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"Adventures in Anisotropy at the Base of the Mantle: Seismic Constraints on Deep Earth Dynamics"

**Abstract:** Dynamic processes at the base of the mantle play a critical role in Earth evolution, influencing the pattern of mantle convection, heat flow across the core-mantle boundary, the chemical evolution of the mantle, and the tectonic features we see at the surface. The lowermost mantle exhibits a number of unusual features imaged by seismology, including two large low shear velocity provinces (LLSVPs), a complicated seismic discontinuity structure, ultra-low velocity zones (ULVZs), and significant seismic anisotropy. The origin of many of these features, however, remain enigmatic. While observations of seismic anisotropy (that is, the directional dependence of seismic wavespeeds) at the base of the mantle are robust, their interpretation in terms of mantle dynamics remains difficult. In this talk I will discuss several recent and ongoing studies that aim to place tighter observational constraints on lowermost mantle anisotropy and to interpret those observations in terms of lower mantle dynamics. One area of focus is the African LLSVP, where we have documented anomalous splitting of SK(K)S phases that sample the lowermost mantle just outside the LLSVP edge. A detailed study of anisotropy beneath the Afar region, on the northeastern edge of the LLSVP, reveals shear wave splitting that varies as a function of propagation direction, suggesting complex anisotropy. Forward modeling of these observations using realistic mineral physics scenarios yields evidence for mantle flow with a significant vertical component, suggesting that the LLSVP edge may play a role in deflecting ambient mantle flow.