D” ANISOTROPY FROM LAMELLAE AND TRANSVERSE ISOTROPY

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Observations of shear wave splitting in the lowermost mantle may hold key information for revealing the dynamics of the lower mantle boundary layer. The majority of observations are consistent with horizontally polarized shear wave components having slightly higher velocity than vertically polarized shear wave components. This is consistent with radial anisotropy or vertical transverse isotropy in the deep mantle. Such anisotropy could arise due to horizontal shearing of velocity heterogeneities that gives a distribution of lamellae on scales finer than the seismic wavelengths, from distributions of melt aligned in the boundary layer, or from sheared crystalline structure with fast axes randomly oriented in the horizontal plane in the boundary layer. Numerical models are compared with data to assess the magnitude and scale lengths of those models that can be locally approximated with layered isotropic or transversely isotropic models. The lack of azimuthal coverage of most regions leaves open the possibility of azimuthal anisotropy in many regions, but it is established that single, or sparse lamellae models are not likely to be responsible for the observations. It appears that globally there may be regions of lattice preferred orientation and other regions of shape-preferred orientation responsible for shear wave splitting in the lowermost mantle.

Moore, M. M., E. J. Garnero, T. Lay, and Q. Williams, Shear wave splitting and waveform complexity for lowermost mantle structures with low-velocity lamellae and transverse isotropy.

Supported by NSF grants EAR-0125595 and EAR-0135119.