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Seismic anisotropy derived from joint inversion of SKS and P-to-S converted phases

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SKS (and similar phases SKKS, PKS) is a powerful diagnostic tool in seismic anisotropy study. Initially SKS phase is polarized in the wave plane. If SKS propagates through anisotropic media, the wave splits into two quasi-shear waves with different velocities orthogonally polarized to each other. Phase shift between components and its amplitude ratio depends on anisotropic parameter of the media. Lateral resolution of the SKS technique is high enough in comparison with other seismological tools, e. g. surface wave technique. The SKS technique implies the assumption of a single anisotropic layer, but says nothing on the depth of the layer, which diminish scientific significance of the method.
Receiver function (RF) technique exploits P to S phase conversion. Process of generation and propagation of converted waves is affected by media anisotropic properties. Moreover resulting waveform strongly depends on position of the anisotropic layer. However anisotropic contribution in resulting RF waveform is small in comparison with SKS. Both SKS and RF techniques require earthquake data recorded from many azimuths to exclude effects of lateral inhomogeneity. But usually it is much easier to collect necessary records for P-wave then for SKS phase.
Some attempts to combine SKS and RF data in the seismic anisotropy study were done previously, but without sufficient grounds. In the present study the possibility and possible advantage of joint inversion of SKS and P-to-S converted phases is investigated by numerical analysis. Calculations were performed for both synthetic models and real data. It is shown that the application of the joint inversion of SKS and RF from one hand improves resolution for the determination of basic anisotropic parameters, from the other hand requires careful analysis of the consistence of different groups of data. Ignoring the possible disagreement of different groups of data can lead to significant errors in the estimation of anisotropic parameters.

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