# Inversion of waveform data for radial profiles of shear velocity and attenuation of the lowermost mantle beneath the western Pacific

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The existence of large low shear velocity provinces (LLSVPs) in the lowermost mantle is widely known by seismological global-scale studies. To understand the nature of these features, we investigate the elastic and anelastic structure of the lowermost mantle at the western edge of the Pacific LLSVP by inverting a collection of S and ScS waveforms. The transverse component data were obtained from F-net for 31 deep earthquakes beneath Tonga and Fiji, filtered between 12.5 and 200 s. We observe a regional variation of S and ScS arrival times and amplitude ratios, according to which we divide our region of interest into three subregions. For each of these subregions, we then perform 1D (depth-dependent) waveform inversions simultaneously for radial profiles of shear wave velocity (VS) and seismic quality factor (Q). In figure, models for all three subregions (#1-3) show low VS (a) and low Q (b) structures from 2000 km depth down to the core–mantle boundary. We further find that VS and Q in the central subregion, sampling the Caroline plume, are substantially lower than in the surrounding regions, whatever the depth. In the central subregion, VS-anomalies with respect to PREM (dVS) and Q are about −2.5 per cent and 216 at a depth of 2850 km, and −0.6 per cent and 263 at a depth of 2000 km. By contrast, in the two other regions, dVS and Q are −2.2 per cent and 261 at a depth of 2850 km, and −0.3 per cent and 291 at a depth of 2000 km. At depths greater than ˜2500 km, these differences may indicate lateral variations in temperature of ˜ 100 K within the Pacific LLSVP. At shallower depths, they may be due to temperature difference between the Caroline plume and its surroundings, and possibly to a small fraction of iron-rich material entrained by the plume.

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