Geophysical Research Abstracts
Vol. 12, EGU2010-9276, 2010
EGU General Assembly 2010

Low S-wave-velocity layers in the transition zone: a review of seismic data

Lev Vinnik
Institute of physics of the Earth, Moscow, Russian Federation (vinnik@ifz.ru)

I review the seismic data that suggest the presence of thin (a few tens km wide) low-S-velocity zones atop the 410-km discontinuity and in a depth range of 450 - 520 km. Most of the data are obtained with receiver function techniques. Contrary to the prediction of Bercovici and Karato (2003), the low velocity atop the 410-km discontinuity is found mostly in association with plume-like structures in the mantle of the Kaapvaal craton, the Siberian craton, the Arabian plate, West Siberia, China, West Africa and Antarctica (Vinnik and Farra, 2002, 2007). In southern Africa (Vinnik et al.,GJI 2009) this structure seems to be anisotropic. The latest observations of the low velocity atop the 410-km discontinuity are made in the western US and California (e.g. Vinnik et al. JGR 2010, in press). In southern California and the neighboring Pacific this layer, found with the S receiver function techniques, can be related to the Baja-Guadalupe hot-spot. The low velocity can be related to the high solubilty of water in wadsleyite in the mantle transition zone relative to olivine in the overlaying mantle, but other possibilities cannot be excluded. Most observations of the low-velocity zone in a depth range of 450-520 km are also related to plumes and plume-like structures (Afar, Iceland, Azores, Cameroon, south-eastern Atlantic). A plausible theory of this phenomenon should explain why the low S velocity never extends to depths exceeding 520 km.