Geophysical Research Abstracts
Vol. 12, EGU2010-8179, 2010
EGU General Assembly 2010

Detecting subsurface reflectors in southwestern Japan using ambient seismic noise

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We will demonstrate to detect several subsurface reflectors in southwestern Japan using ambient seismic noise. There are several subsurface reflectors or possible reflectors shown in previous studies. Examples are mid-crust reflector in Tamba area (near Osaka and Kyoto), reflective Moho discontinuity in Shikoku district (e.g. Gupta et al., 2009, JAES), and upper boundary of Philippine Sea plate which is gently subducting beneath Shikoku district (e.g. Shiomi et al., 2004, JGR).

We computed the auto-correlation functions (ACF) of continuous short period seismograms obtained from Hinet (NIED) and DPRI (Kyoto Univ.) seismic networks. We divided the continuous record into 1 hour segments and applied 'running absolute mean normalization' (Bensen et al., 2007, GJI) and band-pass filtering. In this analysis, pass band of the filter was assumed 0.5 Hz – 1.0 Hz. Then we stacked the ACFs of at least 1.5 years long for each single station. In this frequency range, the shapes of ACFs are rather temporally stable although the slight seasonal change of the input signal recognized from the corresponding cross-correlation functions among the stations. Thus we stacked the ACFs of all year around without selecting particular season. Finally we adopted automatic gain control (AGC) filter to enhance the later phases of the stacked ACFs.

Preliminary result shows several phases recognized in some regions. Lag times of prominent phases of one region seem to be different from those of the other region. Although these phase are not identified in this stage, we are investigating the source of the phases. If this method is successfully applied, we would able to delineate precise distribution of subsurface reflectors beneath Japan using the dense seismic network. It will contribute to understand the behavior of possible existing fluid beneath active faults that affects the occurrence of the shallow crustal earthquakes as well as shallow plate boundary earthquakes.