2011年東北沖巨大地震域の3次元異方性構造
Seismic anisotropy structure of the 2011 Mw 9.0 Tohoku-oki earthquake area

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The great 2011 Tohoku-oki earthquake (Mw 9.0) took place in the megathrust zone beneath the Tohoku forearc from the Japan Trench to the Pacific coast. To clarify the generating mechanism of this great event, it is necessary to investigate the detailed structure of the megathrust zone using various approaches. Seismic anisotropy tomography is a new but powerful method, because it can determine both 3-D isotropic velocity variations and seismic anisotropy, providing geodynamic information such as stress regime and/or mantle flow (e.g., *Zhao et al*. 2016). Recently, we developed a new method to determine anisotropic tomography using both P and S wave arrival-time data (*Liu & Zhao* 2016). In this work, we apply this new method to obtain a detailed 3-D model of azimuthal anisotropy tomography of the Tohoku subduction zone from the Japan Trench outer-rise to the back-arc area, using a large number of high-quality P and S wave arrival-time data of local earthquakes recorded by the dense seismic network on the Japan Islands. Depth-varying seismic azimuthal anisotropy is revealed in the Tohoku subduction channel. The shallow portion of the Tohoku megathrust zone (< 30 km depth) generally exhibits trench-normal fast-velocity directions (FVDs) except for the source area of the 2011 Tohoku-oki earthquake (Mw 9.0) where the FVD is nearly trench-parallel, whereas the deeper portion of the megathrust zone (at depths of ~30-50 km) mainly exhibits trench-parallel FVDs. Trench-normal FVDs are revealed in the mantle wedge beneath the volcanic front and the back-arc. The Pacific plate mainly exhibits trench-parallel FVDs, except for the top portion of the subducting Pacific slab where visible trench-normal FVDs are revealed. A qualitative tectonic model is proposed to interpret such anisotropic features, suggesting transposition of earlier fabrics in the oceanic lithosphere into subduction-induced new structures in the subduction channel (*Liu & Zhao* 2017).

References

Liu, X., D. Zhao (2016) Seismic velocity azimuthal anisotropy of the Japan subduction zone: Constraints from P and S wave traveltimes. *J. Geophys. Res.* 121, 5086-5115.
Liu, X., D. Zhao (2017) Depth-varying azimuthal anisotropy in the Tohoku subduction channel. *Earth Planet. Sci. Lett.* 473, 33-43.
Zhao, D., S. Yu, X. Liu (2016) Seismic anisotropy tomography: New insight into subduction dynamics. *Gondwana Res.* 33, 24-43.

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