Estimation of seismic anisotropy by receiver function analysis

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We study the effect of seismic anisotropy on P-wave receiver function, calculating synthetic seismograms of a plane P wave that propagates into a layered anisotropic medium, in which hexagonal anisotropy is assumed. Transfer function of the layered structure is synthesized for different propagation directions of P wave. In the case where the seismic anisotropy exists in the layered structure, P-SV and P-SH conversions take place at the layer boundaries, and transverse component, as well as vertical and radial components, is excited. Thus two kinds of receiver functions, R-receiver and T-receiver, are calculated by deconvolution of the vertical component seismograms from the radial and transverse component seismograms. The Ps phase (P-to-S converted wave) and other reverberations are identified in the synthetic receiver functions. Arrival times and amplitudes of these phases are found to change with a period as the P-wave propagation direction varies. The periodic change may be attributed to shear wave splitting of the converted wave and reverberation phases. In order to infer the seismic anisotropy, T-receiver function analysis is made using 200 seismograms recorded at two stations in Okayama prefecture. The periodic changes of pi and twice pi are found for Ps phase amplitude in the T-receiver functions. The changes are interpreted as being due to the hexagonal symmetry axis in the N-S direction.