Geophysical Research Abstracts, Vol. 7, 05607, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05607

Seismic anisotropy in the Western US as a testbed for advancing combined models of upper mantle geodynamics and texturing

T. W. Becker (1), V. Schulte-Pelkum (2), and D. K. Blackman (3)

(1) University of Southern California, Los Angeles CA (twb@usc.edu), (2) University of Colorado, Boulder, (3) IGPP, Scripps, U.C. San Diego

Observed seismic fast axes are popularly equated with directions of mantle flow. In order to substantiate this assumption, we present improved models of mantle flow, derived textural anisotropy, and predicted seismic anisotropy. Results include global models, where we compare surface wave based seismologic inversions with predictions from large-scale mantle circulation computations. For body wave anisotropy, we focus on a regional model of the western United States, a relatively simply-parameterized region where a wide range of seismic data is available. Our work addresses the three stages needed to connect mantle flow and anisotropy: flow, texture development, and wave propagation in a heterogeneous upper mantle and lithosphere. For the flow models, we explore lateral variations in viscosity, improved rheologic realism, and joint regional/global convection computations. In terms of mineral physics, we compare predictions from finite strain (FS), lower-bound (LB), and kinematic (KR) texture formation theories. The seismological modeling includes computing apparent splitting from spatially variable, not necessarily hexagonal anisotropic elastic tensors. We also evaluate the potential role of the crust in partly obfuscating the underlying dynamic processes. Preliminary results indicate that FS, LB, and KR models are similar except in regions of large spatial variations in flow, as expected. Mantle circulation models that take the inferred Farallon slab density anomalies at depth into account show a return flow roughly opposite to the surface motion of North America. Those models tend to fit the data better, indicating a possible avenue to better constrain tectonic processes in the study region over time.