Sedimentological, physical, geochemical and magnetic properties of sediments from the Canadian Arctic: sedimentary processes since the last millenium

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Background

- In the context of global warming, understanding the sediment, dynamic variations during changing climatic conditions is crucial. This information will be of point of comparison to better document Arctic climate variability.

- 50 box cores were sampled in the Canadian Arctic in 2016 and 2017 on board the CCGS Amundsen

- Box cores are ~40 cm in length

Objectives

- Compare the sedimentological, physical and magnetic properties of sediments during the last millenium.

- Identify the factors affecting the origin of detrital material, sediment transport and sediment dynamics in the Canadian Arctic during Holocene climatic periods (Little Ice Age, Medieval Warm Period & recent).

Methodology

1. 210Pb to determine recent sedimentation rates
2. Physical & Geochemical analyses
   - Radiography (Geisert ACT digital x-ray system)
   - XRF, XRD (Geisert Silica and Minerals detectors)
   - SEM (Scanning electron microscope)
   - Cryogenic magnetometer (Bartington MS2)
   - Magnetic analyses
     - Alternating Gradient Magnetometer (Bartington AGM200)
3. 210Pb measurements from the first dated core (Coronation Gulf) illustrate an average sedimentation rate of 0.17 cm/yr:
   - The base of the core would be close to 270 years.
   - The core thus probably records the Little Ice Age.

Surface sediments

- Grain size
  - MEAN
  - SOERT: Sorting
  - PCA: Principal Component Analysis

- Geochemistry
  - Cluster @ Depth:
  - PCA 1 @ Depth:

- Magnetic properties
  - Pseudo Vs.

Chronology

- All the parameters illustrate a West-East trend with a different sediment dynamics:
  - West Province: dominated by detrital sediment supplies from numerous rivers (e.g., Mackenzie plume, Coppermine, Ellef, Back and Hayes rivers)
  - by coastal erosion of dolomite cliffs and glacial tills cropping out on the Banks Island Shelf
  - East province: influenced by sediment-laden sea ice and icebergs
  - Important carbonate inputs from the coastal erosion of Ordovician-Silurian carbonate-bearing rocks cropping out in the Victoria and the Prince of Wales Islands

Conclusions

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