

# Shear-wave splitting across western Saudi Arabia: The pattern of upper mantle anisotropy at a Proterozoic shield

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**Abstract.** We constrain upper mantle anisotropy across the Arabian Shield from shear-wave splitting analyses of *SKS* phases at eight temporary broadband stations that operated in Saudi Arabia. The direction of fast polarization is consistently aligned north-south and the delay time between fast and slow shear waves is generally 1.0 to 1.5 s, indicating that the mantle anisotropy is relatively homogeneous and coherent. We cannot distinguish between two possible models for the origin of this signal. The observed splitting may reflect fossil upper mantle anisotropy associated with the dominantly east-west accretion of oceanic terranes and formation of the Proterozoic Arabian lithosphere. Our results may also be compatible with present-day asthenospheric anisotropy caused by the northward absolute plate motion of the Arabian plate or northward asthenospheric flow from an Ethiopian mantle plume.