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## The dawn of Molecular Genetics in Paleoceanography: tracing Arctic change during the Holocene with marine sedaDNA records from Greenland

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As we move towards a “blue” Arctic Ocean in the summer within the next decades, predicting the full range of effects of climate change on the marine arctic environment remains a challenge. This is partly due to the paucity of long-term data on ocean-biosphere-cryosphere interactions over time and partly because, today, much of our knowledge on past ocean variability derives from microfossil and biogeochemical tracers that all have considerable limitations such as preservation biases and low taxonomic resolution or coverage.

Recent studies have revealed sedaDNA as a potential “game-changer” in our ability to reconstruct past ocean conditions, due to the preservation of DNA at low temperatures, and the possibility to capture a much larger fraction of the Arctic marine biome diversity than with classical approaches. However, while sedaDNA has been used in terrestrial, archeological, and lake studies for some years, its application to marine sediment records is still in its infancy.

Here, we will present new results from material recently collected along the two Arctic Ocean outflow shelves off Greenland (Greenland Sea/Fram Strait and Northern Baffin Bay/Nares Strait). We have used a combination of modern and ancient DNA methods applied to seawater, surface sediments, and sediment cores covering the past ca. 12 000 years with the objectives of: 1) characterizing the vertical export of sea ice-associated genetic material through the water column and into the sediments following sea ice melt and 2) exploring the potential of sedaDNA from the circum-polar sea ice dinoflagellate *Polarella glacialis* as a new sea ice proxy. For the first objective, we followed a comparative metabarcoding approach while the second objective included designing species-specific primers followed by gene copy number quantification by a droplet digital PCR assay.

We argue that sedaDNA will have a critical role in expanding the Paleoceanography “toolbox” and lead to the establishment of a new cross-disciplinary field.

