2023 W.W. Hutchison Medalist

Dr. Jamie Kirkpatrick (Associate Professor): McGill University

Dr. Jamie Kirkpatrick is a young structural geologist at McGill University who has made exceptional advances to our understanding of faults, fault rocks and earthquakes in recent years. His contributions are worthy of recognition by the GAC and the W.W. Hutchison Medal. Jamie is a courageous researcher who breaks new ground by tackling long-standing difficult problems in creative new ways. His recent work on the rheology of fault rocks, the geometry of fault surfaces, and criteria for recognizing ancient fault rocks in the rock record represents an enormous contribution with many practical applications. His research is rigorous with attention to detail. Jamie combines quantitative theoretical research with field studies in critical settings to produce results that can be applied directly to real rock. The results of his research have direct implications for investigations as diverse as earthquake hazard mitigation, structural and tectonic field analysis, and exploration for orogenic gold deposits. Canadian Earth scientists in a variety of subdisciplines benefit from the advances made by Jamie's research. He has a well-funded research program that has resulted in a large number of publications and conference presentations. He has taught and supervised student research at the doctoral, masters and undergraduate level, and knows how to share results and generate excitement about research with a diverse audience. Jamie is an international leader in the earthquake science community and is pioneering the application of field observation and structural geology techniques to problems in tectonics, faults and shear zones. His advancement of quantitative methods and instrumentation applied to classic problems of understanding stress and strain is impressive and his effectiveness as a communicator and educator is ensuring that the geoscientists of tomorrow are well-prepared to address pressing societal issues. Jamie is rapidly establishing himself as one of the bright young lights in the fields of earthquake science and structural geology.

Title: "When earthquakes go slow motion"

Abstract: Earth's tectonic plates move steadily past one another over geological time, but at their boundaries, major faults may be stationary or slip slowly over centuries to millennia, then rupture suddenly to produce earthquakes. Twenty years ago, scientists discovered 'slow earthquakes', which can be similar in magnitude to moderate-sized earthquakes, but their slip rates are slower so they can last for weeks, and don't produce shaking that people feel. This discovery challenged our previous understanding of slip rates across faults, which we understood to basically be fast or slow depending on the properties of the rocks and the tectonic stresses. Assuming the range of slip rates we observe today also occurred in the geological past, field and microstructural observations of ancient faults and shear zones can provide unique insights into the processes, rock physical properties or environmental conditions that control how and why slip at different rates occurs. In this presentation, I will review methods for establishing the slip rates associated with different geological structures. I will then use the characteristics of ancient structures to suggest some potential controls on earthquake and slow earthquake occurrence. These insights illustrate how structural studies are needed to support the geophysical documentation of transient increases in slip rates associated with slow earthquakes, and also suggest reinterpretation of deformation structures may be necessary in some cases.