



# A sedimentary ancient DNA approach to elucidate the Labrador Sea paleoceanography over the last ~130,000 years

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## **A sedimentary ancient DNA approach to elucidate the Labrador Sea paleoceanography over the last ~130,000 years**

Stijn De Schepper, Jessica L. Ray, Lisa Griem, Nicolas Van Nieuwenhove, Danielle M. Grant, Kristine Steinsland, Katrine Sandnes Skaar, and Umer Z. Ijaz

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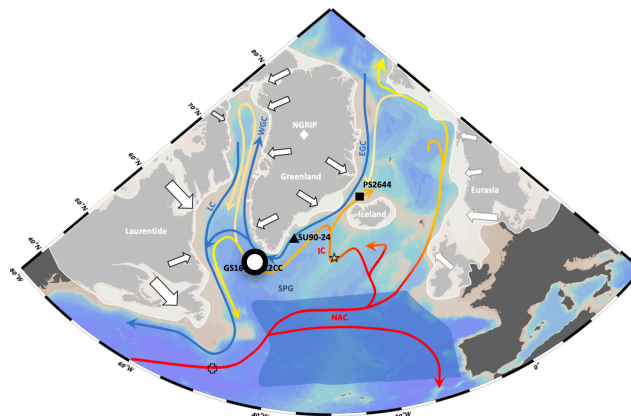
### **Abstract**

Long sedimentary ancient DNA (sedaDNA) records from the marine environment are at present a curiosity and their utility in paleoceanographic research is not yet fully explored. Nevertheless, a few studies indicate that this ecogenetic repository represents an untapped source of new information with which paleoclimatic and paleoceanographic variability can be more deeply explored. We have generated a sedaDNA record from a 19.6 m-long sediment core in the Labrador Sea (Eirik Drift, south of Greenland). The record extends from the early Holocene to Marine Isotope Stage 5 (ca. 130,000 years ago), and we characterized several important climatic transitions in this time interval using stable isotope stratigraphy, ice-rafted detritus counts, and dinoflagellate cyst census counts.

The primary goal of this investigation was to query the sedaDNA record for a biological indication of the last and penultimate deglaciation, as well as Heinrich events identified between 65,000 and 25,000 years ago. Our metabarcoding strategy targeted a broad diversity of eukaryotic organisms through amplification of the V7 hypervariable region of the small subunit ribosomal RNA (SSU rRNA) gene. The preliminary sedaDNA results indicate that eukaryote ancient DNA is present in all samples investigated, including those dating back to Marine Isotope Stage 5. Furthermore, we identified abundance shifts in Protaspidae (cercozoa), diatoms, dinoflagellates, and marine stramenopiles (amongst others) that may be linked to changes in paleoceanography during the last two deglaciations as well as Heinrich events (HE3, HE4).

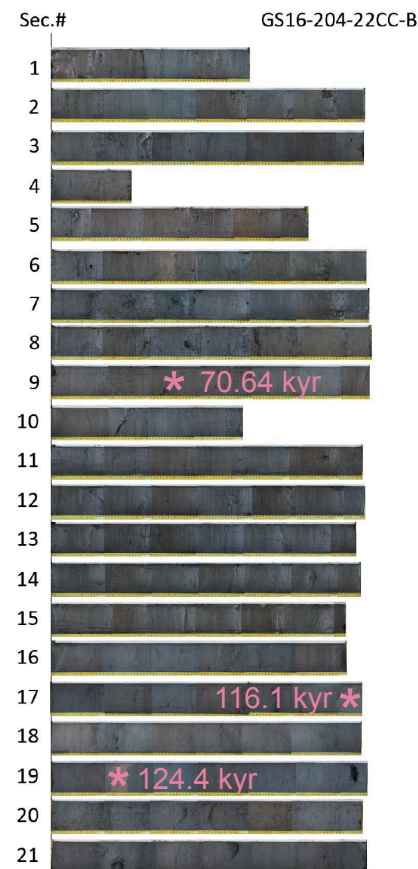
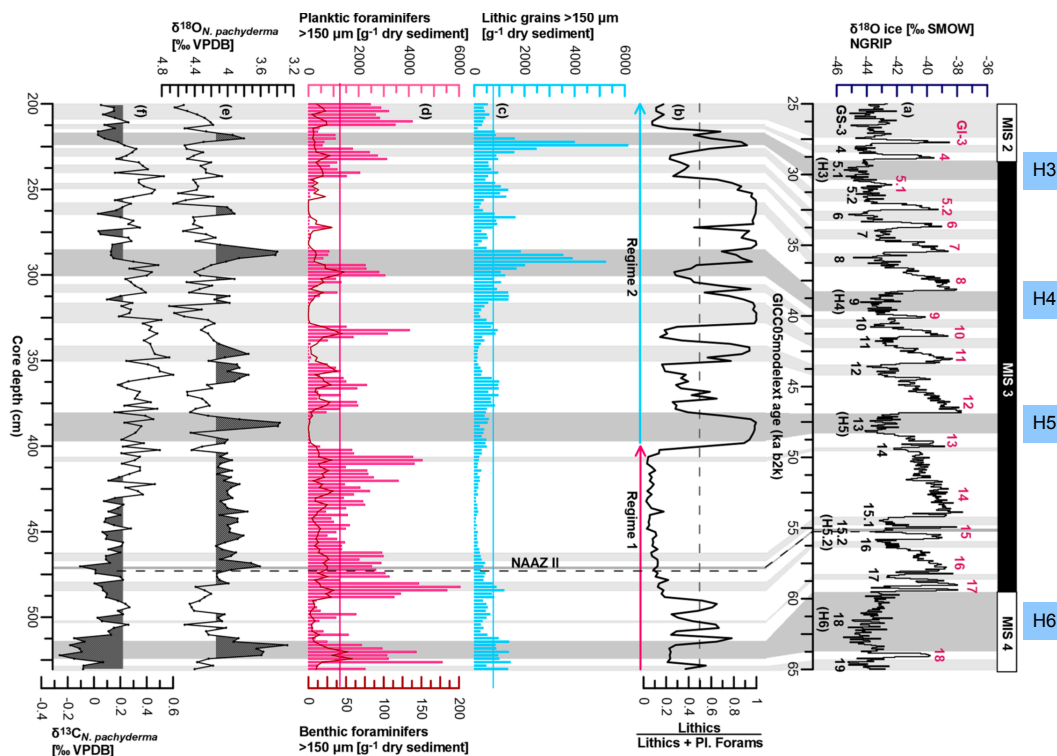
## Study site

