

# OCGC Seminar

## Lithospheric fault rheology: Probing the formation and evolution of eastern Laurentia with surface-wave tomography

**Dr. Fiona Darbyshire**

GEOTOP

Université du Québec à Montréal

**Thursday, March 1<sup>st</sup>, 2018 11:30 AM**

**University of Ottawa**

**25 Templeton ST**

**ARC233**

**Jeudi le 1 march 2018, 11h30**

**Université d'Ottawa**

**25 Templeton St.**

**ARC233**

One of the grand challenges in seismology is to understand the formation and evolution of the continental lithosphere using information from broadband seismic networks on a regional or continental scale. We have known for a long time that the stable Precambrian cratonic lithosphere is characterised by abnormally high seismic wavespeeds, consistent with cold temperatures and an iron-depleted composition. The complexity of the cratonic lithospheric mantle, contrary to that of the crust, has only recently come to light. Early tomographic models showed the shields as near uniform high-wavespeed bodies, leading to the perception that the stable cratonic lithosphere was relatively uninteresting compared to active tectonic regions.

With the increase in data coverage afforded by the Canadian POLARIS project and its offshoots, along with EarthScope Transportable Array and FlexArray deployments, it has been possible over the last 10-15 years to probe the cratonic lithosphere in much more detail than before. Now, instead of a relatively uniform fast body, we see a complex structure whose internal lateral and vertical wavespeed variations provide valuable information on the formation and evolution of Precambrian continental lithosphere. The subdivisions of Archean cratons, Proterozoic mobile belts and large-scale rift systems is shown to extend beneath the crust into the mantle lithosphere, and we are beginning to see systematic signatures in both wavespeed and seismic anisotropy that provide new insights into ancient tectonic processes.

The focus of this talk will be the structure of the eastern Canadian Shield, using datasets from Hudson Bay, central Canada and the central-northern US, and the Ontario-Quebec-Labrador region. Surface wave tomography illuminates a wide range of structures and fabrics within the cratonic lithosphere in these regions, and I discuss the tectonic implications of these present-day 'snapshots'.

Geological Survey of Canada

**LOGAN CLUB**  
**CLUB LOGAN**  
Commission géologique du Canada



**Carleton**  
UNIVERSITY