Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SSS026-17 Room: Function Room B Time: May 27 10:00-10:15

Consideration of Subduction System Based on Body Wave Anisotropy: In the Case of the Japan Subduction Zone

Motoko Ishise[1*], Hitoshi Oda[2]

[1]ERI, Univ. Tokyo, [2]Okayama Univ.

We have been investigating body wave seismic anisotropy beneath the Japan islands to understand the structure and the dynamics of the subduction zone. Based on the results of our previous studies, in this presentation, we organize characteristics of the seismic anisotropy existing within the crust and mantle of the Japan subducion zone.
We employed anisotropic P-wave tomography method [Ishise and Oda, 2005 JGR; 2008 PEPI] to model three dimensional anisotropic P-wave velocity (heterogeneity and azimuthal anisotropy described by the fast propagation direction and strength of the anisotropy) beneath whole of the Japan islands [e.g., Ishise and Oda, 2009 J. Seismo. Soc. Jpn; Ishsie et al., 2009; GRL] and receiver function analysis to detect S-wave anisotropy beneath the Chugoku, Shikoku, and Tohoku districts [e.g., Nagaya et al., 2008 BSSA; Akazawa et al., 2008 JGU Meeting; Kamimoto and Oda, 2009 SSJ Fall Meeting]. As a result, we obtained P- and S-wave anisotropy in the crust, mantle, and the Philippine Sea and Pacific slabs. The characteristics of the P- and S-wave anisotropy are almost in agreement and consistent with theoretical and experimental findings, which are summarized as follows,

(1) The crust anisotropy is consistent with large-scale geological features, for example, orientation of the active faults and geological zones such as metamorphic belts in the Shikoku district. Crust anisotropy is strongly affected by geological structure in the Japan subduction zone.
(2) The direction of the mantle anisotropy is parallel/sub-parallel to that of the present-day absolute plate motions. This result suggests that the mantle anisotropy is attributable to preferred orientation of lattice and texture of the mantle minerals.
(3) The slab anisotropy arises from complex and diverse causes. The anisotropy within the old slabs, such as the Pacific slab and the Philippine Sea slab beneath the Kyushu district, is explained by preferred orientation of mantle minerals, which formed during the sea floor spreading. On the other hand, the anisotropy in the youngest part of the Philippine Sea slab beneath the Shikoku district is consistent with the directions of the current plate movement and the P-axes of the slab earthquakes, which suggest that the anisotropy is caused by the present-day tectonic stress.

Keywords: subduction zone, Japan islands, azimuthal anisotropy, seismic tomography, receiver function