Dynamics of the deep Earth as seen by Seismology

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Seismic studies of recent years show that the lower mantle is far from simple homogeneity. Strong heterogeneities have been detected on many scale lengths spanning several orders of magnitude from a few to 1000's of km using a variety of seismic probes. Using modern data and improved imaging techniques current seismological studies are able to image finer and finer details in the deep Earth.
The seismic models of the lowermost mantle include a variety of features such as intermittent sharp horizontal discontinuities which show considerable topography, strong seismic anisotropy, thin ultra-low velocity zones (ULVZ) and large low velocity provinces that show sharp vertical boundaries between normal and low velocity mantle.

These structures indicate a highly dynamic and complicated region that can only be understood by combining results from various disciplines such as seismology, geodynamics, mineralphysics, and geochemistry. Current models to explain the seismological data include the recently detected solid-solid phase transition from perovskite to post-perovskite to explain the discontinuity atop of the D" layer and possibly other regional layers, partial melts to explain ULVZ and chemically distinct regions and enrichment to explain a variety of features from ULVZ to large low velocity provinces.

This presentation will highlight recent seismological results of the structure of the lowermost mantle and the D" region going from the large low velocity provinces beneath the Pacific and Africa, to the structure of the post-perovskite phase transition as the source of the D" discontinuity to the small-scale structure of ULVZ.