Seismic anisotropy in the lowermost mantle beneath Antarctic Plate; contribution to Antarctic Arrays/POLENET at IPY 2007-2008

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We have understood the stress and strain fields of the Earth's deep interior through many approaches associated with geodynamics, such as mantle convection. However the research of seismic anomalies in Antarctica is poor because the number of seismic station is not enough. We construct and manage seismic station network around Syowa station in East Antarctica for International Polar Year 2007-2008. Observations and investigations of shear wave velocity anomalies in the lowermost mantle are performed beneath the Antarctic Plate using broad-band seismic data of such stations and permanent seismic stations in Antarctica.

We generally observe earlier arrivals of transverse components (SH) than those of longitudinal components (SV) for shear waves passing through the D double prime (D2) layer, which is a region of several hundred kilometers above core-mantle boundary. The estimated anisotropy is about 2.15% and it is the same degree as those reported for the D2 layer beneath Alaska and the Caribbean Sea. The residuals of S-SKS differential travel times are consistent with those of SYYM2, not PREM. The model SYYM2 is the anisotropic shear wave velocity structure in the D2 layer with 2.0% discontinuity at the depth of 2550km beneath Pacific Antarctic Ridge.

We propose that the D2 layer beneath Antarctic Plate is one of the coldest and thickest region. The difference of the thickness and the velocity structure are possibly controlled by the difference in the subducting age, the location of slabs reaching at the CMB and the strength of shear flow. This study result is able to contribute to resolve the past tectonism and recent and/or past mantle flows in Antarctic Plate.

Recently more complex style of anisotropy such as dipping anisotropy has been observed in a number of regions. Causes for inclined anisotropy could be flow of a downwelling structure, deformation of a slab and post-perovskite phase. In future work, we apply differential S-ScS splitting and investigate dipping anisotropic structure in the D2 layer beneath Antarctic Plate.