



SplitRacer – a semi-automatic tool for the analysis and interpretation of teleseismic shear-wave splitting

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We present a semi-automatic, graphical user interface tool for the analysis and interpretation of teleseismic shear-wave splitting in MATLAB. Shear wave splitting analysis is a standard tool to infer seismic anisotropy, which is often interpreted as due to lattice-preferred orientation of e.g. mantle minerals or shape-preferred orientation caused by cracks or alternating layers in the lithosphere and hence provides a direct link to the earth's kinematic processes. The increasing number of permanent stations and temporary experiments result in comprehensive studies of seismic anisotropy world-wide. Their successive comparison with a growing number of global models of mantle flow further advances our understanding the earth's interior. However, increasingly large data sets pose the inevitable question as to how to process them. Well-established routines and programs are accurate but often slow and impractical for analyzing a large amount of data. Additionally, shear wave splitting results are seldom evaluated using the same quality criteria which complicates a straight-forward comparison.

SplitRacer consists of several processing steps: i) download of data per FDSNWS, ii) direct reading of miniSEED-files and an initial screening and categorizing of XKS-waveforms using a pre-set SNR-threshold. iii) an analysis of the particle motion of selected phases and successive correction of the sensor miss-alignment based on the long-axis of the particle motion. iv) splitting analysis of selected events: seismograms are first rotated into radial and transverse components, then the energy-minimization method is applied, which provides the polarization and delay time of the phase. To estimate errors, the analysis is done for different randomly-chosen time windows. v) joint-splitting analysis for all events for one station, where the energy content of all phases is inverted simultaneously. This allows to decrease the influence of noise and to increase robustness of the measurement when deriving hypothetical one or two-layer splitting parameters.