

Seismic basement structure in and around the northeastern Kanagawa Prefecture inferred from the seismic interferometry

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1. Introduction

Detailed information on seismic basement structure is required for understanding the formation process of the Kanto sedimentary basin. In this study, we investigated the seismic basement structure in and around the northeastern Kanagawa Prefecture by the pseudo reflection seismic profiles from the seismic interferometry of local earthquake waveforms, with other geophysical information from geophysical exploration and deep borehole observation.

2. Data and Analysis

Twenty-seven thousand seismic waveforms of the local earthquakes recorded by SK-net, K-NET, and MeSO-net, were analyzed in this study. Following Yoshimoto et al. (2009), we analyzed the SH displacement waveforms of moderate size earthquakes. After the calculation of the autocorrelation functions of each SH displacement waveform with a length of 10s from the S-wave onset, autocorrelation functions from all events were stacked at each station to obtain the reflection response of S-wave for shallow underground structure.

3. Result

We found clear reflective surfaces in the pseudo reflection seismic profiles. As for the Atsugi-Yokohama survey line, it was found that significant reflective surface is inclined to the east from 2s to 6s in two-way traveltime. We interpreted this reflective surface as the top of the Shimanto belt, comparing the geological information at Sagami-hara borehole (Ozawa et al., 1999). The observation stations located at the north of the Tama River show very reflective surface compared with those located above the Shimanto belt. Since this reflective surface is observed at the vicinity of Koto borehole and Fuchu borehole, we interpreted this reflective surface as the top of the Chichibu belt.

The boundary of the Shimanto belt and the Chichibu belt is found to be located nearly along the Tama River, slightly shifting to the south near the northeastern Yokohama City. The top of the Shimanto belt in the south side of this boundary was found at 6s in two-way traveltime in the mid-eastern Yokohama City, and it is about 1s deeper than the top of the Chichibu belt in the north side. It was also found that the Shimanto belt becomes shallower toward the west in western Yokohama City (in and around Asahi-ku and Totsuka-ku). These results are consistent with the seismic traveltime analysis (Yokohama City, 2000). As for the top of the Chichibu belt, its depth was estimated to be nearly horizontal in the east of Chofu, Tokyo, however, it becomes suddenly shallower at the westward of Fuchu.

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