Chronostratigraphy and evolution of sedimentary environments and processes since deglaciation along the continental margin of Eastern Canada

Quentin Duboc[1] Guillaume St-Onge[1], Patrick Lajeunesse[2], Matthias Moros[3]

[1] *Institut des sciences de la mer de Rimouski (ISMER), Canada Research Chair in Marine Geology and GEOTOP*

[2] *Département de géographie and Centre d'Études Nordiques- Université Laval* [3] *Leibniz Institute for Baltic Sea Research*

Introduction

In the context of actual ice-sheet melting, studying the processes involved during and after the Laurentide-Ice-Sheet (LIS) retreat may help understanding the dynamics of ice-sheet retreat. As massive amounts of sediment are eroded, transported and deposited by glaciers and meltwaters, structures and variations in the sedimentary record reflect ice-margin dynamics. In Eastern Canada, the deglaciation was followed by the deposition of a sequence of glaciomarine, paraglacial and postglacial sediments in fjords and on the continental margin. As important glacial outlets, Hudson Strait, Labrador fjords, as well as the Laurentian and Esquiman channels can provide high-resolution sedimentary records of the evolution of environmental conditions after the deglaciation.

Sampling

Mission MSM46 on board the R/V Maria S. Merian, Summer 2015.

- Several gravity-cores.
- Swath bathymetry data.
- Sub-bottom profiles.

Figure 1. R/V Maria S. Merian

Core chronology

- ^{14}C ages obtained on forams.
- Paleomagnetism, by comparing paleosecular variations and relative paleointensity with global models and regional records.
- Chronostratigrapic markers such as the red layer associated with the final drainage of Lake Agassiz-Ojibway (8470 cal BP).

Hudson Strait, South-Western Basin

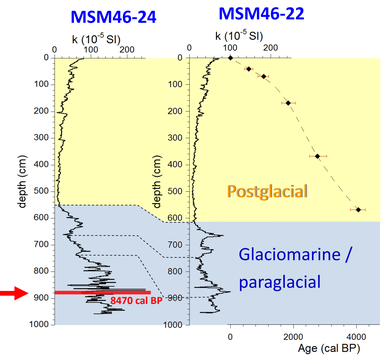
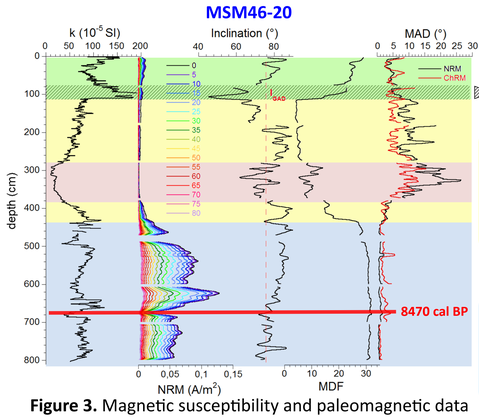


Figure 2. Correlation between cores MSM46-24 and MSM46-22, with their magnetic susceptibility profiles and the initial age-model for **core MSM46-22.**

Hudson Strait, Western Basin



Sharp increase of k + low inclinations -> turbidite ?

Postglacial

Weak and non-stable magnetization, low magnetic susceptibility -> reduced fraction of terrigenous sediment ?

Glaciomarine / paraglacial

Stable magnetization, higher mag. susceptibility, several IRDs -> coarser terrigenous sediment.

Figure 3. Magnetic susceptibility and paleomagnetic data of core MSM46-20.

Hudson Strait, Eastern Basin

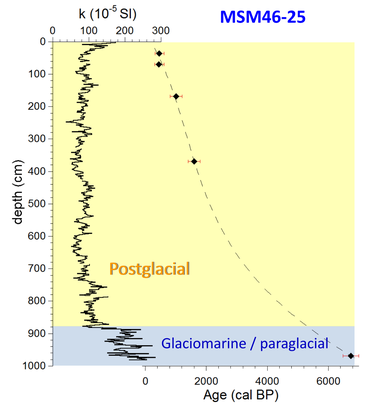


Figure 4. Magnetic susceptibility and preliminary age-model of core MSM46-25.

Nachvak Fjord (Labrador)

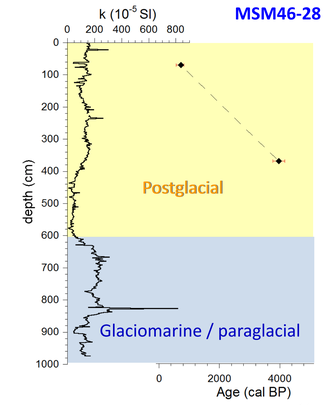


Figure 5. Magnetic susceptibility and ^{14}C data of core MSM46-28.

Objectives

- Establish a Holocene chronostratigraphy for the eastern margin of the former Laurentide Ice Sheet by combining the analysis of sub-bottom profiles and sediment core data.
- Characterize the processes involved in the glaciomarine, paraglacial and postglacial sedimentation occurring after the ice-margin retreat in the different areas.
- Determine the influence of Holocene climatic variations on the processes involved in the post-ice-retreat sedimentation dynamic.

