Anisotropic upper mantle structures in northeast Asia from Bayesian inversions of ambient noise data

Sang-Jun Lee¹, Seongryong Kim², and Junkee Rhie¹

¹School of Earth and Environmental Sciences, Seoul National University, Seoul, Korea, Republic of (stonbear@snu.ac.kr)
²Department of Geological Sciences, Chungnam National University, Daejeon, Korea, Republic of

The northeast Asia region exhibits complex tectonic settings caused by interactions between Eurasian, Pacific, and Philippine Sea plates. Distributed extensional basins, intraplate volcanoes and other heterogeneous features in the region marked results of the tectonic processes, and their mechanisms related to mantle dynamics can be well understood by estimating radial anisotropy in the lithosphere and asthenosphere. We constructed a three-dimensional radial anisotropy model in northeast Asia using hierarchical and transdimensional Bayesian joint inversion techniques with different types of dispersion data up to the depth of the upper mantle (~160 km). Thick and deep layers with positive radial anisotropy (\(V_{SH} > V_{SV}\)) were commonly found at depths between 70 and 150 km beneath the continental regions. On the other hand, depths and sizes of layers with positive radial anisotropy become shallower and thinner (30 ~ 60 km) respectively beneath regions where experienced the Cenozoic extension. These variations in positive radial anisotropy for different tectonic regions can be understood with the context of extensional geodynamic processes in back arc basins within the East Sea (Japan Sea). Interestingly, the most predominant positive radial anisotropy is imaged along areas with large gradient of the lithosphere-asthenosphere boundary beneath intraplate volcanoes. These observations favor the mechanism of edge-driven convection caused by the difference in lithosphere thickness and localized sublithospheric lateral flow from the continental region to back arc basins.