

Depth variation of the P- and S-wave velocities in the Kanto sedimentary basin inferred from seismic interferometry

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Information on the seismic velocity structure of the Kanto sedimentary basin is necessary for evaluating the strong and long-period ground motions in the Tokyo Metropolitan area for future large-to-great earthquakes. However, there are few studies on the depth variation of both P and S wave velocities of the sediment, except for the vertical seismic profiling (VSP) measurements at a limited number of deep boreholes. In this presentation, we will report the characteristics of the depth variation of both P and S wave velocities of the sediment on the basis of the seismic interferometry for P and S waves of local earthquakes.

Seismic waveforms of 160 local earthquakes recorded by the MeSO-net were analyzed in this study. The autocorrelation of vertical displacement waveform of P wave and SH displacement waveform from a single event were stacked over all events available at each station, respectively, to obtain the P- and S-wave reflection responses of the Kanto sedimentary basin. We successfully found clear P- and S-wave reflections from the bedrock (seismic basement) at 266 observation points. This result indicates that the P-wave seismic interferometry is effective for the exploration of deep sedimentary basin as well as S-wave interferometry. In our data, two-way travel time between the free surface and the bedrock of P-wave and S-wave (hereafter T_p and T_s , respectively) ranges from 0.5 s to 4.0 s and 2.0 s to 8.0 s, respectively. A graph showing T_p - T_s relation reveals that the trend of its variation is very similar to that reported at Iwatsuki deep boreholes from VSP measurement, even though there is a large scatter of data. Our results indicate that the ratio of P-wave velocity and S-wave velocity of the sediment is approximately 4 at a shallow depth (<0.5 km) and decreases down to 2 or less at a deep depth (>2.0 km) in the Kanto sedimentary basin.

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