Geophysical Research Abstracts, Vol. 8, 01861, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01861

Lithospheric structure beneath western United States

X. Li, X. Yuan and R. Kind
GeoForschungsZentrum Potsdam (li@gfz-potsdam.de)

The coast range of Western United States is a tectonically very active region. Many of the tectonic features are directly related to the northward migration of the Mendocino triple junction (MTJ) along the western edge of North America during the past 30 million years. South of the MTJ the Farallon slab has completely subducted beneath the North American plate, leaving a slab window which is thought to be filled by the upwelling asthenospheric materials. Accurate knowledge of the thickness of the lithosphere is improtant to understand the tectonic evolution of northern California. High temperature in the upper mantle estimated from seismic tomography and xenolith data indicates a thin ($<$100 km) thermal lithosphere. A zone of low shear wave velocity is imaged down to a depth of 300 km by surface wave tomography. Receiver function technique is one of the most powerful tools to detect seismic discontinuities in the crust and upper mantle. Here we jointly use P and S receiver function methods for 67 permanent broadband seismic stations of numerous seismic networks. The P receiver functions reveal complicated crustal structures. A strong intra-crustal interface at a depth of $\sim$20 km effectively masks the converted signals from the Moho and lithospheric interfaces at many sites. The S receiver function method overcomes this problem, as the direct S-to-P converted waves arrive earlier than the S waves and thus consequently separated from the multiples that arrive later. We calculated S receiver functions from waveform data of S and SKS phases for all the stations. A significant phase with negative amplitudes is observed in the S receiver functions at $\sim$8 s, indicating a low velocity interface in the upper mantle at a depth of $\sim$70 km. We interpret this phase as the S-to-P conversion at the base of the lithosphere. Waveform modeling shows that the lithosphere-asthenosphere boundary here is less than 20 km sharp. The 410 and 660 km discontinuities are also well observed with P and S receiver functions. The simultaneous delay of both discontinuity phases by 2–3 s is consistent with a thin lithosphere and a slow upper mantle in the area.