Subduction-Zone Anisotropy Beneath Corvallis, Oregon: A Serpentinite Skidmark of Trench-Parallel Terrane Migration?

Jeffrey Park • Yale University
Huaiyu Yuan • University of Wyoming
Vadim Levin • Rutgers University

We studied the back-azimuth dependence of Ps converted phases at GSN station COR (Corvallis, Oregon) using broadband P receiver functions computed from 602 earthquakes. The amplitudes and polarities of the transverse Ps phases are largely two-lobed, which indicates anisotropy with a tilted symmetry axis. A double-peaked Ps conversion at 4.5–6.5-s delay has the moveout of a dipping slab, but is not consistent with simple deflection of the Ps phase by the dipping interface. A polarity flip on the transverse RF near north-south back azimuth indicates an anisotropic symmetry axis aligned north-south, far from plate convergence (N68°E). The Ps phase is modeled using reflectivity synthetics with a highly anisotropic layer of depressed wavespeed (VP~6.0 km/s) near 40 km depth, at the slab interface with the overriding N. American plate. 1-D modeling suggests 10% anisotropy in the supraslab layer, with a slow symmetry axis oriented N5°E at a 60° tilt from the vertical. Adjustments for the effect of slab-interface dip on Ps amplitude suggest a somewhat lower 7% anisotropy. We infer a thin (7 km) anisotropic detachment zone for the northward slippage of the Siletz forearc terrane along the top of the slab, a motion consistent with GPS measurements and models of regional lithospheric dynamics. Serpentinite is a likely constituent for the deep anisotropic layer, owing to its reduced VP and high Poisson ratio. The ductile rheology and hydrated composition of serpentinite make it a plausible lithology for a detachment zone.