Waveform inversion for 3-D S-wave velocity structure of the D″ region beneath Eurasia

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The D″ region, lowermost several hundred kilometers of the Earth's mantle immediately above the core-mantle boundary (CMB), is the thermal boundary layer, and the solidus of its constituent materials is thought to be close to the mantle geotherm. Therefore, vertical and lateral variations of temperature and chemical composition associated with Earth's thermal evolution are expected. The 3-D S-wave velocity structure of D″ beneath Eurasia has ever been inferred by traveltime tomography (e.g., Grand 2002) or global waveform inversion studies (e.g., French & Romanowicz 2014) not yet by localized waveform inversion ones. We infer the 3-D S-wave velocity structure of D″ beneath Eurasia, using localized waveform inversion methods (Kawai *et al.* 2014). We use waveform data obtained from the National Research Institute for Earth Science and Disaster Prevention F-net and Observation & Research Facilities for European Seismology (ORFEUS). Our dataset consists of about 4,200 transverse component of broadband body-wave seismograms observed at Japan for 4 intermediate earthquakes occurred in Europe, and European stations for 137 intermediate and deep events occurred beneath the western Pacific subduction zone. We use waveforms in time window including S and ScS phases.

The results of the synthetic resolution test (checkerboard test) indicate that our methods and dataset can resolve S-wave velocity structure in the target region vertically 50 km and laterally 5°. We obtain 3-D S-wave velocity models showing two distinct low-velocity anomalies about 4 per cent slower than the Preliminary Reference Earth Model (PREM). We interpret the low-velocity anomaly which is located at the west of the target region as “Perm Anomaly” (e.g., Lekic *et al.* 2012) and we will discuss the origin of them.

Keywords: D″, Waveform inversion, S-wave velocity structure, Perm Anomaly

