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Frontiers in Geoscience Colloquium

Monday, March 21, 2016

3:00pm – 4:00pm

EES-DO Conference Room (TA-3, 215, 275)

Plastic and elastic anisotropy in olivine: Understanding plate boundaries in the laboratory

Prof. Lars Hansen

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Plate tectonics is clearly the largest scientific revolution in the Earth sciences. However, a key outstanding gap in our understanding of the solid earth is the manner in which tectonic plates can be relatively rigid, with most deformation focused into narrow zones at their base and around their edges. This localization of deformation is likely related to micromechanical processes in olivine, the dominant mineral in the upper mantle. In this talk, I will review recent laboratory experiments designed to investigate potential mechanisms of strain localization. Importantly, olivine is demonstrated to develop strong plastic anisotropy. A constitutive model is developed to describe this anisotropy and is applied to outcrop-scale shear-zone formation and lithospheric-scale plate motion. Furthermore, the observed plastic anisotropy is associated with strong elastic anisotropy. The evolution of elastic anisotropy during deformation is parameterized and extrapolated to geological conditions. This extrapolation agrees favorably with recent observations of seismic anisotropy, shedding light on the mechanical nature of the base of tectonic plates.

Host: Ricardo Lebensohn (MST-8, lebenso@lanl.gov, 5-3035).

If you wish to meet with the speaker, please contact Dr. Lebensohn.

