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Constraints on seismic anisotropy at the base of the mantle from combined S, ScS, SKS, and SKKS splitting analysis

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The D" region at the base of the mantle exhibits striking seismological properties, including the presence of seismic anisotropy. The fact that there is significant anisotropy in D" - in contrast to the generally isotropic overlying lower mantle - is presumably telling us something important about lowermost mantle dynamics, but we are not yet at the point of being able to reliably relate D" anisotropy to mantle flow patterns, as studies of upper mantle anisotropy routinely do. This is in part due to uncertainties about the causative mechanism for D" anisotropy, but the generally poor coverage of seismic raypaths that sample the lowermost mantle represents a major limitation on our understanding. A promising observational strategy for placing stronger constraints on the geometry of D" anisotropy is to combine different types of data which sample the lowermost mantle in different ways, and to exploit phases which are less commonly used to study D" anisotropy. We present measurements of S, ScS, SKS, and SKKS phases that sample the lowermost mantle in two different regions: beneath the northwestern Pacific Ocean, and beneath the Afar/Horn of Africa region. In both regions, we find evidence for significant splitting due to D" anisotropy. We discuss the constraints on anisotropic geometry obtained from combining different types of phases in our splitting analysis and explore the implications of our measurements for our understanding of flow at the base of the mantle in these regions.