Quasi-3D seismological imaging of Caroline plate using Monte-Carlo waveform inversion of teleseismic SS phases

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We present a quasi-3D S-wave velocity structure of the upper mantle under Southwest Pacific. Since it is fully covered by the ocean, seismic station coverage in this region is poor, leading a poorer resolution with respect to other regions in previous global tomographic studies. We collect 126 seismic events recorded at 35 AU stations, resulting a dataset of > 4200 pairs of event and station. In order to obtain a high resolving power, we use SS phases that have their bouncing points in the vicinity of the region. We perform regional 1D Monte Carlo waveform inversion using a combination of waveform and traveltime residuals between observed and synthetic data as a cost function. We generate 10.000 1D models for each pair of event and station and each pair chooses its preferred models that minimize the misfit function as a combination of SS-S traveltime double differences and SS waveform residuals. The mantle transition zone beneath the Caroline plate shows 1-3 % higher Vs anomaly with respect to PREM but the anomaly is cutted vertically by a low velocity zone (~1-2 % lower to PREM) underneath the Eauripik Rise which is situated in the center of Caroline plate. This low velocity zone can be interpreted as a thin plume coming from the base of the mantle, which could be locked due to the complex tectonics in the shallower part.

Keywords: Caroline plate, Monte-Carlo inversion, waveform inversion

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