EGU22-11315, updated on 15 Aug 2022
https://doi.org/10.5194/egusphere-egu22-11315
EGU General Assembly 2022


# Differential SKS-SKKS splitting due to lowermost mantle anisotropy beneath North America measured from beamformed SmKS phases

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Differential SKS-SKKS splitting is often interpreted as evidence for lowermost mantle anisotropy, because while SKS and SKKS raypaths are very similar in the upper mantle, they diverge substantially in the lowermost mantle. While discrepant SKS-SKKS splitting is a valuable tool to probe D'' anisotropy, individual measurements are typically noisy and have large scatter, making interpretation challenging. Array techniques are commonly used in observational seismology to enhance signal-to-noise ratios and extract seismic phases that would not be reliably detectable in single seismograms. Such techniques, however, have rarely been applied to resolve seismic anisotropy via shear wave splitting. In this study, we apply stacking and beamforming for different subarrays across the USArray to analyze SKS-SKKS splitting discrepancies measured across the North American continent. A benchmarking exercise demonstrates that the effect of upper mantle anisotropy on the beamformed phases can be understood as a relatively simple average of splitting over different upper mantle volumes, and that discrepant measurements reflect a contribution from the lowermost mantle. We obtain robust differential splitting intensity measurements for beamformed data from a selection of events that occurred in the western Pacific and Scotia subduction zones. This approach yields a robust set of splitting intensity discrepancy values for phases that sample the lowermost mantle beneath North America and the surrounding region, with much less scatter than comparable datasets based on individual seismograms. We find evidence for several distinct regions with strong anisotropy at the base of the mantle beneath our study region, plausibly due to subduction-related lowermost mantle flow and deformation.