SUBDUCTION-ZONE ANISOTROPY BENEATH CORVALLIS, OREGON: A SERPENTINITE SKIDMARK OF TRENCH-PARALLEL TERRANE MIGRATION?

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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 ($V_P$~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 $V_P$ and high Poisson ratio. The ductile rheology and hydrated composition of serpentinite make it a plausible lithology for a detachment zone.