Waveform inversion for 3-D shear wave velocity structure within D″ beneath the Northern Pacific and Alaska

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We conduct waveform inversion to infer the 3-D shear wave velocity structure within D″ beneath the Northern Pacific and Alaska (Fig. 1a). This region is suitable as the target for waveform inversion, since we are able to use data that densely sample the target region (the lowermost 400 km of the mantle beneath the Northern Pacific and Alaska). Our dataset consists of ~20,000 transverse components of broadband body-wave seismograms observed at North American stations (from dense receiver networks such as the USArray). We use 114 intermediate and deep events that are widely distributed throughout the western Pacific (Japan and Izu Bonin) region. We use *S, ScS* and other phases that arrive between them. Our dataset is homogeneous in terms of epicentral distance (Fig.1b). Resolution tests indicate that our method and data can resolve the lateral and vertical velocity profile within D″ in the target region. We use two different one dimensional shear wave velocity models (Fig. 1c) as the starting model for the inversion: PREM, and a model based on mineral physics, which includes a thermal boundary layer of 100 km effective thickness. The 3-D models obtained by our inversion show that there is a high velocity area that can be interpreted as subducted paleoslabs down to about 200 km above the core-mantle boundary (CMB), a plume like low-velocity structure, and also lateral and vertical complexity that may come from interaction between the subducted paleoslabs and development of plumes within D″.

Keywords: S-wave velocity structure, D", waveform inversion