

Palaeo Sea Ice and Climate Dynamics: Biomarker-based sea ice reconstructions

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Abstract

Sea ice is a key component of the climate system as it exerts a strong control on the heat and gas exchange between the ocean and the atmosphere and the formation of dense deepwater driving thermohaline circulation processes. Changes in sea ice cover are also considered to affect the calving rate of icebergs at marine-terminating glaciers.

So far, sea ice reconstructions in the Southern Ocean are mainly based on diatom assemblage studies and specific transfer functions permitting even quantitative estimates of sea ice concentrations. The sea ice biomarker IPSO₂₅, a highly branched isoprenoid akin to the well-established Arctic sea ice proxy IP₂₅, offers an additional method for the reconstruction of past sea ice conditions in the Southern Ocean. This may be particularly valuable in areas (or time intervals) where the preservation of diatoms is limited due to silica dissolution.

Here we present first results of the new Helmholtz Young Investigator Group PALICE, settled at the Alfred Wegener Institute in Bremerhaven and the University of Bremen. Main objectives of the group are the assessment of past sea ice-ocean-atmosphere (and ice-sheet) interactions and the further evaluation and application of highly branched isoprenoids (including IPSO₂₅) for robust sea ice reconstructions across different time scales. Specifically, direct comparisons between biomarker and diatom data may provide for an evaluation of both approaches. Current focus is on recently collected surface sediments and long cores from the Bransfield Strait, the southern Drake Passage (PS97) and the Amundsen Sea (PS104) as well as on upcoming expeditions in the Weddell Sea (PS111) and the Ross Sea (IODP 374).

Keywords: sea ice, highly branched isoprenoids, IPSO₂₅