Testing models of complex anisotropy using teleseismic SKS data from broadband station RSSD in NW South Dakota

In this study, we examine complex anisotropy observed at station RSSD in NW South Dakota. A preliminary analysis of the RSSD data set using the Silver and Chan method yielded high quality results that clearly show back-azimuthal variation of apparent fast axis orientation and split time, indicating that complex anisotropy is present beneath the station. To model this anisotropy, we test and statistically rank possible models of multiple layer structure by comparing observed SKS from RSSD to predicted SKS. The cross convolution method of Menke and Levin is used to measure the goodness of fit, and a direct Monte-Carlo search method (the Neighborhood Algorithm) is used to guide the search through parameter space and produce maximum likelihood models. We then use the $F$-test to rank the significance of the relative error reductions between the different model parameterizations. This combination of methods provides for statistical examinations of the fit of various complex models, and proves more effective than fitting back-azimuthal variations of splitting times.

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