of the fault distances, horizontal PGAs and PGVs reach a maximum increase of 82% and 124%, respectively. This value is larger than that of the 1994 Northridge earthquake (51% increase) estimated by Abrahamson and Somerville (1996). Furthermore, vertical PGAs and PGVs reach a maximum increase of 130% and 396%, respectively. It means that the hanging-wall effect on vertical ground motions is larger than that on the horizontal ground motions. We also confirmed that the handing-wall effect on PGVs is larger than that on PGAs. Some earthquakes showed larger residuals on the foot-wall side due to the site amplification effect or rupture directivity effect. In the future, we analyze not only Japanese earthquakes but also earthquakes in the world to increase the data and built up the reliability of the hanging-wall effects.

Acknowledgement
We acknowledge NIED for providing K-NET and KiK-net data and JMA, NILIM, PARI, and TEPCO for strong motion data.