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

[S-IT22]Interaction and Coevolution of the Core and Mantle in the Earth and Planets

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Recent observational and experimental investigations have significantly advanced our understanding of the structure and constituent materials of the deep Earth. Yet, even fundamental properties intimately linked with formation and evolution of the planet, such as details of the chemical heterogeneity in the mantle and light elements dissolved in the core, remained unclear. Seismological evidence has suggested a vigorous convection in the lower mantle, whereas geochemistry has suggested the presence of stable regions there that hold ancient chemical signatures. The amounts of radioactive isotopes that act as heat sources and drive dynamic behaviors of the deep Earth are also still largely unknown. We provide an opportunity to exchange the achievements and ideas, and encourage persons who try to elucidate these unsolved issues of the core-mantle evolution using various methods, including high-pressure and high-temperature experiments, high-precision geochemical and paleomagnetic analyses, high-resolution geophysical observations, geo-neutrino observations, and large-scale numerical simulations. Since this session is co-sponsored by geomagnetism, paleomagnetism and rock magnetism division of the SGEPSS, contributions in geomagnetism and geodynamo simulation are also encouraged.

[SIT22-P13]A preliminary model for S-wave velocity structure in the D" region beneath New Guinea by using Thai Seismic Array (TSAR)

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The edge of a Large-Low Shear Velocity Province (LLSVP) is an interesting area to understand active interaction with ambient mantle. To address such an issue, Thai Seismic Array (TSAR) has been constructed, which locates at an appropriate position to investigate the seismic structure in the D" region beneath New Guinea, where is the western edge of the Pacific LLSVP, by using deep earthquakes occurred in Fiji Islands. To date, we observed S, SKS, and ScS phases from deep Fiji earthquakes with distance range from 84° to 91°. The best event was occurred on Feb 24, 2017. After applying bandpass filter (0.04 – 0.3 Hz) and the correction of SKS splitting, the travel time differences of S–SKS, and ScS–SKS were measured on the radial components of velocity seismograms by picking the corresponding peaks and compared with those measured on reflectivity synthetic seismograms for PREM (Dziewonski and Anderson, 1981). The residuals of ScS–SKS differential travel times were +2 to +3 s, which were consistent with those predicted by

the 3D model S40RTS (Ritsema et a., 2011). However, the residuals of S–SKS were about –3 s at shorter distances to 0 s at larger distances, which was not consisted with S40RTS. These observations suggest that a high velocity layer is imbedded in a low velocity region near the base of the mantle. Therefore, we conducted forward modeling using the waveforms to seek for the most appropriate structure. We considered velocity structures that were modified from PREM. S-wave velocity was assumed to linearly decrease from 2300 km depth up to several hundred km above the core-mantle boundary (CMB). To explain the S–SKS residual of 0 s at larger distances, we assumed that the reduction of S-wave velocity just above the velocity discontinuity was a half of the assumed velocity jump, then the velocity discontinuously increased by the assumed velocity jump. The S-wave velocity below the discontinuity (corresponding to the top of the D" layer) linearly increased or decreased to be the assumed value at the CMB. Here we prepared approximately 400 models for the thickness of D" layer to be 50 to 350 km with a 50km interval, the velocity jumps from 0.5 to 4.5% with a 0.5 % interval, and S wave velocity at the CMB from 7.0 to 7.4 km/s with a 0.05 km/s interval. By forward modeling with reflectivity synthetics, we obtained that the most preferred model has 4% velocity jump at 200 km above the CMB with Vs of 7.0 km at the CMB.