

PhD research in Environmental (bio)geochemistry

The Alberta bituminous sands have received global attention due to the highly visible profile of industrial operations, in stark contrast with the surrounding Boreal landscape. These striking images have provoked increased scrutiny related to potential impacts, such as the release of trace metals into the Lower Athabasca River (LAR). High-quality scientific investigation is therefore needed to assess industrial contributions to trace element concentrations in the LAR; however, distinguishing between natural and anthropogenic inputs is not straightforward. Myriad natural sources also contribute to the 125-km stretch of the LAR that is proximate to industrial operations, such as tributaries containing high concentrations of iron and organic matter. Thus, a sound understanding of the biogeochemical processes occurring during the mixing of sources is needed to assess their impact on trace element concentrations. Cutting-edge analytical methods and ultraclean metal-free sampling and analysis conditions are also required to measure trace element speciation at low natural background concentrations.

The SWAMP (Soil, Water, Air, Manure, and Peat) lab is a world class metal-free analytical facility in the Department of Renewable Resources at the University of Alberta, specially designed to measure metal concentrations at ultratrace levels (<https://swamp.ualberta.ca/>). The SWAMP facility houses iCAP-Qc quadrupole and Element 2 XR sector field ICP-MS instruments for multi-element quantification in the ng L^{-1} and pg L^{-1} range. Asymmetrical flow field-flow fractionation (AF4) is coupled to the iCAP-Qc system for the separation of dissolved trace elements into mainly ionic, organic-associated, and mainly inorganic species, allowing source differentiation based on the size distribution and speciation of trace elements in the colloidal phase. Absorbance and fluorescence detectors are coupled to the AF4 system for the characterization of dissolved organic matter. A G-SPLITT fractionation system is also available to eliminate filtration artefacts during the isolation of colloids.

The SWAMP lab team is currently seeking a highly motivated and qualified individual to undertake PhD research related to trace element sources and cycling in the LAR. The ideal candidate will have graduate-level research experience in chemistry, geochemistry, or biogeochemistry, with a strong background in analytical chemistry. Laboratory experience is required, since lab work will comprise a significant proportion of all research projects. Fieldwork experience is an asset, as the work may require one or more two-week sampling tours on the LAR. To apply for the position, please send a letter of application, CV, and the names of two references to Ms. Karen Lund (klund@ualberta.ca). For further information about the project, please contact Dr. Chad W. Cuss (cuss@ualberta.ca).

Renewable Resources