We investigated a sediment record recovered from the Eirik Drift in the Labrador Sea. The area is influenced by warm Atlantic water as well as cool water from the East Greenland Current. Several Last Glacial Heinrich Events were identified in the interval 2–5.5 m. The Last Interglacial is found around 16 m depth.



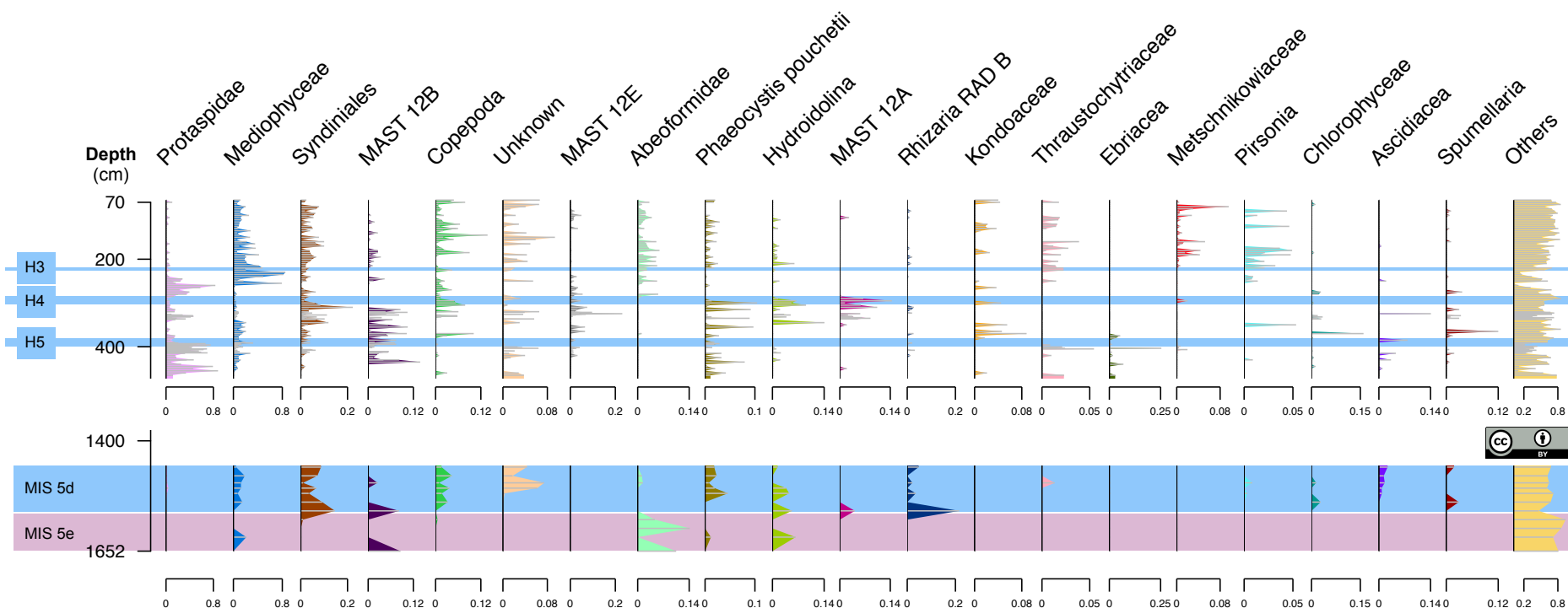
Modern surface ocean currents with important MIS 3 climatic features such as the IRD belt (dark blue shading) and the expanded Northern Hemisphere ice sheets.

