

## **Four PhD positions in Canada: high-latitude land surface-atmosphere interactions and tree hydrodynamics (positions are open for start in September 2020 [PhD1-3] and January 2021 [PhD4])**

We are looking for four highly motivated individuals for PhD positions focusing on changes in high-latitude land surface-atmosphere interactions in northwestern Canada. Based at the Université de Montréal (UdeM; PhD1, PhD2 and PhD4) and the Université du Québec à Trois-Rivière (UQTR; PhD 3), funding packages for the four PhD positions include four-year stipends (\$21,000/year), and travel and field expenses. Additional sources of funding include university fellowships, tuition remission (international students), research and teaching assistantships, and external sources (e.g., Natural Sciences and Engineering and Research Council of Canada). Details for all projects are to be determined and depend largely on the student interest and background.

**PhD1: Land surface-atmosphere interactions across the boreal treeline.** Co-supervised by Dr. Oliver Sonnentag/UdeM and Dr. Philip Marsh/Wilfrid Laurier University, the focus of this PhD project is on high-latitude land-atmosphere interactions across the boreal treeline. The study area consists of two nearby research sites near Inuvik, NT, Havikpak Creek (sub-Arctic woodland with continuous permafrost) and Trail Valley Creek (mineral upland tundra) where eddy covariance of carbon, water and energy fluxes and ancillary measurements, and detailed hydrology, permafrost and snow surveys have been made since 2013 and the early 1990s, respectively.

**PhD2: Land surface-atmosphere interactions near the southern limit of permafrost.** Co-supervised by Dr. Oliver Sonnentag/UdeM and Dr. David Olefeldt/University of Alberta, the study area for this PhD project consists of three eddy covariance research sites in northern Alberta and the southern Northwest Territories across the southern limit of permafrost. the project aims to examine if permafrost thaw-induced changes in land cover (e.g., wetland expansion at the expense of boreal forest) and thus land surface atmosphere interactions observed in the isolated and sporadic permafrost zones can be used to project similar changes in the discontinuous permafrost zone as the regional climate keeps getting warmer.

**PhD3: Measurement and remote sensing of tree hydrodynamics.** Co-supervised by Dr. Alexandre Roy/UQTR and Dr. Oliver Sonnentag/UdeM, this PhD project will look at a variety of different instruments that measure tree water transport and storage (e.g., high-frequency dendrometers [stem diameter], thermal dissipation sensors [sap flux], Stevens Water HydraProbe [dielectric properties]), in order to improve our understanding of hydraulic strategies of boreal tree species. This project will first examine at available datasets from various boreal forest sites in Saskatchewan, Québec and Massachusetts, but the student will also conduct fieldwork in order to instrument additional sites in Québec. A second step of the project will look at monitoring tree hydraulic strategies across North America's boreal forests using microwave remote sensing observations (e.g., Vegetation Optical Depth).

**PhD4: Multi-scale observations of tundra carbon and water.** Co-supervised by Dr. Oliver Sonnentag/UdeM and Dr. Carolina Voigt/UdeM & University of Eastern Finland, this project contributes to a comprehensive effort to quantify tundra carbon and water fluxes using "nested" eddy covariance and chamber measurements (automated and manual) across spatial scales: landscape- (mineral tundra and shrub patches) > ecosystem- (mineral tundra) > plot-scale (mineral tundra cover types). These efforts are complemented by a comprehensive set of supporting continuous and campaign-based measurements of permafrost, topography and vegetation characteristics.

**Ideal applicants for all four PhD positions should have**

- 1) a strong quantitative (including programming skills in Matlab and/or R) and technical background obtained through a Master's or Diploma degree in ecology, biogeosciences, environmental sciences, hydrology, etc.,
- 2) previous exposure to some aspects of the project (e.g., high latitude ecosystems/ecohydrology/catchment science/biogeochemistry),
- 3) (some) wilderness outdoor experience as the project requires frequent traveling to and extended stays at the sites,
- 4) the ability to work independently and effectively as part of a team setting consisting of university and government researchers and Indigenous communities, and
- 5) proficiency in English (UQTR and UdeM are francophone research universities, so knowledge of French is of great advantage but not mandatory).

Please email questions regarding the PhD positions/admission processes and application packages consisting of cover letter, curriculum vitae, an English writing sample (ideally a publication), copies of academic credentials, and names and contact information of at least two referees to:

oliver.sonntag \*at\* umontreal.ca (PhD1, PhD2 and PhD4)

pmarsh \*at\* wlu.ca (PhD1)

olefeldt \*at\* ualberta.ca (PhD2)

alexandre.Roy@uqtr.ca (PhD3)

carolina.voigt \*at\* umontreal..ca (PhD4)

The review of applications will commence immediately until the positions are filled.