Composition of Soil Organic Carbon in the Active Layer and Permafrost along the Eureka Sound Lowlands, Nunavut, Canada

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INTRODUCTION
The dynamics of soil organic carbon (Corg) along the Eureka Sound Lowlands (ESL) are influenced by the terrain’s vulnerability to warming temperatures [1]. This study aims to examine the current state of Corg in active layer and permafrost soils from the ESL.

The objectives are to:
1) quantify the amount of organic matter and Corg in the active layer and permafrost,
2) determine the source of Corg in the active layer and permafrost, and
3) examine the lability of the Corg by examining the amount and composition of particulate (POM) and mineral-associated organic matter (mOM).

STUDY AREA
The ESL extends across approximately 750 km², from eastern Axel Heiberg Island to western Ellesmere Island in the Canadian High Arctic. The ESL is situated in the polar desert climate regime, which promotes the persistence of cold, continuous permafrost, reaching depths of up to 500 m [1, 2]. The permafrost is ice-rich and sensitive to warming temperatures [1].

RESULTS & DISCUSSION
LOI provides an initial analysis of the organic matter (4-10 %) and carbonate (1-2 %) contents in the active layer and permafrost. Bulk analysis suggests a more terrestrial Corg source, due to relatively high C:N ratios and light δ13C values, and the occurrence of biogeochemical processes that deplete 13C over 12C and 15N over 14N.

Fractional analysis of the DS-1 active layer reveals that the more labile, terrestrially-sourced POM fraction contains 18 to 36 % of the total Corg, while the less labile, marine-sourced mOM fraction contains 64 to 82 % of the total Corg.

CONCLUSIONS
The findings of this study enhance our understanding of the state of Corg in Canadian High Arctic soils and its potential role in the global climate system. Additional fractional analysis of the soil organic matter in the BT-2 active layer is ongoing. So far, the majority of the Corg is largely unavailable for uptake and degradation.

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