Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SSS015-07 会場:ファンクションルームA 時間: 5月28日15:30-15:45

自己相関・相互相関解析に基づく2008年岩手・宮城内陸地震震源域の地殻内反射面検出の試み

Detection of crustal reflected waves in the 2008 Iwate-Miyagi Nairiku earthquake by seismic interferometry

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Hori et al. (2004) have detected S wave reflected phases from microearthquakes with epicenter distance of about 10-30km in the area includes the focal region of the 2008 Iwate-Miyagi Nairiku earthquake. Such S wave reflectors in crust can be interpreted as the presence of fluid in crust. Fluid would be significant factor of seismogenic process (e.g. Sibson, 2009, Okada et al., 2010). Distribution and origin of such reflectors allow us to understand the seismogenic process of inland earthquake. However, such detection of S wave reflector from natural earthquake is spatially limited because of inhomogeneous hypocenter distribution.
Seismic interferometry can reproduce the Green's function between two receivers by calculating cross-correlation of seismograms measured at their locations. Green's functions from ambient noise are used to estimate subsurface structure. Recently, Tonegawa et al. (2009) extracts Moho reflections as well as direct waves by cross-correlation of teleseismic data. In this study, we attempted to extract body wave, especially reflect wave from crustal reflector, from data observed by the dense aftershock observation of the 2008 Iwate-Miyagi Nairiiku earthquake.
High dense seismic network was operated to observe the aftershocks of the 2008 Iwate-Miyagi Nairiku earthquake. We used continuous data for about 3 months observed at these about 130 stations, whose separation distances are about 3 km.
First, we checked whether body wave can be retrieved by cross-correlation functions (CCFs) of ambient noise. Frequency range that we used is 0.2-0.5 Hz. 1-month stacked CCFs are computed in vertical and transverse component. CCFs of vertical component which are lined up by separation distance between two stations show two distinct phases, whose apparent propagation velocities are about 6 km/s and 3km/s. The phase with apparent velocity of about 3 km/s can be seen from the CCFs of transverse component. These phases with apparent velocity of 6 km/s and 3 km/s might be direct P and S wave, respectively.
Next, using data of earthquakes, we attempted to extract reflected wave by auto-correlation function (ACFs) and cross-correlation function. The frequency ranges of above 1 Hz are used to calculate ACFs and CCFs. Considering concept of stationary phase, wave components whose incident angles are near vertical are required to retrieve reflected wave from near horizontal reflectors. In order to satisfy this requirement, coda waves from intermediate-depth earthquakes are used. After computing ACFs and CCFs of coda waves, we convert ACFs and CCFs to depth

section by assuming P-to-P reflection. Depth sections show some phases in upper/lower crust, which can be interpreted as phase of reflected wave. Some parts of these phases are likely to be consistent to the reflect phases by vibroseis-reflection survey at the Dedana fault (Saito et al., 2008).