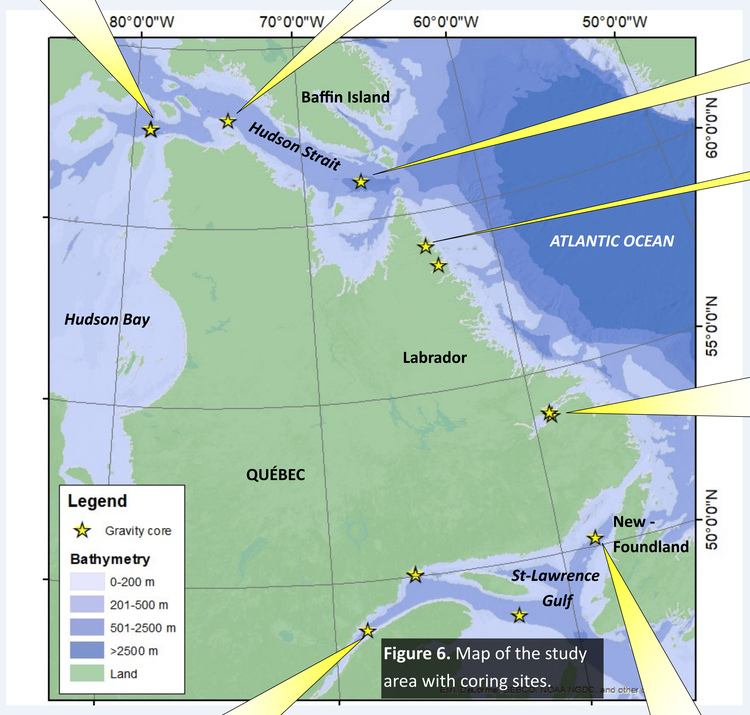


Figure 6. Map of the study area with coring sites.

Lake Melville (Labrador)

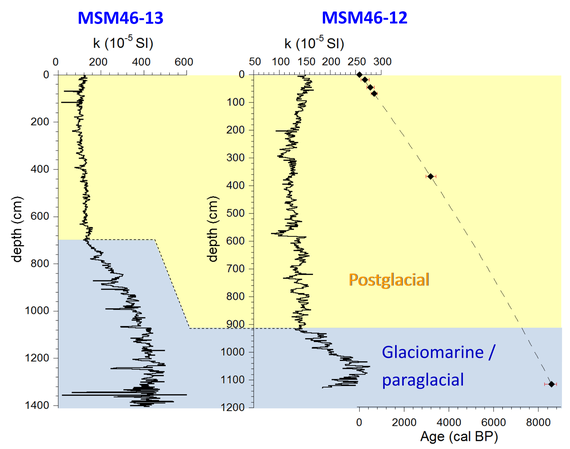


Figure 7. Correlation between cores MSM46-13 and MSM46-12, with their magnetic susceptibility profiles and an age-model for core MSM46-12.

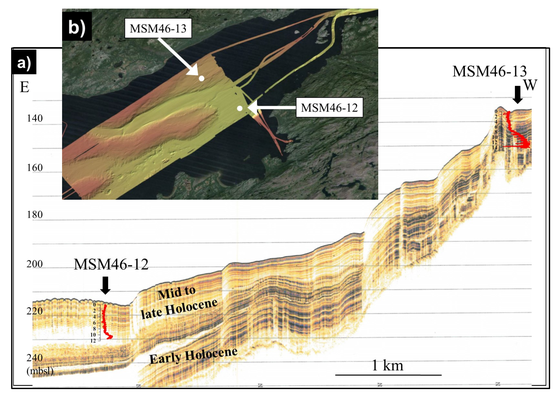


Figure 8. a) Sub-bottom profile and b) previous bathymetric data in Lake Melville with position of cores MSM46-12 and MSM46-13.

A higher sedimentation rate at site MSM46-12 yields a higher downcore resolution for postglacial sedimentation, whereas core MSM46-13 recovered a thicker sequence of older units.

Laurentian channel

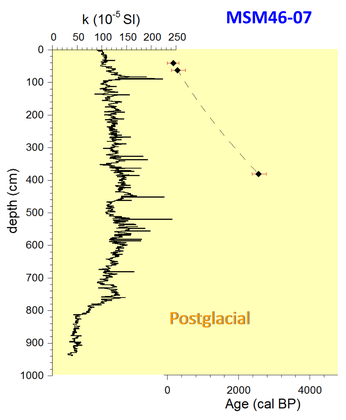


Figure 9. Magnetic susceptibility and ^{14}C data of core MSM46-07.

Esquiman channel

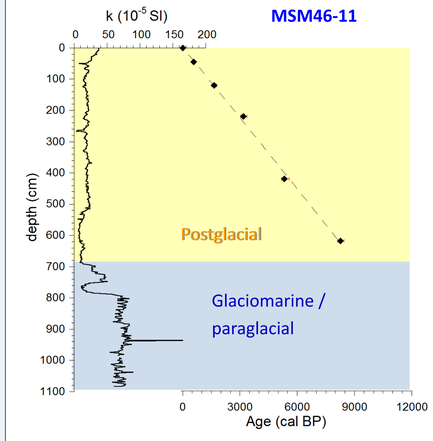


Figure 10. Magnetic susceptibility and preliminary age-model of core MSM46-11.

Summary

- According to the preliminary age models, all the sites show high postglacial sedimentation rates (70-150 cm/ka).
- Most of the cores show two units : a lowermost unit with a higher sediment variations and magnetic susceptibility, identified as a glaciomarine and/or paraglacial facies, and an uppermost unit with less variations and a lower magnetic susceptibility which corresponds to postglacial sedimentation.
- The transition to postglacial sedimentation, which reflects the end of glacier meltwater influence on sedimentation, depends on the location and occurs earlier in the St-Lawrence area and later in Lake Melville and Hudson Strait.
- **Further work** will first focus on sub-bottom profile analysis, more 14C dating and paleomagnetic measurements to establish robust chronostratigraphies.

Acknowledgments

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