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We are seeking two highly motivated candidates to carry out PhD projects with emphasis on tectono-metamorphic and isotopic studies, with helicopter-supported field work and laboratory components in the Paleoproterozoic Ungava Orogen, Nunavik, Québec. The two projects are fully funded through an FRQNT-DDSM II and in collaboration with the Québec Ministère de l'Énergie et des Ressources Naturelles (MERN). The results will be integrated with those from the larger research group that will evaluate the importance of lower plate inheritance on the evolution of the Paleoproterozoic Ungava Orogen, with emphasis on metallogeny.

Projects have anticipated start dates of **January or May 2022**, with fieldwork in summer 2022. The selected students will register to the Université Laval-INRS-ETE joint Earth Science PhD program and will be based at Université Laval, Québec City. Fluency in spoken and written English is mandatory and proficiency in French is beneficial, but not required.

PhD project 1: Isotope tracing of the influence of Archean crustal architecture on Paleoproterozoic magmatism in the Cape Smith Belt, Nunavik, Québec

The meta-volcano-sedimentary Cape Smith belt formed during the Paleoproterozoic Trans-Hudson Orogeny and is now exposed as a fold-and-thrust belt overlying the Archean Superior Craton, in Nunavik, Québec, Canada. The southern domain of the Cape Smith belt is host to two operating orthomagmatic Ni-Cu-Co-PGE deposits and is composed of the Povungnituk and Chukotat Groups, each considered part of large igneous provinces at 2.0 and 1.9 Ga, respectively. Specifically, this project seeks to complete stable (S) and radiogenic (Sm-Nd) isotope mapping within the southern domain of the Cape Smith belt in order to investigate the interaction between rift and/or plume derived-magmas and the underlying Superior Craton, and its impact on the formation of the Paleoproterozoic orthomagmatic mineral systems. The project involves helicopter-supported field work and laboratory work, including mineral chemistry by μ -XRF, EPMA, LA-ICP-MS and isotopic analysis by SF6-IRMS and TIMS.

The project will be under the supervision of Dr. Crystal LaFlamme and co-supervision of Dr. Carl Guilmette. The candidate will also collaborate with geologists of the MERN working in the area. The candidate will be selected on the basis of a) academic excellence, b) field experience and c) expertise in geochemistry.

Please submit a motivational letter, transcript (unofficial), and CV to:
Crystal.laflamme@ggl.ulaval.ca

Crystal LaFlamme, PhD, PGeo
Assistant Professor/Canada Research Chair II
Département de Géologie et de Génie Géologique, Université Laval
<http://www.laflammerg.com>



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PhD project 2: Contrasting tectonometamorphic styles in the Ungava Orogen, Nunavik, Québec; Testing the Paleoproterozoic Paired Metamorphic belt hypothesis.

The Ungava Orogen formed during the Paleoproterozoic Trans-Hudson Orogeny in response to the collision between the Churchill upper plate and the Archean Superior Craton. The hinterland of the Ungava Orogen exposes the contact between the upper plate Narsajuaq domain and lower plate Kovik domain along the Kovik tectonic window. The recent discovery of eclogite within the Kovik domain indicates that it is one of the earliest examples high-pressure crustal rocks known on Earth, whereas the Narsajuaq domain records widespread granulite facies metamorphism. Whether these two tectonometamorphic styles were contemporaneous and coeval with the formation of major mineral deposits in the region, remains an open question. To help close this knowledge gap, the current project seeks to investigate the extent and timing of metamorphism in the lower and upper plates of the Ungava Orogen. The project involves helicopter-supported field work and laboratory work, including mineral chemistry by μ -XRF, EPMA, LA-ICP-MS and isotopic analysis by MC-ICP-MS and TIMS.

The project will be under the supervision of Dr. Carl Guilmette and co-supervision of Dr. Kyle Larson (UBC-Okanagan), in collaboration with Dr. Crystal Laflamme (ULaval) and Matthijs Smit (UBC) as well as with geologists of the MERN working in the area. The candidate will be selected based on a) academic excellence, b) field experience and c) expertise in tectonometamorphic studies.

Please submit a motivational letter, transcript (unofficial), and CV to:

Carl.guilmette@ggl.ulaval.ca

Carl Guilmette, PhD. Eng.

Professeur agrégé, directeur du programme de géologie

Département de Géologie et de Génie Géologique, Université Laval

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