Seismic anisotropy tomography and mantle dynamics (Presentation canceled)

Dapeng Zhao*†[1], Zhouchuan Huang[2], Wei Wei[3], and Xin Liu[4]

[1]Tohoku University – Japan
[2]Nanjing University – China
[3]China Earthquake Administration – China
[4]Ocean University of China – China

Abstract

Seismic anisotropy tomography is a new but powerful tool for mapping 3-D variations of seismic anisotropy in the crust and mantle, shedding new light on mantle flow and subduction dynamics (e.g., *Zhao et al.*, 2016; *Liu and Zhao*, 2017). We determined 3-D P-wave anisotropic tomography of the NW Pacific subduction zones (*Wei et al.*, 2015), which show that the intraplate volcanism is caused by hot and wet upwelling in the big mantle wedge above the stagnant Pacific slab. The fast velocity direction (FVD) in the subducting Philippine Sea slab beneath the Ryukyu arc is trench parallel, being consistent with the spreading direction of the West Philippine Basin during its initial opening stage, which may reflect the fossil anisotropy. A striking variation of the FVD with depth is revealed in the subducting Pacific slab beneath the Tohoku arc, which may be caused by slab dehydration that changed elastic properties of the slab with depth. The FVD in the mantle wedge beneath the Tohoku and Ryukyu arcs is trench normal, reflecting subduction-induced convection. Beneath the Kuril and Izu-Bonin arcs, the FVD in the mantle wedge is nearly normal to the moving direction of the downgoing Pacific plate, suggesting that the oblique subduction together with the complex slab morphology have disturbed the mantle flow. We also determined 3-D Vp anisotropic tomography in the mantle beneath SE Asia, which shows the high-velocity (high-V) subducting slabs clearly in the upper mantle and the MTZ. Low-velocity (low-V) zones with trench-normal anisotropy are revealed in the uppermost mantle, which indicate back-arc spreading or secondary mantle-wedge flow induced by the slab subduction. In contrast, trench-parallel anisotropy dominates in the deep upper mantle and reflects structures either in the subducting slab or in the upper mantle surrounding the slab. A low-V body extending down to the lower mantle is visible under the Hainan volcano far away from the plate boundaries, suggesting that Hainan is a hotspot fed by a lower-mantle plume. The low-V body under Hainan is connected with low-V zones in the upper mantle under SE Tibet and Vietnam.

References

Huang, Z., D. Zhao, L. Wang (2015). JGR 120, 5154-5174.

Liu, X., D. Zhao (2017). *GJI* 210, 1410-1431.

*Speaker
†Corresponding author: zhao@tohoku.ac.jp

Wei, W., D. Zhao, J. Xu, F. Wei, G. Liu (2015). *JGR* 120, 1642-1666.
Zhao, D., S. Yu, X. Liu (2016). *Gondwana Res.* 33, 24-43.