

西太平洋沈み込み帯の深部構造と異方性 Deep structure and seismic anisotropy of the Western-Pacific subduction zones

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We determined high-resolution P and S wave tomography and 3-D P-wave azimuthal anisotropy of the Western-Pacific subduction zones by inverting a large number of P and S wave arrival-time data of local and regional earthquakes. Our results show some differences between P and S wave images for the stagnant Pacific slab in the mantle transition zone (MTZ) beneath NE Asia. The stagnant slab looks thicker in the P wave image than that in the S wave image, which may reflect the effects of both hydration and lower temperature in the MTZ, though differences in the resolution of P and S wave tomography may also have some effects. The Changbai and other intraplate volcanoes in NE Asia are caused by hot and wet upwelling in the big mantle wedge above the stagnant Pacific slab in the MTZ. Our P-wave anisotropy tomography shows that the fast velocity direction (FVD) in the subducting Philippine Sea plate beneath the Ryukyu arc is NE-SW (trench parallel), which is consistent with the spreading direction of the West Philippine Basin during its initial opening stage, suggesting that it may reflect the fossil anisotropy. A striking variation of the FVD with depth is revealed in the subducting Pacific slab beneath the NE Japan 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 NE Japan and Ryukyu arcs is trench normal, which reflects subduction-induced convection. Beneath the Kuril and Izu-Bonin arcs where oblique subduction occurs, 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.

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