

## Seismic crustal structure beneath the southeastern part of northeast Japan by dense seismic array observation

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The 2011 Tohoku-Oki Earthquake (Mw9.0), that occurred on the Japan Trench off the eastern shore of northern Honshu, Japan, generated enormous crustal deformations. Seismic activity in northeastern Japan increased significantly after the 2011 Tohoku-Oki Earthquake. Detailed crustal structure and deep geometry of the active fault is important to constrain the process of earthquake occurrence. Active and passive seismic experiments were conducted to obtain a structural image beneath the southeastern part of NE Japan (Sato et al., 2013). The geometry of the active faults have been revealed by seismic reflection profiling (Sato et al., 2013). Natural earthquake data set is useful to obtain a deep structural image. Forty portable seismographs were deployed along a 70-km-long line between Souma and Takahata during the period from August 16, 2012 to December 24, 2012. Each seismograph consisted of a 1-Hz 3-component seismometer and off-line data recorder (Shinohara et al., 1997). Waveforms were continuously recorded at a sampling rate of 200 Hz. In the area of the present study, deep seismic reflection profiling was conducted using vibrators (Sato et al., 2013). The off-line recorders observed the controlled seismic signals as well as natural earthquakes. During the seismic array observation, the JMA located 2956 earthquakes in a latitude range of 37.2-38.5 N and a longitude range of 139.6-141.3 E. We selected 200 earthquakes, all of which occurred near the survey line. In order to obtain a high-resolution velocity model, a well-controlled hypocenter is essential. Due to this, we combined the seismic array data with permanent seismic station data. The arrival times for the first P- and S waves obtained from local earthquakes and Vibrator shots were used in a joint inversion for earthquake locations and three-dimensional Vp and Vp/Vs structures, using the iterative damped least-squares algorithm, simul2000 (Thurber and Eberhart-Phillips, 1999). Permanent seismic stations observed the controlled seismic signals as well as natural earthquakes. We added the arrival time data of these controlled sources into the dataset to improve the shallow velocity structure. The depth section of Vp structure along the survey line shows that lateral variation of the Vp value at a shallow depth. This lateral variation correlates with the surface geology along the profile.

Keywords: dense seismic array observation, seismic tomography, the 2011 Tohoku-Oki Earthquake