

# Azimuthal anisotropy in the uppermost mantle beneath the western US from ambient noise cross-correlation measurements

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Seismic anisotropy holds a key to unlock information about dynamic processes in Earth's interior. Despite clear evidence for anisotropy caused by the lattice preferred orientation (LPO) of olivine in the upper mantle, there is no clear consensus on how the mantle flows and interacts with the overlying tectonic plates particularly beneath continents. One reason for this is that anisotropy measurements from different techniques disagree and lead to different conclusions. To resolve this problem, it is crucial to improve the resolution of anisotropic imaging either by expanding the available datasets or improving current observational and imaging methods.

Surface wave tomography based on ambient noise cross-correlation measurements (ANT) has created a new type of dataset that results in high resolution images of the shallow earth at regional and continental scales. Applying this method to the Transportable Array (TA) component of USArray/EarthScope and combining with our newly developed Eikonal tomography method now is shining new light on shallow anisotropy. Our preliminary 3D azimuthal anisotropy inversion clearly reveals anisotropy in the uppermost mantle associated

with tectonic processes such as strike-slip motion along the San Andreas Fault and the subduction of the Juan de Fuca Plate (Figure 1). The result also compares well with published SKS splitting measurements.

Shallow anisotropy across a much broader region can be imaged with the expansion of USArray eastward in coming years. Efforts to incorporate disparate data types, such as SKS splitting measurements and receiver functions, will lead to a fuller understanding of the extent of 3D anisotropy structure in the upper mantle as well as the relationship between mantle dynamics and plate tectonics. These results will not be possible without the TA, and future work will involve assimilating Flexible Array (FA) and PASSCAL data along with new TA stations.

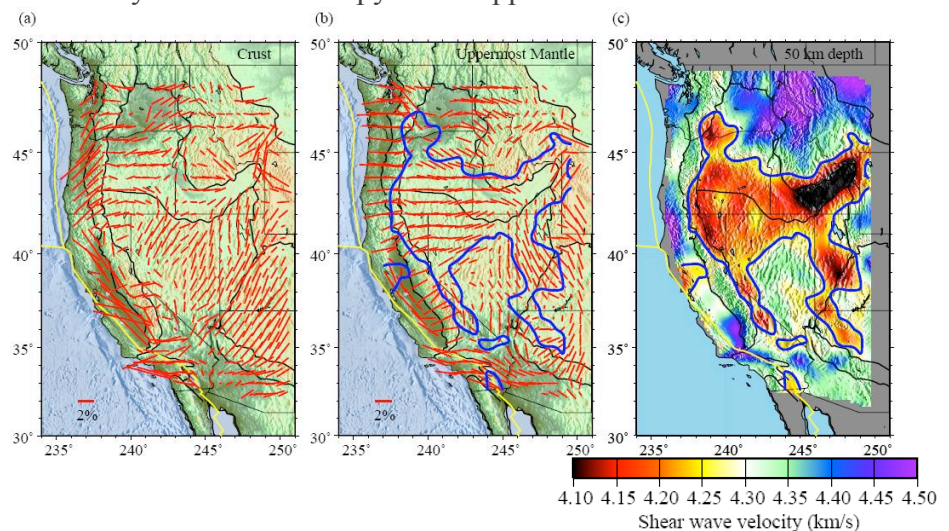


Figure 1. Azimuthal anisotropy in the middle crust (a) and uppermost mantle (b) and isotropic shear velocity at 50 km depth (c) inverted using ambient noise cross-correlation measurements.