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TRACE ELEMENT BIOGEOCHEMISTRY IN THAW LAKES: INFLUENCE OF ORGANIC MATTER

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Rising temperatures are beginning to rapidly thaw the Arctic permafrost, and this may be a driving factor for the release of trace elements, organic carbon and greenhouse gases into water and air. These inputs could have serious consequences for aquatic biota and may further accelerate global warming in the North.

Several studies have evaluated the concentrations of carbon compounds and trace elements in thaw lakes, and have examined some of the biogeochemical processes responsible for the partitioning, speciation and fate of certain elements on these lakes. However the chemical structure of the organic matter and its role in biogeochemical processes in thaw lakes remains unknown.

In order to contribute to the understanding of the role and structure of organic matter in biogeochemical processes in thaw lakes, a field campaign was undertaken in the Canadian subarctic region of Kuujjuarapikp-Whapmagoostui (QC) in June0-July 2014 as a part of the Canadian ADAPT and the Portuguese PERMACHEM projects. Six thaw lakes and two rock basin reference lakes were sampled. Water samples were collected at different depths and analysed for labile and total dissolved metals. Duplicates were sampled for ^1H and ^{13}C NMR (1D and 2D) as well as for mass spectrometry (GC-MS and HPLC-TOF). Water samples were also collected for dissolved sulphur speciation. Lake sediments and nearby soils were also sampled and analysed using the equivalent techniques for solids and also by X-ray diffraction both in powder and single crystal analysis. Finally, subsamples of soil and sediment were ^{14}C -dated.

Preliminary results showed that in thaw lakes the concentrations of some trace elements varied with depth, in general increasing towards the bottom. The proportion of labile elements also varied, and was more related with the anoxia of the water, assessed with a Hydrolab profiler and also by their HS^- content. In soils and sediments the sulphur composition also varied from lake to lake. In high carbon content lakes more than 50% of the total sulphur was in organic form, while in the reference rock basin lakes the contrary was observed. Interestingly the high trace element content were also proportionally higher in high organic sulphur anoxic lakes, suggesting precipitation of those elements from the water column. NMR and MS analyses are currently in progress.