[JJ] Evening Poster | S (Solid Earth Sciences) | S-SS Seismology

[S-SS14]Strong Ground Motion and Earthquake Disaster

convener:Masayuki Kuriyama(Central Research Institute of Electric Power Industry)
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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.

[SSS14-P14]S-wave velocity and attenuation structure as estimated from deconvolution analysis of KiK-net records

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Shallow shear-wave velocity and attenuation structure strongly affects amplification characteristics of earthquake ground motion. Therefore, it is important to estimate such structure for prediction of strong ground motion. Fukushima et al. (2016) estimated S-wave quality factor (Qs) beneath KiK-net borehole seismic stations from the spectral ratios between incident and surface reflected waves that appear on the deconvolution records between borehole and surface receivers. However, other phases that are reflected from layer boundaries also appear on the deconvolution records in addition to the incident and surface-reflected phases, and these phases have important information about S-wave velocity and attenuation structure. Therefore, we try to estimate one-dimensional S-wave velocity and attenuation structure by modeling all parts of these deconvolution records.

We chose CHBH10 (CHIBA) station because the theoretical two-way shear-wave travel time between the surface and borehole receivers is longer than 0.5 seconds. We used seismograms whose epicentral distances are smaller than 150km and whose peak ground accelerations at the surface are smaller than 100gal. First, we deconvolved borehole records by surface records for the 20s-long time window starting from the S-wave onset. Deconvolution was performed in the frequency domain, and the spectra were smoothed by Parzen window with a width of 0.24Hz for stabilization. Then we calculated S-wave quality factor Qs from incident and reflected waves on these deconvolution records following Fukushima et al. (2016). Second, deconvolution records were sorted by incident angles() at the borehole. Incident angles were calculated using JMA2001 velocity structure (Ueno et al. 2002). Deconvolution records are stacked for the cosine of the incident angle (cos) of larger than 0.995. Finally, we estimated one-dimensional shear wave velocity structure with the estimated Qs so as to explain the stacked deconvolution record. Referring to the velocity logging data, we set 7 layers. We used MCMC-method for that purpose. After 10,000 iterations, we found that S-wave velocity ranges from about 400m/s to 1000m/s at depths shallower than 1500m, and is larger than 2000m/s at depths deeper than 1500m. We still have a room to improve the accuracy of the structure estimation by adjusting the parameters of MCMC-method and by adding oblique-incident data. We also plan to deal with other KiK-net stations.

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