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GEOCHEMICAL REANALYSIS OF ARCHIVED REGIONAL LAKE-SEDIMENT SAMPLES FROM THE HOPEDALE BLOCK, NEWFOUNDLAND AND LABRADOR

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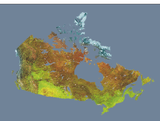


INTRODUCTION

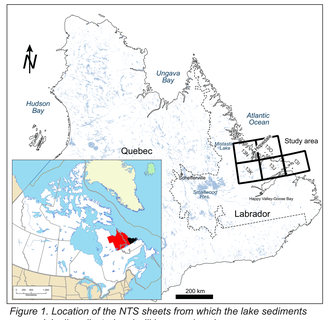


Figure 1. Location of the NTS sheets from which the lake sediments were originally collected and will be reanalyzed.

The study area covers over 45 000 km² within the National Topographic System (NTS) Map sheets 13K, 13J, 13I, 13N, and 13O (Figure 1). A batch of 4011 lake sediment samples was reanalyzed for additional elements not determined initially, with and at lower detection limits that provide an assessment of mineral potential not possible during the initial analysis.

The original samples, collected between 1977 and 1984, were amalgamated in 1993 (Table 1). These 4011 samples were retrieved from the GSC's archive, sieved to recover the silt fraction (< 180 µm) and submitted to Bureau Veritas Laboratories in Vancouver for geochemical analysis. Lake sediment samples were digested using a modified aqua regia solution (1:1:1 HNO_3:HCl:H_2O) followed by inductively coupled plasma mass spectrometry (ICP-MS) with an additional package for rare earth elements (REE). Data for 65 elements will be determined with improved upper and lower detection limits.

Following the analysis of the archived material, the data will undergo GSC Quality Assurance and Quality Control protocols (QA/QC) to ensure the reliability of the data (high precision and accuracy) following the procedures of McCurdy and Garrett (2016) and using an Analysis of Variance (ANOVA) of duplicate samples.

Table 1.

NTS Sheet	GSC Open Files	# samples	Last date of analysis	# elements
13I	513, 1636, 2646	129	1993	8
13J	513, 1636, 1637,2646	992	1993	8
13K	997, 1636, 2645, 2650	1710	1993	9
13O	1636, 1637, 2646	207	1993	8
13N	558, 1636, 2648	973	1993	34

BEDROCK GEOLOGY

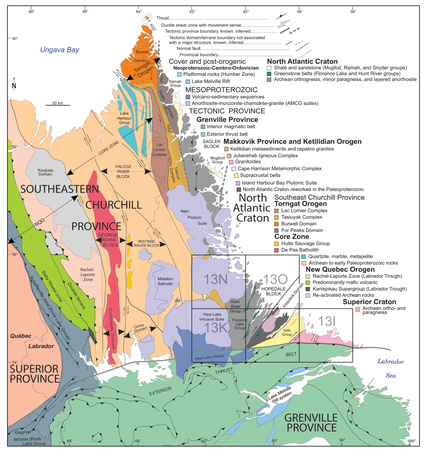


Figure 2. Bedrock geology of Quebec and Labrador with the NTS map sheets (NTS 13I, 13J, 13K, 13N and 13O) from which lake sediments were originally collected. The study area largely falls within the Hopedale Block, which has some of the more complex geology of the region (modified from Hinchey et. al., 2022).

