Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01799, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01799
EGU General Assembly 2008

Measurements and sensitivity kernels of finite-frequency SKS splitting

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The splitting of SKS waves caused by anisotropy may be analyzed by measuring the 'splitting intensity', i.e., the amplitude of the transverse signal relative to the radial signal in the SKS-time window. This quantity is simply related to structural parameters. Extending the widely-used cross-correlation method for measuring traveltime anomalies to anisotropic problems, we propose to measure the SKS-splitting intensity by a robust cross-correlation method that can be automated to build large high-quality datasets. For weak anisotropy, the SKS-splitting intensity is retrieved by cross-correlating the radial signal with the sum of the radial and transverse signals. The cross-correlation method is validated based upon a set of Californian seismograms. We investigate the sensitivity of the SKS-splitting intensity to general anisotropy in the mantle based upon a numerical technique (the adjoint spectral-element method) considering the full physics of wave propagation. The computation reveals a sensitivity remarkably focused on a small number of elastic parameters and on a small region of the upper mantle. These fundamental properties and the practical advantages of the measurement make the cross-correlation SKS-splitting intensity particularly well adapted for finite-frequency imaging of upper-mantle anisotropy.