High-frequency later phases for intraslab earthquakes and attenuation in the mantle wedge beneath northeastern Japan

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For intraslab earthquakes occurred at depths of greater than 100 km beneath northeastern Japan, we found that arrival of peak amplitude in S wave remarkably delay in 8 Hz. Lag times of the peak amplitude from S-wave arrivals increases in seismograms recorded at backarc stations compared to those at forearc stations. In this study, we focus on the later phase observed in the high-frequency range and estimate their propagation paths by using a method based on the source-scanning algorithm [Kao and Shan, 2004]. Under the assumptions that the high-frequency later phase is a single scattered wave, we calculate lag time from direct S wave at a scattering point and stack observed S-wave amplitude for each scattering point as MS envelope of two horizontal components. Here, we take seismic attenuation along a scattered ray path into account as a weight for amplitude staking.

This analysis carried out in five frequency bands; 1-2, 2-4, 4-8, 8-16, and 16-32 Hz. In higher frequency bands (8-16 and 16-32 Hz), the later phase is obviously observed and often mark the maximum amplitude. In the frequency band, peak amplitude delays could be modeled as a wave detouring beneath the forearc region. These results suggest that the high-frequency later phases propagate avoid the mantle wedge which has strong attenuation, as discussed in Hasemi and Horiuchi [2010]. Additionally, the results suggest that the later phase may also be recorded in 4-8 Hz. In seismograms (4-8 Hz), the later phase seems to be recorded occasionally as the second peak of amplitude. Therefore, investigations of this frequency-dependence of the later phases and comparisons amplitude between the direct waves and the later phase would improve understandings of seismic attenuation in the mantle wedge and short wave-length structures beneath northeastern Japan.

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