

Shear Wave Splitting across the Mackenzie Mountains

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The Mackenzie Mountains (MM) of northwest Canada are an actively uplifting, seismogenic salient of the northern Canadian Cordillera that lie about 800 km NE of the plate boundary. We present new shear wave splitting measurements for the region featuring results from the recent NSF-funded Mackenzie Mountain Earthscope Project seismometer deployment, a linear array which transects the MM and the Northern Canadian Cordillera to characterize upper mantle anisotropy in this region. These measurements can provide constraints on fossilized strain in the lithosphere and/or the directionality and degree of lateral asthenospheric flow. Our splitting measurements used the newly developed Whittle Likelihood Estimation Method (Corbalan et al., in review). This is a robust method that better characterizes the effects of pre-event noise on parameter uncertainties. We note a gradual rotation in anisotropy across the Canadian Cordillera, with stations nearest to the craton yielding fast axis orientations that are subparallel to North America absolute plate motion of (~NE-SW). Moving SW from craton, across the MM, and towards the plate boundary, fast-axis orientations gradually rotate to become subparallel to the strike of the Denali and Tintina faults (NW-SE). This, along with recent body wave tomography results, suggests that these large offset fault zones are associated with narrow lithosphere-scale shear zones. Further to the SW, shear wave splitting is dominated by the effects of subduction under the Gulf of Alaska, which divert asthenosphere flow about the slab. (Hanna and Long, 2012; Wang and Becker, 2019).

Mackenzie Mountains

