[EE] Evening Poster | S (Solid Earth Sciences) | S-IT Science of the Earth's Interior & Tectonophysics

[S-IT28]The lithosphere and the asthenosphere

convener:Catherine Rychert(University of Southampton), Hitoshi Kawakatsu(Earthquake Research Institute, University of Tokyo), Samer Naif(共同), Jessica M Warren (University of Delaware)
Tue. May 22, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
The lithosphere-asthenosphere boundary (LAB) separates Earth's rigid tectonic plates from the underlying convecting mantle. The LAB is fundamental to our understanding of plate tectonics and mantle dynamics, although its depth and defining mechanism are highly debated. How it varies among tectonic environments and its relationship to the Moho, MLD, and anisotropy are also poorly understood. Ocean bottom seismic data is particularly important for constraining the young plate with relatively simple history, although this data is difficult to attain and rare. We will focus on the lithosphere, the asthenosphere, and the lithosphere-asthenosphere system in a variety of settings including but not limited to continents, oceans, margins, rifts, ridges, hotspots, plumes, and subduction zones. We welcome research contributions from diverse fields, including but not limited to seismology, magnetotellurics, petrology/mineralogy, dynamical modelling, and mineral physics.

[SIT28-P02]Inversions for radially anisotropic upper mantle structure with the new fifth anisotropic parameter $\text{\η}_{\text{\κ}}$ using multi-mode surface waves

*Shuya Okuyama[1], Kazunori Yoshizawa[2], Hitoshi Kawakatsu[3] (1.Graduate School of Science, Hokkaido University, 2.Faculty of Science, Hokkaido University, 3.Earthquake Research Institute, The University of Tokyo)

Seismic anisotropy estimated from surface waves provides us with fundamental information to unravel dynamics and structure of the Earth’s mantle. Radial anisotropy is described by five elastic parameters; four parameters related to seismic wave speeds ($\text{\β}_{v}$, $\text{\β}_{h}$, $\text{\α}_{h}$, $\text{\α}_{v}$) and an additional fifth anisotropic parameter (η). One of the anisotropic parameters, η, was originally defined by Anderson (1968), but its physical proprieties have been rather unclear compared with other four parameters related to elastic velocity.

A newly proposed definition of the fifth anisotropic parameter $\text{\η}_{\text{\κ}}$ by Kawakatsu et al. (2015) makes it easier to understand its physical proprieties compared with the conventional parameter η. The introduction of $\text{\η}_{\text{\κ}}$ causes non-negligible influence on shape of sensitivity kernels of Rayleigh wave phase speeds with respect to $\text{\η}_{\text{\κ}}$, and PH-wave speeds $\text{\α}_{h}$ and PV-wave speeds $\text{\α}_{v}$ (Kawakatsu, 2016b). Since the sensitivity kernel for $\text{\η}_{\text{\κ}}$ becomes higher than that for η, we may have a possibility of resolving $\text{\η}_{\text{\κ}}$. However, since the inverse correlation between the sensitivity kernels of SV-wave speed $\text{\β}_{v}$ and $\text{\η}_{\text{\κ}}$ becomes rather stronger, the trade-off between $\text{\β}_{v}$ and $\text{\η}_{\text{\κ}}$ may easily occur, which makes it difficult to interpret the resultant model.

In this study, by incorporating $\text{\η}_{\text{\κ}}$ with several combinations of *a priori* parameters, we performed inversions for five elastic parameters in the upper mantle, based on an iterative nonlinear least-squares inversion method (Tarantola and Valette, 1982). We employed multi-mode dispersion data sets of surface waves in the Australian region to construct a preliminary 3-D anisotropic model. Regional variations of $\text{\η}_{\text{\κ}}$ can be observed between Coral/Tasman seas and Australian continent . Beneath the continent, a positive anomaly of η$_{\κ}$ at asthenospheric depth was observed, which is located deeper than that beneath the oceanic region. In this preliminary model, the depth where η$_{\κ}$ is close to 1.0 seems to coincide well with the lithosphere-asthenosphere boundary. Care needs to be taken, however, for the interpretation of the η$_{\κ}$ model, since it can readily be affected by SV wave speed β$_{v}$ due to the strong trade off, which should be examined in more detail.