[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-P08]Construction of stable S receiver function and its application to observations of seismic discontinuities in the lithosphere-asthenosphere system beneath South Korea

Xuzhang Shen[1], *Younghee Kim[2], Teh-Ru Alex Song[3], Hobin Lim[2] (1.Sun-Yat Sen University, 2.Seoul National University, 3.University College London)

Keywords:S receiver function, lithosphere-asthenosphere system

This presentation aims to improve the robustness of seismic processing in the S receiver function (SRF), a technique now commonly used to retrieve forward scattering of S-to-P converted waves originated from the lithosphere-asthenosphere system (LAS) beneath the stations. Unlike P wave receiver function method, SRF does not suffer interferences from backward scattering waves such as the first multiples from the Moho. However, one severe drawback is that S-to-P converted waves can interfere with P coda waves and it is not necessarily trivial to make robust identification and interpretation of S-to-P converted waves from the LAS. These P coda waves can consist of multiple mantle P waves or/and S-to-P scattering waves within the crust and lithosphere between the source and the receiver, whereas the amplitude and timing of these P coda waves depend on the strength of scatters as well as epicentral distance, source depth, and earthquake source mechanisms.

To devise an objective criterion to minimize the interference from P coda waves, as a proof of concept, we first examine SRFs recorded in South Korea seismic network, sitting on a geologically stable continental platform. Through systematic analysis of full-waveform synthetic waveforms and SRFs from realistic focal mechanisms and source depths, we find the systematics that, when the mean amplitude of P coda waves is comparably stronger than the S wave recorded in the radial component, SRFs from 1-D IASP91 model display strong and dubious arrivals. Furthermore, if the mean amplitude of SRFs after the S wave is large, dubious signals of SRFs before the S arrival become strong as well. It is conceivable that these signals may be mistakenly interpreted as S-to-P converted waves beneath seismic stations.

We devise measures of ZRR, the amplitude ratio between vertical P coda waves and radial S waves, and AMP, the amplitude of SRFs after the S arrival and systematically test how ZRR and AMP threshold may be used to detect and retain robust S-to-P converted waves. We will demonstrate the effectiveness of our new data selection criteria, which not only provides a more robust and consistent observation of S-to-P converted waves in a broad frequency band between 0.1 Hz and 1 Hz, but offers a great potential to better characterize seismic discontinuities in the LAS.