

Seismic imaging of the eastern Japan forearc region using S-net data

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The great 2011 Tohoku-oki earthquake (Mw 9.0) occurred off the Pacific coast of Northeast Japan, where the Pacific plate is subducting beneath the Okhotsk plate. The S-net (the Seafloor observation network for earthquakes and tsunamis along the Japan Trench), initiated in 2016, is a large-scale, permanent, ocean-floor seismograph network with cabled 150 stations, which covers a wide oceanic region off Northeast Japan (Kanazawa, 2013). In this study, we aim to reveal the 3-D seismic velocity structure beneath the forearc region covered by the S-net.

We carefully picked 3754 first P-wave arrival times of 63 local earthquakes (M3.5–6.2) in the Tohoku forearc region from the continuous S-net records. Then, the newly picked data are integrated with the existing arrival-time data (Zhao et al., 2012) of 360 teleseismic and 1,180 local earthquakes recorded at 3,205 Hi-net stations on the Japanese land areas. These combined data are inverted to obtain a new 3-D P-wave velocity (Vp) model beneath the entire Northeast Japan arc by using the seismic tomography method of Zhao et al. (2012).

In this work we focus on the obtained 3-D images at depths < 40 km below the region covered by the S-net. The major results are summarized as follows.

- (1) Prominent low-Vp anomalies are revealed in the off-Iwate and off-Fukushima areas. These features are consistent with those revealed by previous works (e.g., Zhao et al., 2011; Huang & Zhao, 2013; Liu and Zhao, 2018), indicating that our hand-picked arrival-time data are quite accurate and robust.
- (2) A significant high-Vp anomaly is revealed along the Japan Trench especially beneath the off-Miyagi region where the 2011 Tohoku-oki earthquake (Mw 9.0) occurred, which may reflect that the sedimentary layer is very thin above the subducting Pacific plate.

References

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