Geophysical Research Abstracts
Vol. 12, EGU2010-8396, 2010
EGU General Assembly 2010

SHdiff/SVdiff splitting in an isotropic Earth and anisotropy in D''

Dimitri Komatitsch (1), Lev Vinnik (2), and Sebastien Chevrot (3)

(1) Universite de Pau et des Pays de l'Adour, France, (2) Institute of physics of the Earth, Moscow, Russian Federation, vinnik@ifz.ru, (3) Observatoire Midi-Pyrenees, Toulouse, France

The vertically-polarized SVdiff seismic phase sometimes arrives later than the horizontally-polarized SHdiff. Both phases propagate in the D" layer at the base of the mantle and the difference in their arrival times is usually interpreted in terms of seismic anisotropy in D". Here, using numerical simulations based on the spectral-element technique, we demonstrate that a significant delay of SVdiff relative to SHdiff is present even in the IASP91 isotropic reference Earth model and in a model with a high S velocity in D" relative to IASP91. The delay is accompanied by strong amplitude decay of SVdiff with distance. This relationship resembles the effect of anelasticity. In a model with a low S velocity in D", the waveform of SVdiff can be very different from SHdiff, and this difference can be mistaken for a delay of SHdiff relative to SVdiff. In a laterally-heterogeneous isotropic D" SVdiff can also be delayed because, unlike SHdiff, SVdiff has strong amplitude decay along fast paths. Its traveltime is thus dominated by slow propagation paths and tends to be positively biased. For D" models with an S velocity difference of 3% between two hemispheres, there are regions where SHdiff arrives up to 15 s earlier than the first clearly visible SVdiff.
This is observed in a corridor several hundred kilometers wide.
If the effects that are observed in our experiments are misinterpreted in terms of D" anisotropy in actual seismic data, estimates of anisotropy are biased and may contribute to the idea of seismic anisotropy being different in high- and low-S-velocity regions of D".