Title: A multi-layered anisotropic model beneath the eastern North American continent
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We investigated the anisotropic structure of the North American lithosphere using observations of shear wave splitting in core refracted waves recorded along a ~1300 km long array stretching from James Bay to the Fundy Basin. We interpret the anisotropic structure beneath this study area to be both multi-layered and laterally variable. Specially, the average delay time increases from ~0.5 s in the Superior Province to ~1 s in the Appalachians with a lateral transition in the Grenville Province, which we believe to be the boundary of craton at depth.

Lateral changes in the pattern of observed splitting coincide with a region of significant change in azimuthal anisotropy at depth constrained by the joint inversion of surface and body waves (Yuan and Romanowicz, 2011). To resolve these differences better, we carry out forward modeling using a 1D anisotropic layered reflectivity method of Levin and Park (1997) and take Yuan and Romanowicz (2011) model as a starting point.

We are particularly interested in two specific areas: 1) the lateral change in splitting patterns beneath the Grenville Province; 2) cratonic area with weak anisotropy. The tomographic model has a limited lateral resolution of ~500 km, however, our new measurements of shear wave splitting are done with lateral step of 50 km or less, and thus offer us a way to detect the exact location where upper mantle fabric changes.

Figure required in the abstract:

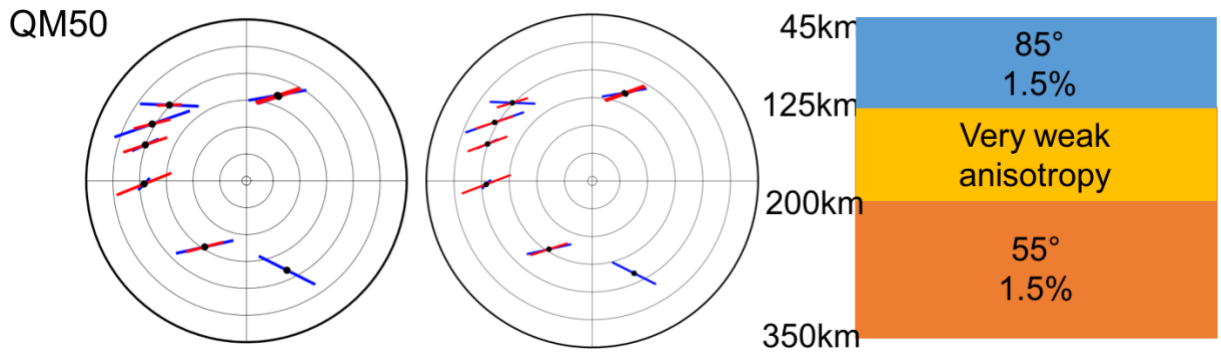


Figure 1. An example of outcome at station QM50 which is located close to the lateral change in splitting patterns. Polar diagram on the left is centered at QM50 and shows the observed (blue) splitting patterns and predicted (red) splitting patterns from Yuan and Romanowicz (2011) model. The polar diagram in the middle is centered at QM50 and shows the observed (blue) splitting patterns and predicted (red) splitting patterns from our model. Blocks on the right are illustrations of our best fitting model for QM50. Different colors show different anisotropic layers. For each layer, the numbers on top show the fast polarizations, the numbers at bottom show the strength of azimuthal anisotropy (%).