Three-dimensional seismic velocity structure beneath and around Japanese Islands including beneath the Pacific Ocean using NIED S-net data

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1. Introduction
We investigate the 3D seismic velocity structure beneath and around Japanese Islands including beneath the Sea of Japan and Pacific Ocean with seismic tomographic method. National Research Institute for Earth Science and Disaster Resilience (NIED) constructed the High-sensitivity seismograph network (Hi-net) after the 1995 Kobe earthquake, the Seafloor observation network for earthquake and tsunamis along the Japan Trench (S-net) after the 2011 Tohoku-oki earthquake on March 11, and the Dense Oceanfloor Network System for Earthquakes and Tsunamis (DONET) constructed by Japan Agency for Marine-earth Science and Technology (JAMSTEC) was transfered to NIED on April 1, 2016. We used arrival time data detected by these networks operated by NIED as well as other organizations and apply the seismic tomography for these data.

2. Data and method
The target region, 20–48°N and 120–148°E, covers the Japanese Islands. In addition to the arrival time data used by Matsubara et al. (2017), we used P- and S-wave arrival times for 32952 earthquakes recorded at approximately 1500 stations including the NIED S-net and DONET from April 2016 to June 2018. We also added the arrival time data detected at the stations operated by universities near the coast of the Sea of Japan from 2000 to 2004. Totally 6356481 P arrival data and 3534482 S arrival data from 112631 events are available. The inversion reduces the RMS of the P-wave traveltime residual from 0.245 s to 0.189 s and that of the S-wave data from 0.287 s to 0.236 s after 11 iterations.

3. Result and discussion
We clarified the seismic velocity structure beneath the Sea of Japan at depths of 10-20 km from off Hokkaido to Wakasa Bay. Vp beneath the Okushiri and Sado Islands is low at a depth of 10 km however, Vp beneath the Sea of Japan is high at depths of 10-35 km. Vp along the coast of Sea of Japan in western Japan is moderate. The lithospheric velocity structure in this region is strongly affected by the mid-Tertiary break up and formation of the Sea of Japan. Through the reactivation of the younger compression, tsunamigenic source faults has been developed. The information of the lithospheric structure provides the essential information to the structure of faults.
Due to the contribution of S-net, the velocity structure of the overlying plate beneath Pacific Ocean has been improved. One important feature is the probable Mesozoic rift structure trending NS from the coast of Tohoku to the west of Hidaka collision zone. Recent the 2018 Hokkaido Eastern Iburi Earthquake (M6.7) may related to the reactivation of the rift related structure in the upper mantle to the lower crust, where marked by high-Vp.

Keywords: seismic tomography, NIED S-net, rift

