Seismic interferometry imaging of subsurface structure in the southernmost area of South Japanese Alps

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The Philippine Sea (PHS) plate is subducting beneath Japanese island arc toward northwest direction in the Tokai area. Seismological events such as low frequency events and slow slip events are occurred in this area. The eastern Tokai area is a transition zone from the collision zone of Izu arc to the subduction dominated area. To understand the subsurface structure in this area and fill the gap between the previous seismic surveys, a seismic observation using a dense seismic linear array composed of 34 receivers was conducted in 2013.
In this study, we applied seismic interferometry imaging to the seismic records of the array observation. Seismic interferometry can retrieve the reflection response between two receivers as if one receiver is a virtual shot and the other is a receiver by calculating the cross-correlation of the transmission responses recorded at the two receivers. For a single receiver, the reflection response recorded at the receiver from the same receiver is retrieved by calculating the autocorrelation of the transmission response recorded at the receiver. In this study, we used the regional deep earthquakes occurred in the Pacific Oceanic slab as the seismic sources to image the PHS plate and crustal structures. We conducted autocorrelation analysis and created reflection profiles for both P- and S-wave. Moreover, because the cross-correlation between two adjacent receivers is expected to be similar to the autocorrelation due to the shorter interval of stations of the array (about 1.5 km) than the wavelength of the seismic wave used in this study (about 4 km), we projected the cross correlation waveform between two adjacent stations to the mid-point of the two stations and imaged the reflection profile.
In the time section of the waveforms of the autocorrelation and the cross-correlation, as expected, the cross-correlation waveforms show high similarity to the autocorrelation waveforms. They also show some laterally-coherent phases both in the P-wave and the S-wave sections. After migration using the velocity structure obtained by the tomography analysis, the P- and S-wave reflection depth profile shows clear, coherent reflections at the depth of about 20 km ~ 30 km.
Various studies have been conducted to understand the subsurface structure in this area. Hirose *et al.* (2008) conducted the seismic tomography for southern Japan and revealed that the low V_S and high V_P/V_S area is located on the seismic region in the slab of the PHS plate. The top of this area corresponded to the upper boundary of the PHS plate estimated by the seismic refraction survey conducted by Kodaira *et al.* (2004). Kawasaki (2015) applied the receiver function analysis to the same seismic records as this study and estimated the upper boundary of the PHS plate and oceanic Moho at the depth of about 20 km and 30 km, respectively. In the poster session, from the comparison with above previous studies, we discuss the subsurface structures and its correspondence to the reflection profiles in this study.

Keywords: seismic array observation, seismic interferometry, reflection depth profile

