

# Variability and origin of seismic anisotropy across eastern Canada: evidence from shear-wave splitting measurements

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Measurements of seismic anisotropy in continental regions can be interpreted with respect to past tectonic processes, preserved in the lithosphere as “fossil” fabrics, and/or with respect to present-day sublithospheric mantle flow. Discriminating between these different sources of seismic anisotropy is particularly challenging beneath shields, whose thick ( $\geq 200$  km) lithospheric roots may record a protracted history of deformation and strongly influence underlying mantle flow. Eastern Canada, where the geological record spans  $\sim 3$  Ga of Earth history, is an ideal region to address this issue. Here we use shear wave splitting measurements to define upper-mantle anisotropy via the fast-polarisation orientation  $\phi$  and delay time  $\delta t$  of SKS and other core phases. We compare the resulting anisotropy measurements with surface tectonics and aeromagnetic data to assess the contribution of fossil lithospheric fabrics. The influence of sublithospheric mantle flow is considered via flow directions derived from global geodynamic models. We consider that the splitting parameters likely record a combination of present-day mantle flow and older lithospheric fabrics.

We look forward to carrying out further analysis of seismic anisotropy in eastern Canada and the northeast US using the new data sets available through the EarthScope TA and QM-III FlexArray deployments. SKS splitting measurements will highlight lateral variability, especially lithospheric-scale fabrics. Surface-wave measurements will provide the opportunity to investigate the depth-dependence of anisotropy in more detail, shedding new light on the relative contributions of lithospheric and sublithospheric processes.

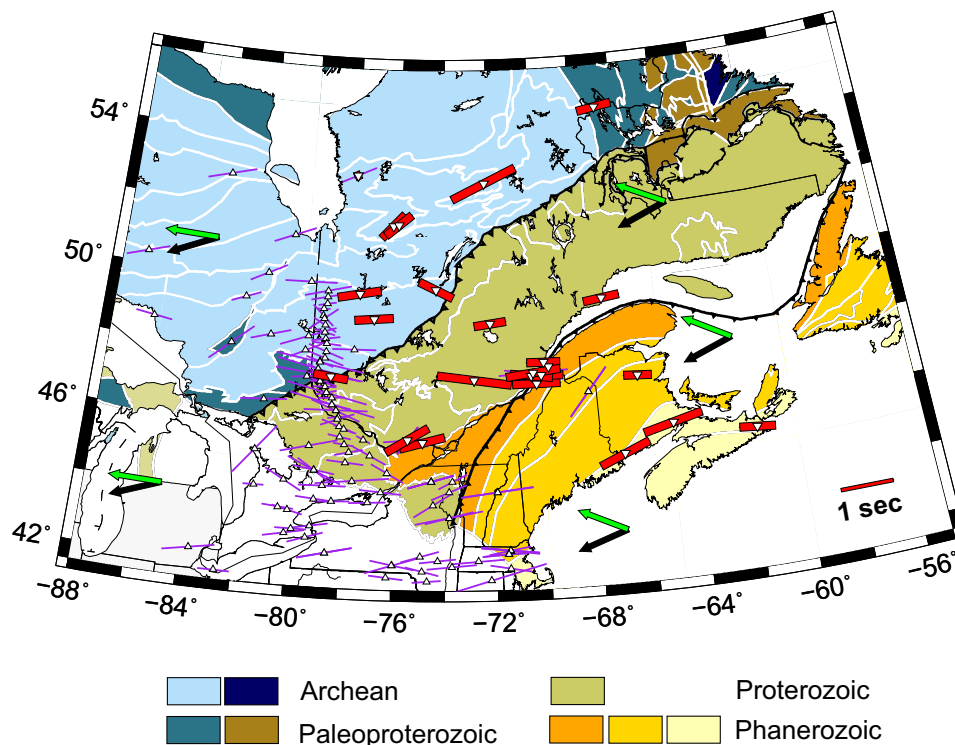


Figure 1: SKS splits (red and purple bars) superimposed on tectonic boundaries. The two arrows show absolute plate motion (APM) in two different reference frames: Nuvel-NNR and HS3. Ticked lines AF and GF show the Appalachian and Grenville fronts, respectively.