[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)

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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-P07]Measurements of Rayleigh-wave particle motions: Implication for crust and upper mantle structure beneath the Japanese islands

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Rayleigh-wave particle motions are measured to investigate the crust and uppermost mantle structure under the Japanese islands. The elliptical retrograde motions of the fundamental-mode Rayleigh waves can be estimated from the amplitude ratio between the horizontal and vertical components of Rayleigh waves (H/V ratio or ellipticity), which is more sensitive to shallow structure than the conventional phase or group dispersion data. It has been well-known that such H/V ratios or ellipticity of Rayleigh waves can be used to infer the internal structure of the Earth, but their application for mapping spatial distribution of the H/V ratios in the longer period with dense broadband seismic arrays has yet to be investigated in the Japanese islands. In this study, we measure Rayleigh wave particle motions in two ways; (1) H/V ratios and (2) ellipticity of a 3-D ellipsoid. The former can be derived from the simple spectral amplitude ratios from the horizontal (radial) and vertical components of Rayleigh waves, while the latter is calculated by using the method of multi-taper polarization analysis, in which the three-dimensional polarization ellipsoid of Rayleigh waves (including arrival-angle anomaly and inclination from the vertical axis) can be estimated by using the three-component seismic signals in the frequency domain. The measurement techniques are applied to the fundamental-mode Rayleigh waves at intermediate to long period (30 - 200 s) for all stations of the Japanese broadband seismic network (F-net) using 250 seismic events from 2009 to 2015.

The measurements of the ellipticity using multi-taper spectral analysis are more stable and reliable compared to the simple estimation of H/V ratios which can be contaminated by large errors due to various effects such as arrival-angle anomalies. We should, therefore, use the ellipticity for the structural investigation. Our preliminary results show that the observed ellipticity become larger than

regional average, particularly in the south of Hokkaido, the south of Kyushu and the Kanto areas in the longer period than 90 s, while those in the south-western Japan show relatively smaller values. Our results coincide well with the velocity anomalies in the upper crust derived from ambient noise tomography (Nishida et al. 2008); i.e., large ellipticity (high H/V ratios) in slow velocity regions, and small ellipticity (low H/V ratios) in fast velocity regions. These results indicate that the Rayleigh wave ellipticity has a good potential to constrain the crustal and uppermost mantle structure, if we use them in conjunction with the conventional phase speed or ambient noise data.