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TITLE: SimLAB: Evaluating Geophysical Proxies for the Lithosphere-Asthenosphere Boundary

PRESENTATION TYPE: Poster Requested

CURRENT SECTION/FOCUS GROUP: Study of Earth's Deep Interior (DI)

CURRENT SESSION: DI03. An Interdisciplinary View of Earth's Mantle: Combining Geophysics and Mineral Physics

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ABSTRACT BODY: The Lithosphere-Asthenosphere Boundary (LAB) is a fundamental but inadequately understood element of the dynamic Earth system. While various geophysical methods can provide useful proxies for imaging the LAB, including modelling flexural studies or heat flow observations, seismic studies (surface-wave inversion, receiver-function analysis, and investigation of seismic anisotropy) and magnetotelluric methods, globally, and even locally, consistent interpretations of these results remain elusive (particularly beneath continents). Here, we are developing a systematic, comprehensive and realistic suite of synthetic data with the aim of benchmarking various seismological and magnetotelluric methods for imaging the LAB. Our study is based on a hypothetical regional geological model (800x800x400km) on a 10 km grid that is smoothly embedded within a standard global Earth model. The regional model extends from oceanic to thick cratonic lithosphere. Physical properties of the regional model (i.e. anisotropic elastic moduli, density, electrical conductivity, thermal and rheological parameters) match prescribed surface heat-flow and geoid boundary conditions and are computed using an approach based on thermodynamics, mineral physics, geochemistry, petrology, and solid-Earth geophysics. Anisotropy is incorporated into the model through both mantle-flow calculations and prescribed fossil anisotropy within cratonic lithosphere. Long-period synthetic seismograms are computed for teleseismic and regional events using SPECFEM3D, which provides full wave-equation modeling of seismic wave propagation incorporating phenomena such as anisotropy, attenuation and fluid-solid interfaces. To ensure a realistic (non-ideal) azimuthal distribution, the event locations are based on a subset of a one-year global catalog within the magnitude range from 6.0 to 7.0. Forward modeling of magnetotelluric response will also be undertaken. The initial public release of the suite of synthetic data for use by research groups is intended to be a blind test that will enable comparison of different imaging methods at an international workshop in Spring, 2012.

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INDEX TERMS: [8120] TECTONOPHYSICS / Dynamics of lithosphere and mantle: general.