Estimation of Rayleigh Wave Phase Velocities around the Beppu Bay Area using Long-period Volcanic Signals

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We deployed a dense seismic array consisting of 12 broadband stations after late August 2014 around the Beppu bay area, Oita prefecture to investigate seismic velocity structure of deep sedimentary basin (Hayashida et al., 2015, JpGU Meeting). Around the same time of the installation, long-period volcanic tremors at Aso volcano (Kaneshima et al., 1996, Science) have been frequently generated [e.g. Sandanbata et al. (2015, JpGU Meeting); Matsuzawa et al. (2015, JpGU Meeting)] and our observation network clearly detected the corresponding signals. The characteristics of the detected signal are as follows: (1) the signal is dominant in the frequency range between 0.06 and 0.125 Hz, (2) the signal is particularly dominant in the vertical component, (3) the signal behaves much like Rayleigh wave, and (4) the signal propagates with a velocity about 3.2 km/s. As seismic interferometry analysis of observed seismic noise can yield surface-wave group velocities down to 0.2 Hz at the lowest due to small station-to-station distances (Hayashida et al., 2015, SSJ Fall Meeting), we utilize the abundant data for the volcanic signals to investigate surface-wave properties at lower frequencies and to validate deeper S-wave velocity structure around the bay. We selected 15 station pairs that have much smaller station-to-station distances compared to distances between Mt. Aso and the stations to assume plane wave-front propagation. Based on the phase differences of the band-pass filtered waveforms (vertical component) between two stations, we estimated Rayleigh-wave phase velocities in the frequency range between 0.05 and 0.12Hz at intervals of 0.001 Hz. The estimated phase velocities show dispersions and correspond well to those calculated from the existing crustal velocity structure model (Nishida et al., 2008, JGR) in the frequency range between 0.06 and 0.08 Hz (3.4-3.6 km/s) for most station pairs. On the other hand, at around 0.1 Hz, the estimated phase velocities show spatial variations reflecting complicated sedimentary structure beneath the area.

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