ELEMENT CONCENTRATION MAPS

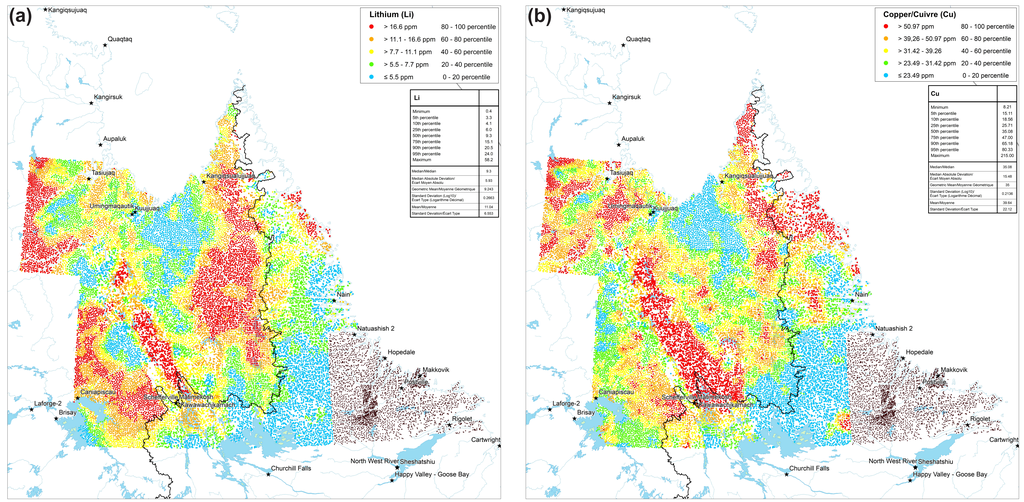


Figure 3a-d. Lake sediments collected from sites in Quebec and Labrador between 1973 and 1997 and re-analyzed using ICP-MS for 53 elements (McCurdy et al., 2018). Results for a) Li, b) Cu, c) Ni, and d) Sn are shown above. Five colours represent the five ranges within analytical results from each site were classified. Data for the Hopedale region (black symbols) will be integrated with the adjacent data set from Quebec and Labrador.

DISCUSSION

This project is designed to create the most extensive contiguous geochemical map in Canada that will reveal large-scale geochemical patterns, assist in regional bedrock mapping, and guide mineral exploration in the region. Previous lake sediment geochemical reanalysis has shown that some bedrock lithologies, buried under Quaternary sediments, can be characterized by specific elemental associations. These associations in lake sediments were demonstrated by Amor et al. (2019), showing that anorthosites are low in many elements (As, Ba, Bi, Cr, Cs, Cu, Fe, Hg, K, Li, Mg, Mn, Ni, Pb, Rb, Se, Th, Tl, U, Zn, Zr) and high in only one (Na).

Interestingly, this work also indicated that regional ice streams (IS) had a detectable effect on the geochemical distribution (McClenaghan et al., 2019). Specifically, the glacial dispersal of sediments within the Kogaluk IS (Figures 3d and 4) can be mapped using lake sediment geochemical data, indicating that the ice-flow history of the region must also be considered when evaluating the distribution of elements within the study area. Given the number of active ice streams draining the Laurentide Ice Sheet's eastern margin during deglaciation (Margold et al., 2015), the impact on geochemical patterns could be significant. Additionally, the dispersal patterns identified through this work will provide important empirical checks on ice-flow reconstructions.

With an expanded suite of elements and updated ice-flow chronology, this research has the potential to define new exploration targets.

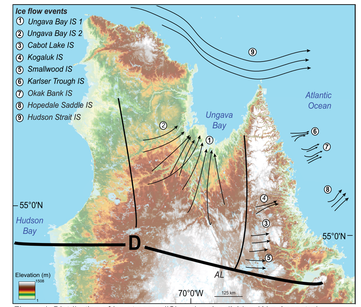
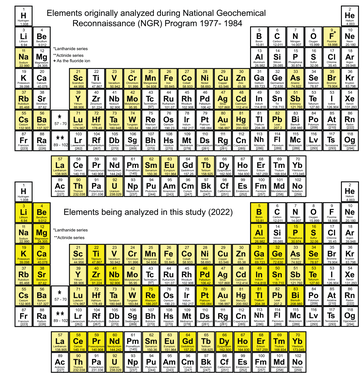


Figure 4. Distribution of ice streams (IS) and major divides (AL= Ancestral Labrador, D= Quebec-Labardor Dome) for the Quebec/Labrador region (modified from Rice et al. 2020, with additional ice streams from Margold et al. 2015).



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