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Diatoms - A novel sea-ice proxy

The Climate Crisis is one of the major challenges facing humanity today. To understand and predict how the Earth's climate will respond to ongoing anthropogenic forcing, it is essential to first examine the dynamics of the climate system and its past variability. Ice sheets covering Greenland and Antarctica serve as crucial archives of past climate conditions, preserving proxies for temperature, precipitation, and, particularly relevant to this study, sea ice variability.

Sea ice plays a fundamental role in the Earth's climate system, influencing heat exchange between the ocean and atmosphere and affecting the planet's albedo. These processes contribute to Arctic Amplification, where warming occurs more rapidly in the Arctic than in other regions. Furthermore, sea ice extent has been linked to potential climate tipping points, underscoring the importance of reconstructing its past variability. Ice cores provide high temporal-resolution climate records, making them valuable for investigating sea ice changes. Several sea-ice proxies have been proposed, each with unique advantages and limitations.

Bromine enrichment (Br) and Methanesulphonic Acid (MSA) are widely used, with Br particularly effective for tracking first-year sea ice. A more recent approach involves utilizing diatoms—unicellular algae typically found in aquatic environments—as potential proxies for sea ice variability. Diatoms can be transported from the upper ocean layers to the ice sheets and preserved in the ice matrix, suggesting their potential to serve as indicators not only of sea ice extent but also of past wind strength.

This study focuses on cataloging diatoms found in Greenland ice cores and investigating their origins—whether from freshwater or seawater sources—to assess their suitability as a climate proxy. Future analysis will examine whether seasonal patterns in diatom abundance correspond to environmental changes, potentially providing new insights into past climate dynamics. To better understand the transport mechanisms of diatoms, HYSPLIT backtrajectory models will be used to trace air mass movements above the deposition sites, allowing for an analysis of how diatom records vary based on their source regions. To further establish the reliability of this method, comparisons will be made with well-established sea-ice proxies, such as bromine enrichment (Br) and methanesulphonic acid (MSA).

Field of study

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