

Last Glacial to recent sea ice coverage in the northern North Atlantic
(Fram Strait and East Greenland Continental Margin)

Juliane Müller^{a,*}, Rüdiger Stein^a, Guillaume Massé^{b,c}, Simon T. Belt^c

^aAlfred Wegener Institute for Polar and Marine Research, Am Alten Hafen 26, 27568 Bremerhaven, Germany

^b LOCEAN, UMR7159, 4 Place Jussieu, 75005 Paris, France

^c SEOES, University of Plymouth, Drake Circus, PL48AA Plymouth, UK

Sea ice is a critical component of global climate since it plays a crucial role in terms of heat reduction and deep-water formation - a driving mechanism of the global thermohaline circulation [1]. The currently observed retreat of Arctic sea ice provokes the question as to whether past variations in sea ice coverage in this climate-sensitive area can be firstly identified, and secondly, linked to climatic fluctuations. Since the major export of Arctic sea ice to the world's oceans occurs through Fram Strait and along the eastern continental margin of Greenland [2], marine sediments from this area serve as climate archives providing useful information about past changes in this efflux system. The presence of the sea ice proxy IP₂₅ (a biomarker molecule synthesised by sea ice algae) in Arctic Ocean sediments, for instance, may be used as a direct hint for sea ice coverage and its variability through time [3, 4]. With the investigation of a high-resolution sediment core on its IP₂₅ content, we reveal extreme variations in sea ice cover for Fram Strait during the past 30 ka. By combining IP₂₅ and common open-water phytoplankton data, we have even been able to reconstruct different sea ice scenarios, which align well with known climatic fluctuations, i.e. cooling and warming events, such as the Last Glacial Maximum or the Bølling warm period. Besides this long-term sea ice record for northern Fram Strait, we present IP₂₅ data obtained on marine surface sediments from the continental margin of East Greenland. IP₂₅ concentration profiles suggest a prolonged sea ice cover at the proximal shelf area, whereas the annual concentration/duration of sea ice coverage seems to decrease with increasing distance from the shelf as reflected by lower IP₂₅ abundances. This sea ice distribution pattern likely mirrors the course of the East Greenland Current carrying polar water southwards through Fram Strait.

References

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