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Generalization of the $H - \kappa$ stacking method to anisotropic media

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The effect of anisotropy on the estimates of crustal thickness H and average bulk v_P/v_S-ratio κ can be significant in the presence of strong seismic anisotropy. Here we extend the stacking approach of Zhu and Kanamori (2000) to include all twenty P-to-S converted phases and their crustal reverberations that are generated in the anisotropic case - instead of only five phases in the isotropic case. The ray-based algorithm of Frederiksen and Bostock (2000) is used to calculate the amplitude and arrival time of each phase. Synthetic tests are performed to investigate the feasibility and robustness of the stacking approach. For simplicity, we assume hexagonal symmetry and a horizontal symmetry axis but more general anisotropy may be considered. The tests reveal that the estimates of H and κ can be significantly affected by the presence of crustal anisotropy. We verify the feasibility of the stacking approach for real data by applying the method to examples from three different tectonic regions. The results show that the anisotropic stacking scheme presented here can provide much better constraints on the estimation of H and κ in comparison to the isotropic stacking. The anisotropic stacking can also help to resolve ambiguities in the determination of H and κ when several maxima of stacked receiver-function amplitudes arise in cases of complex crustal structure.