

Integrating SWOT Altimetry and Physics Based Modelling to monitor and predict changes to Arctic-Boreal Lakes
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The Arctic-Boreal region has vast numbers of lakes that cover a large percentage of the total land surface. Although these lakes are ecologically important and very sensitive to a warming climate, our understanding of the current state of these lakes or how they may change in the future is poorly known. We have a recently funded, multiple year project, aimed at improving the monitoring and prediction of Arctic-Boreal lakes through the development of a novel program that integrates field observations, Surface Water and Ocean Topography (SWOT) remote sensing, and high-resolution lake hydrology modelling.

This project will focus on the Inuvik to Tuktoyaktuk Corridor (ITC) in the western Canadian Arctic but will have cross Arctic-Boreal applications. The ITC is the site of extensive hydrologic monitoring and research, including research at the Trail Valley Creek (TVC) Research Station (Trailvalleycreek.ca). The ITC was also the location of one of the NASA Arctic Boreal Vulnerability Experiment (ABoVE) study transects where AirSWOT was flown.

We invite applications to the following MSc and PhD positions:

1. *PhD. Mathematical modelling of coupled climate and hydrologic processes for increased predictive capabilities,*
2. *MSc. Field studies of lake hydrological processes and variability across the ITC, and*
3. *PhD. Physics based hydrologic modelling of lake dominated watersheds along the ITC.*

Position 1 will be in the Interdisciplinary Mathematical and Statistical Modelling PhD program at Wilfrid Laurier University (Laurier). The program is unique in Canada. This PhD position will focus on integrating physics-based mathematical models into a unique hydrologic model platform as required to consider the impacts of climate change, thawing permafrost, and vegetation change on the hydrology of the Canadian Arctic. Prior experience with CFD and high-performance computing would be considered an advantage for this position. Positions 2 and 3 will be in the Geography and Environmental Studies Department at Laurier. This is a joint graduate program with the University of Waterloo and is the second largest Geography graduate program in Canada, and the sixth largest in North America. Through both the Modelling and Geography programs you will find a unique combination of students, research associates, post-doctoral fellows, and faculty exploring a wide range of research interests through a combination of field studies, modelling, and remote sensing. This combination will offer you a unique, challenging and stimulating research environment. Further information on both programs is available at:

<https://www.wlu.ca/programs/science/graduate/mathematical-and-statistical-modelling-phd/index.html>

<https://uwaterloo.ca/waterloo-laurier-graduate-program-in-geography/>

Ideal candidates should have previous degrees in relevant disciplines (e.g. numerical methods, hydrology, geography, environmental science, engineering, physics, and/or atmospheric science), and should possess aptitude and enthusiasm for understanding the integrated impacts of climate change on Arctic lakes. For the modelling positions, we especially encourage applicants with an interest in high-resolution hydrologic modelling, and proficiency in numerical methods, physics and with appropriate modelling tools. Experience in northern environments is an asset for all positions but is not required.

Graduate students at Laurier receive competitive funding packages that come from a combination of teaching assistantships, internal scholarships, and research assistantships. All students are strongly encouraged to apply for a variety of external scholarships. Students in Melnik's and Marsh's research teams have been very successful in receiving such external awards over the past years. Canadian applicants are strongly encouraged to apply. Funding for Arctic field research is provided by external research grants.

<https://www.wlu.ca/academics/faculties/graduate-and-postdoctoral-studies/funding-at-a-glance/index.html>

For admission in September 2021, candidates are encouraged to contact both Drs. Marsh and Melnik. Please submit a cover letter highlighting relevant experience and your interest in joining our research team, a list of courses taken and marks, and a curriculum vitae to **pmarsh at wlu.ca** and **rmelnik at wlu.ca** with the subject line **“Mathematical lake hydrology graduate students”**. Applicants will be reviewed in order they are received until successful candidates are found.

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