Geophysical Research Abstracts
Vol. 15, EGU2013-234-1, 2013
EGU General Assembly 2013

Study of the eastern edge of the Pacific Large Low Shear Velocity Province

Agnieszka Płonka (1), Sanne Cottaar (2), Barbara Romanowicz (2,3)

(1) Institute of Geophysics, University of Warsaw, Warsaw, Poland, (2) Berkeley Seismological Laboratory, Berkeley, CA, (3) Institut de Physique du Globe de Paris, Paris, France

Large Low Shear Velocity Provinces (LLSVPs) are regions of reduced shear wave velocity in the deep mantle located antipodally beneath the central Pacific and Africa, which likely correspond to a combination of thermal and chemical heterogeneity in this region. Their lateral boundaries are sharp as evidenced by the observation of complexity of waveforms in seismic phases that sample them. Most hotspots appear to be located above LLSVP boundaries. As recent numerical simulations have shown, hot rising plumes may preferentially be rooted at these boundaries, which also could be the locus of interaction with subducted slab material. To further our understanding of the nature of the LLSVPs, it is important to analyze seismic waveforms that correspond to phases which interacted with their boundaries. We here consider the eastern edge of the Pacific LLSVP which is well sampled by S diffracted waves from southern hemisphere earthquakes observed in north America, especially since the recent deployment of the USArray network.

We selected 6 events of magnitude Mw> 6 and stations in the distance between 80 and 130 degrees for events located far in the South (Southern Shetland, Sandwich Islands, Pacific- Antarctic Ridge), while for Chile events the distance was between 60 and 130 degrees. Data were downloaded from the IRIS Data Center.

For an event in Southern Shetland Islands (15 January 2012, magnitude of 6.6), which has a favorable radiation pattern for Sdiff at the considered azimuths, shear waves traverse the lowermost mantle in the eastern part of the Pacific LLSVP (for azimuths between 310 and 330 degrees) and beneath the South American craton (for azimuths between 330 and 350 degrees). Differential Sdiff-SKS travel times measured using the cross-correlation method show around 10 s delay due to the LLSVP and become progressively faster for higher azimuths, as the path spends less time in the LLSVP. Sdiff travel times compared to 1D normal mode synthetics show the same trends. We present estimates of the shear velocities in D" within and outside of the LLSVP using a simple ray theoretical approach, and discuss the nature of observed post-cursors.