**Layered evolution of the oceanic lithosphere beneath the Japan Basin, the Sea of Japan**

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The formation of a new ocean basin provides a unique observational window into the structure and deformation of the oceanic lithosphere. During my stay at ERI, I collaborated with Prof. Akuhara in studying the lithosphere structure of the Japan Basin with broadband ocean bottom seismometers deployed in the eastern Japan Basin, the Sea of Japan (figure 1).

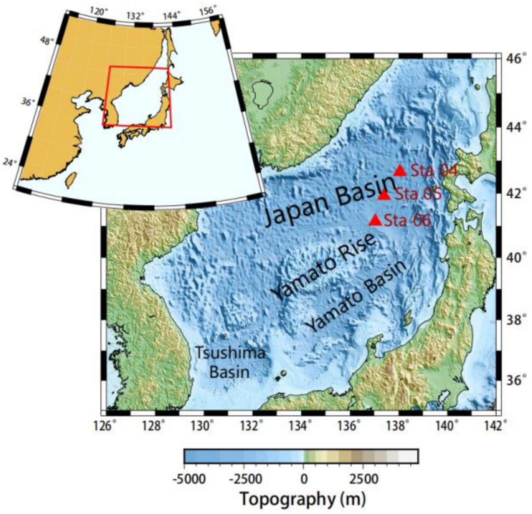


**Figure 1. A bathymetry map of the Japan Basin. The red triangles mark the locations of the OBS used in the present study. The insert subplot marks the location of the Sea of Japan, which is located in the northwestern Pacific.**

Our study offers detailed 1-D vertically polarized shear-wave velocity models of the young Japan Basin by interpreting S receiver functions, seafloor Rayleigh wave ellipticities and phase velocities in a Bayesian trans-dimensional framework. The models suggest a distinct discontinuity in the mid-lithosphere (figure 2). Additional analyses indicate that the upper layer is characterized by strong positive radial anisotropy, while the lower layer is more isotropic.

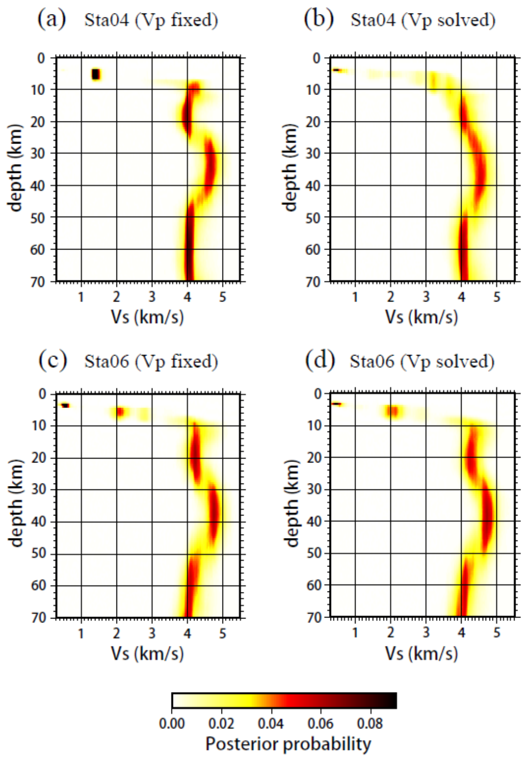


**Figure 2. The posterior distributions of 1-D Vsv models from the trans-dimensional joint Bayesian inversion. The results for station 04 derived from inversions with (a) Vp fixed and (b) Vp solved simultaneously. (c & d) Same as (a & b) but for station 06.**

We interpret that the upper layer was formed during the back-arc opening at 20-15 Ma, where the olivine lattice-preferred orientation (LPO) fabric induced by passive upwelling contributes to the positive radial anisotropy. The lower, less anisotropic layer may be solidified after the sudden cessation of the opening. Small-scale convection (SSC) from such a major tectonic event could randomize the LPO enough to weaken radial anisotropy before cooling down the asthenosphere, leaving a radially anisotropic discontinuity in the present-day mid-lithosphere (figure 3). The proposed layered evolution history of the lithosphere beneath the Japan Basin illuminates an important role of the small-scale convection in modifying the structural fabrics of the asthenosphere in terms of radial anisotropy. Such an SSC-induced radial anisotropy drop could also occur at the base of the lithosphere in regions with ongoing seafloor spreading and enhance the velocity drop of horizontally polarized shear waves. Thus, the role of SSC is non-negligible in explaining the sharpness of the Gutenberg discontinuity detected by SS precursors beneath the oceanic lithosphere.

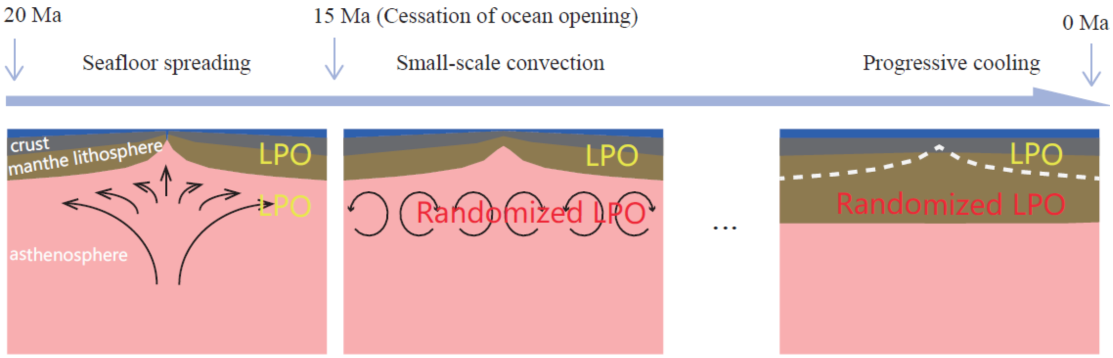


**Figure 3. A cartoon summarizing our proposed formation history of the lithosphere beneath the Japan Basin.**