○ = Site GS16-204-22CC



# Early Holocene–Last Glacial and Last Interglacial sedimentary ancient DNA record for GS16-204-22CC, Labrador Sea (Eirik Drift)

*\* Data and interpretations are preliminary and work in progress*



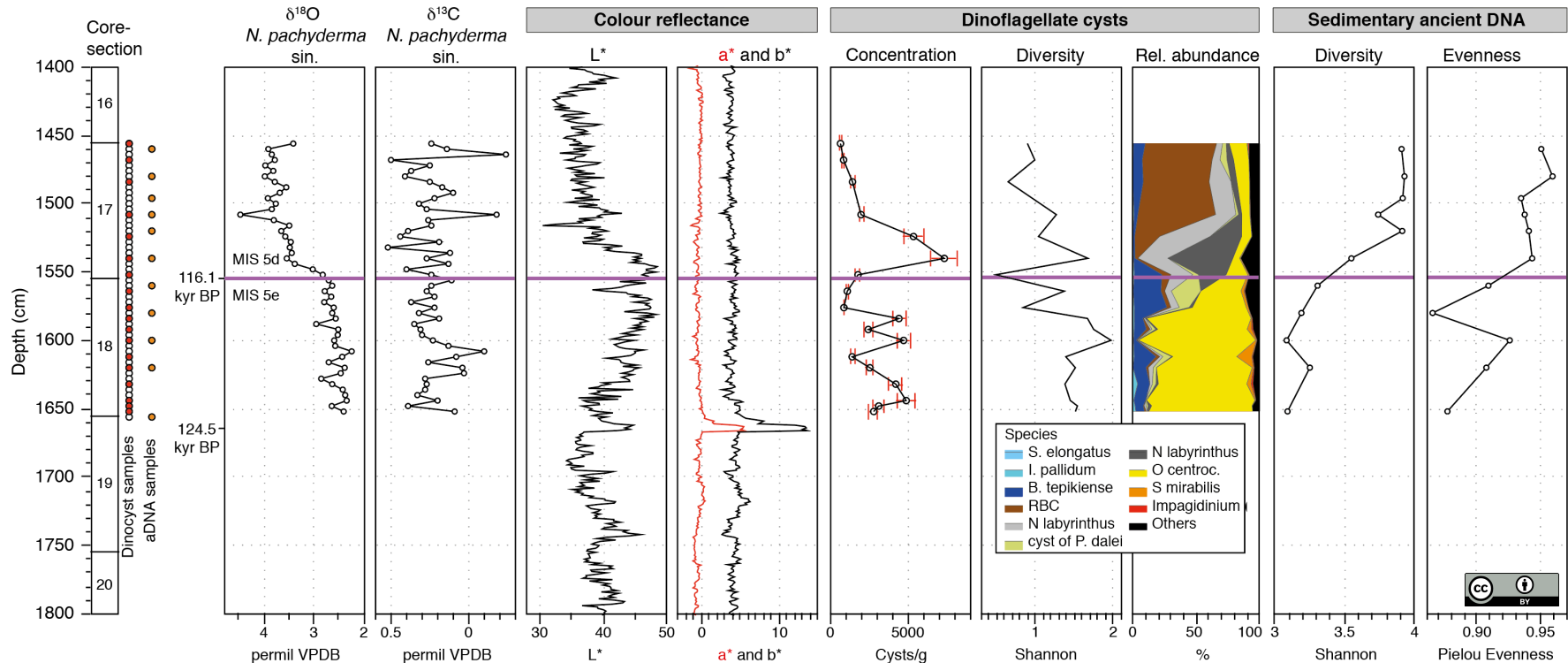
We record a rich diversity in sedimentary ancient DNA down to ca. 5 meters below sea floor, covering the Heinrich Events H3, H4 and H5 in the Last Glacial. This record extends back to ca. 60,000 yr BP.

The lower panel also shows that sedimentary ancient DNA can detect several taxa at ca. 14.5 to 16.5 meters below sea floor, where Last Interglacial sediment (MIS 5e, back to ca. 124 kyr BP).

## Preliminary results from stable isotopes, palynology and sedimentary ancient DNA

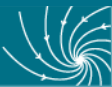
GS16-204-22CC, Labrador Sea (Eirik Drift), Last Interglacial

*\* Data and interpretations are preliminary and work in progress*



**Marine palynology** shows a major assemblage shift and a decrease in concentrations and diversity across the MIS 5e to MIS 5d transition, possibly indicating a shift from Atlantic water to polar-sourced surface waters.

**Sedimentary ancient DNA** records reveal that certain taxa are restricted to MIS 5d (previous figure) and demonstrate a shift in diversity and evenness at the transition from MIS 5e to MIS 5d.



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