

Is seismicity in the western Québec Seismic Zone driven by glacial rebound?

By: Dr. Veronica Prush

**Postdoctoral Scholar
McGill University**

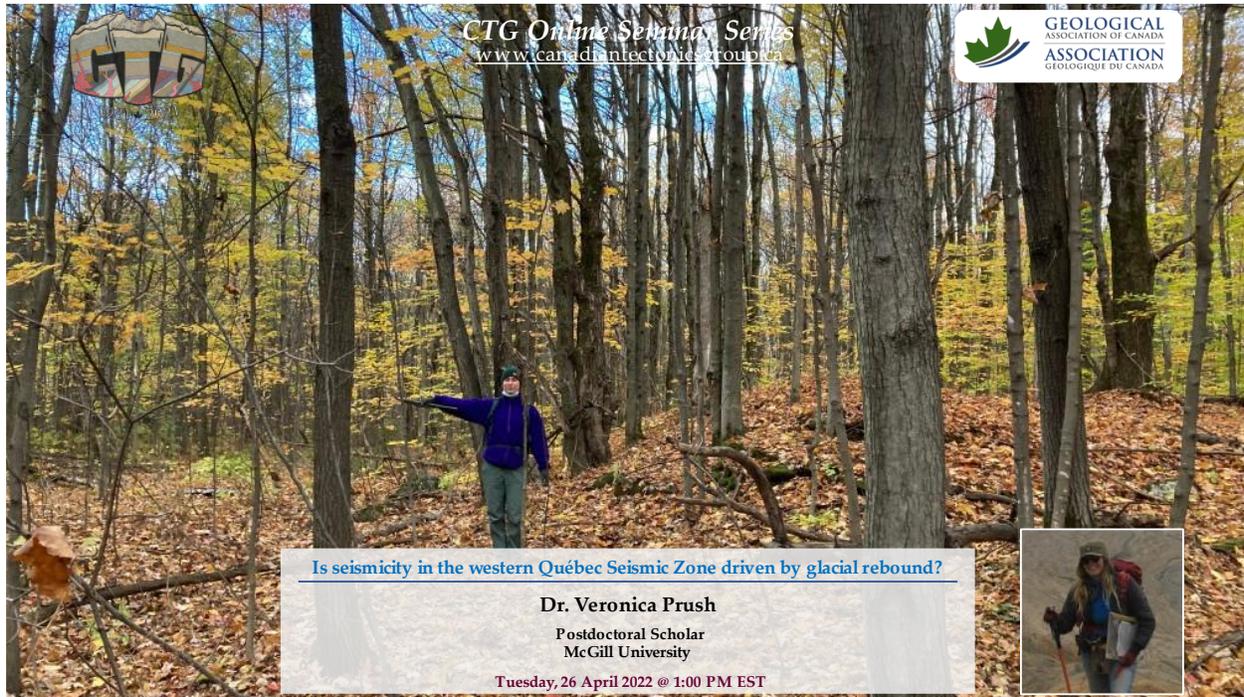
Abstract:

The western Québec Seismic Zone, which encompasses the region from Ottawa to Québec along the Lower St. Lawrence River and north to the Abitibi area, is one of the most seismically active regions in Canada. Past work has attributed the ongoing seismicity in this region to reactivation of Iapetan rift faults caused by stress changes and plate bending related to the recession of glacial ice sheets at ~10-20 ka. Models predict that crustal rebound following ice sheet recession would drive a short period of increased seismicity in a thrust-regime crustal stress setting. As the rebound effects subside, seismicity would be expected to decrease. Testing whether post-glacial rebound can explain the limited available historical record of earthquakes in the western Québec Seismic Zone requires knowledge of the timing, location, and orientations of past earthquakes. We use a recently released set of 1 m-resolution lidar-derived digital elevation models covering the whole of the western Québec Seismic Zone to map possible post-glacial fault scarps. The release of this lidar dataset allows us an unprecedented opportunity to identify possible fault scarps that, with ongoing detailed field studies, may be related to post-glacial faulting. Inspired by work in Fennoscandia, we are in the process of adapting methods for distinguishing possible faults from the geomorphic effects of ice flow and recession, and we present a preliminary set of criteria for identifying fault scarps in this region. We discuss successes and challenges we've encountered in our preliminary work thus far. By combining our remote sensing and mapping efforts with ongoing geodynamic modeling, this work will lead to a dramatically improved understanding of the shaking hazard posed to major Canadian cities that lie within the western Québec Seismic Zone.

Twitter: [@PrushVeronica](https://twitter.com/PrushVeronica)

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