S225-P001 **Room: Poster Session Hall** **Time: May 28**

Estimation of the low-frequency Q-value (below 1Hz)

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Studies that estimate low-frequency Q-value are very scarce. In most of them estimations are made by eye or by trial and error, without any systematic inversion approach. In this study, we propose nonlinear waveform inversion methodology and estimate low-frequency Q-value from the observation data. Results will help us to improve accuracy of the numerical simulations of the long-period waves. The inversion methodology used in this study consists of three steps.

Step 1. Compile 1-D velocity models for every observational site in the target area, source region of the 2000 West Tottori earthquake. For this, in depth range more than 3km we used velocity model estimated by regional seismic exploration studies. For shallow depth, less than 3km, we applied the receiver function inversion method (Miyakoshi et al., 2003).

Step 2. To test results of the receiver function inversion, we compared synthetic and observed waveforms. To calculate synthetic waveforms, source mechanism and seismic moment data estimated by the F-net are used. On this step, we applied low-pass filter both to the observed and simulated records, compared them and selected records that have similar waveforms. In most cases the non-similarity of waveforms can be explained by next three reasons: (1) high low-frequency noise level, (2) errors of the source mechanism determination, (3) complex velocity structure under the site that cannot be modeled by 1-D structure.

Step 3. Use grid search method to estimate Q-value and linear inversion to estimate corrections to the source and site effects.

Results of inversion (Figure 1) show that estimated value in low-frequency range, Q = 80-180, agrees well with the results of spectral inversion in high frequency range, in case of a realistic ray-theory geometrical spreading is considered. Estimated source and site correction coefficients are small, 1.3 - 1.5 in average, which confirms correctness of the estimation of the seismic moment by F-net, and correctness of the shallow velocity structure estimated by the receiver function inversion.

Figure 1. Comparison of the estimated low-frequency Q-value with the high-frequency Q-values from other studies. Optimal Q=180 and minimal effective Q=80 are shown in the valid frequency range 0.5-1Hz. Results for the high-frequency Q-value are divided into 4 groups: (1) results for the same region (Tottori), (2) results for tectonically similar region (Kinki), (3) results of spectral inversion considering realistic ray-theory geometrical spreading (solid lines), and (4) results of spectral inversion considering simplified spherical geometrical spreading (dashed lines).

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Reference

Miyakoshi Ken, Cho Ikuo, Petukhin Anatoly, 2003, Delineation of slip distribution of heterogeneous source, Proceedings of the 2nd Symposium of Study on the master model for ground motion prediction toward earthquake disaster mitigation, 2003, Tokyo, p.87-92 (in Japanese).