McMaster University
Structural Geology and
Tectonics Group

McMaster University

Graduate Student Opportunities

Structural Geology and Applied Geophysics graduate student projects (MSc and PhD) in the School of Geography and Earth Sciences, McMaster University, Canada

The structural geology and tectonics group in the School of Geography and Earth Sciences, McMaster University is seeking applications from skilled and motivated students to work on the projects outlined below. We would like to invite all qualified applicants to get in touch to discuss graduate student opportunities in the group. Applicants should send an email to peacea2@mcmaster.ca expressing why they are interested, qualified and suitable for the project, in addition to a CV. These positions will remain open until filled.

1) PhD project - The causes of neotectonic activity in Eastern North America

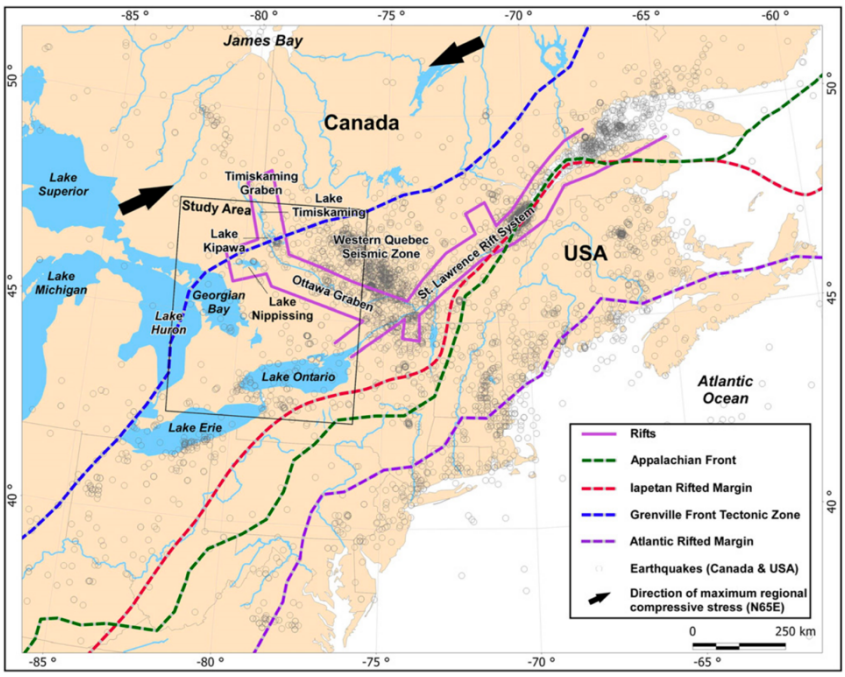

Figure 1 – Tectonic overview of eastern North America with historic earthquake epicentres overlain (1627 – 2013). Modified from Doughty et al. (2014; Sedimentary Geology).

The present day global seismicity pattern is dominated by a dichotomy between plate boundary zones and the more stable plate interiors. Plate boundary zones are typically associated with high strain and magnitude seismicity, whereas plate interiors are dominated by dispersed, lower strain rates and magnitude seismicity. Although most seismicity in continental North America is found at the western margin, a band of not insignificant seismicity in exists in eastern North America, far from present day plate boundaries (Fig. 1). This band of seismicity extends through much of the Eastern North American continent where it approximately follows the Iapetus suture along the St. Lawrence river. Here, earthquakes up to approximately magnitude 6 have been recorded in proximity to large population centres.

As most seismicity is associated with plate boundaries, the causes of this type of intraplate seismicity is particularly intriguing. However, because of the lower strain and seismicity rates intraplate settings are often more problematic to characterise. Reactivation of pre-existing structures through structural inheritance has been proposed as a mechanism controlling such intraplate deformation. However, the precise nature of the link between such reactivation and observed seismicity is poorly understood. In addition, the extent to which active seismicity in the region is controlled by glacial rebound or external tectonic stresses remains to be answered.

This project will use a combination of geological mapping of deformation, both in the field and also on geophysical data, in addition to numerical models of stress to provide new insights into this problem. The project would suite candidates with a background in either geology or geophysics, with significant fieldwork experience.

McMaster University
Structural Geology and
Tectonics Group

McMaster University

2) MSc Project - Formation of the passive margins of the North Atlantic and beyond

The opening of the North Atlantic represents the final dispersal of the Pangea supercontinent forming some of the most well-studied passive margins (e.g., the Newfoundland-Iberia margins) (Fig. 2). These passive margins are of interest scientifically as they provide information about some of the fundamentals of plate tectonic processes, but also because they host vast hydrocarbon resources.

However, despite decades of research from academia, government and industry, significant unknowns remain in our understanding of rifted continental margins. These include: 1) the precise nature of which marginal basins are conjugate, and how connected they were during rifting, 2) the extent, timing, nature and causes of the North Atlantic Igneous Province, 3) the mechanisms involved in rifting, for example whether it was primarily driven by active or passive mechanisms, and 4) the role of structural inheritance (reactivation).

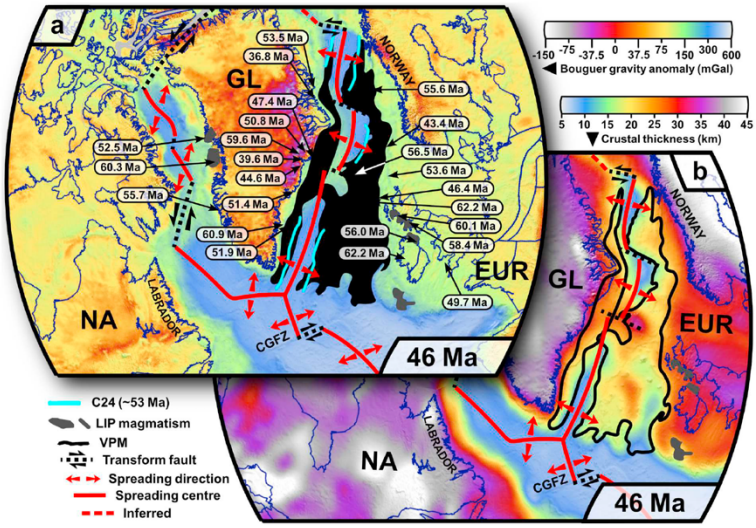

Figure 2 – Tectonic overview of the North Atlantic at 46 Ma. Modified from Peace et al. (2019; Earth-Science Reviews).

This project would aim to answer some of these questions through various approaches that could include: the interpretation of offshore seismic and potential-field data, onshore geological mapping, and development of plate tectonic models (using tools such as GPlates). The project would suite candidates with a background in either geology or geophysics, with significant fieldwork experience.

Finally, many of the issues in the understanding of the evolution of the North Atlantic are present elsewhere, and studies could also be undertaken at other locations where data is available.

Employment equity statement

All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority. In keeping with its Statement on Building an Inclusive Community with a Shared Purpose, McMaster University strives to embody the values of respect, collaboration and diversity, and has a strong commitment to employment equity. The diversity of our workforce is at the core of our innovation and creativity and strengthens our research and teaching excellence. The University seeks qualified candidates who share our commitment to equity, diversity and inclusion. While all qualified candidates are invited to apply, we particularly welcome applications from women, persons with disabilities, First Nations, Métis and Inuit peoples, members of visible minorities, and LGBTQ+ persons. Job applicants requiring accommodation to participate in the hiring process should contact the Human Resources Service Centre at 905-525-9140 ext. 222-HR (22247) or the Faculty of Health Sciences Human Resources office at ext. 22207 to communicate accommodation needs.