Constraints on radial anisotropy in the central Pacific upper mantle from the NoMelt OBS array

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Observations of seismic anisotropy in ocean basins are important for constraining deformation and melting processes in the upper mantle. The NoMelt OBS array was deployed on relatively pristine, 70-Ma seafloor in the central Pacific with the aim of constraining upper-mantle circulation and the evolution of the lithosphere-asthenosphere system. Azimuthal variations in Rayleigh-wave velocity suggest strong anisotropic fabric both in the lithosphere and deep in the asthenosphere, and we aim to evaluate whether radial anisotropy shows a similar pattern. We employ an array-based approach to measure Love-wave phase velocities across the array using seven shallow-focus events (< 25 km) with high signal-to-noise ratio and diverse azimuthal coverage. Our phase-velocity measurements suggest strong interference of the first two overtones for short-to-intermediate periods (20-50 s), while longer periods (>60 s) are mostly dominated by fundamental mode energy. We invert for $V_{SH}$ using multimode Love wave Fréchet kernels to account for this strong overtone interference and combine these measurements with the NoMelt $V_{SV}$ model to obtain estimates of radial anisotropy for the top 300km of the mantle. Through forward modeling of Love wave Fréchet kernels, we find a strong nonlinearity in fundamental-mode sensitivity due to the inferred low-velocity zone underlying the Pacific lid, where the shortest periods have almost no sensitivity within the lithospheric mantle with peak sensitivity at the base of the low-velocity zone. Additional forward modeling of Love wave sensitivity will be carried out to fully explore the effects of this nonlinearity on the inferred velocity structure. Additionally, we will apply a new technique exploiting a modified Helmholtz amplitude correction to separate the fundamental mode from the overtones for more robust measurements of radial anisotropy beneath the central Pacific.

**Figure.** Love wave phase velocity measurements averaged for seven shallow-focus events. Colors show synthetic phase velocities for the fundamental mode ($T_0$) and first four overtones ($T_1$-$T_4$) calculated using the Pacific Pa5 velocity model.