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Evaluating the sea ice proxy $IPSO_{25}$ at the Western Antarctic Peninsula

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Introduction

Sea ice proxies are important tools to reconstruct the climate and environmental history in polar regions. The novel sea ice proxy for the Southern Ocean is the biomarker $IPSO_{25}$ (**I**ce **P**roxy **S**outhern **O**cean with **25** carbon atoms), a highly branched isoprenoid (HBI) diene produced by sea ice diatoms [Belt et al., 2016]. To evaluate the advantages and limitations of $IPSO_{25}$ and to extend its applicability towards quantitative sea ice reconstructions, surface sediments from the Western Antarctic Peninsula (WAP) were used for biomarker analyses and compared to recent sea ice observations.

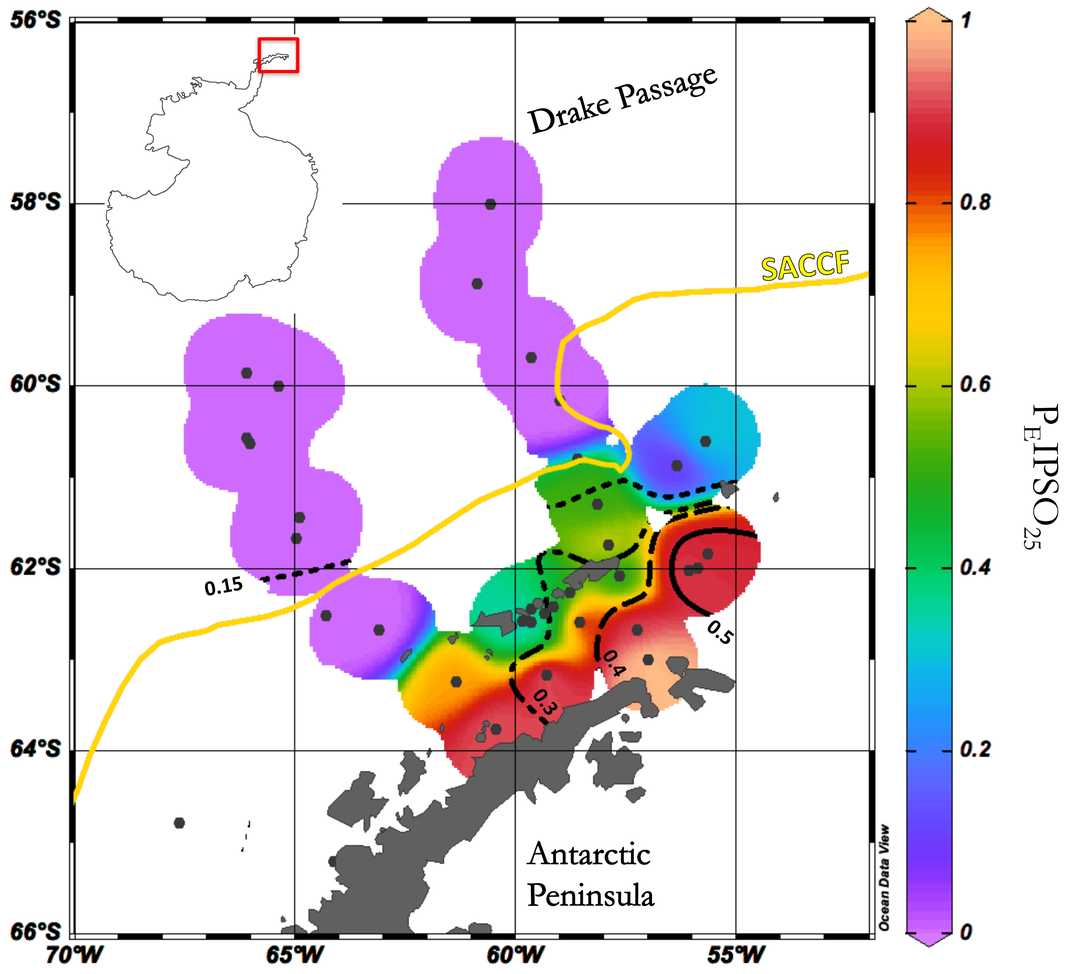
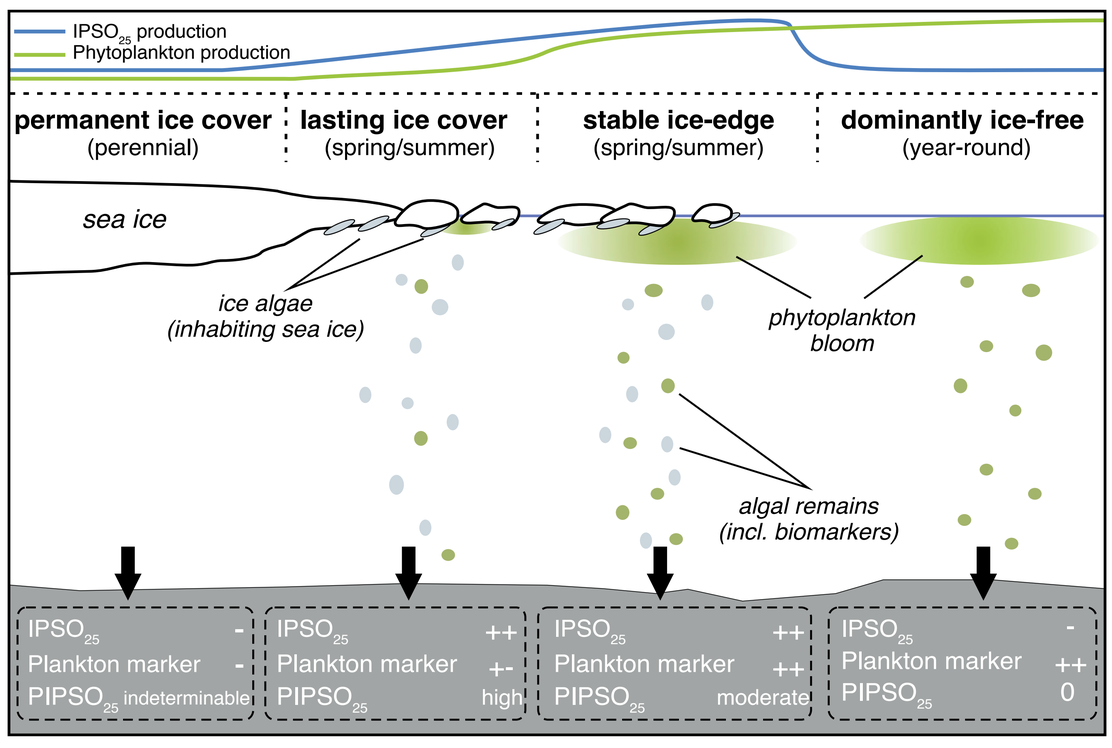


Fig. 1: The distribution of the sea ice index P_EIPSO_{25} at the Western Antarctic Peninsula. The contour lines display satellite-derived winter sea ice concentrations (• stations).

Approach



Biomarkers indicative of sea ice diatoms ($IPSO_{25}$) and open ocean phytoplankton (HBI Z- and E-trienes as plankton marker) are used to determine **$PIPSO_{25}$**, a concept modified after Müller et al., 2011.

Conclusions

- $IPSO_{25}$ is a robust and stable proxy for coastal sea ice in the Southern Ocean and Antarctica
- The sea ice index P_EIPSO_{25} permits to distinguish between dominantly ice-free (<0.3), stable ice-edge (0.3-0.8) and long-lasting ice cover (>0.9) conditions (Fig. 1 and 2)
- $PIPSO_{25}$ correlates very good with winter sea ice estimations from diatom species and satellite observations (Fig. 3)
- Since our sediment samples at the WAP cover roughly the last 200 years we conclude that past spring sea ice distribution is similar to today´s winter sea ice

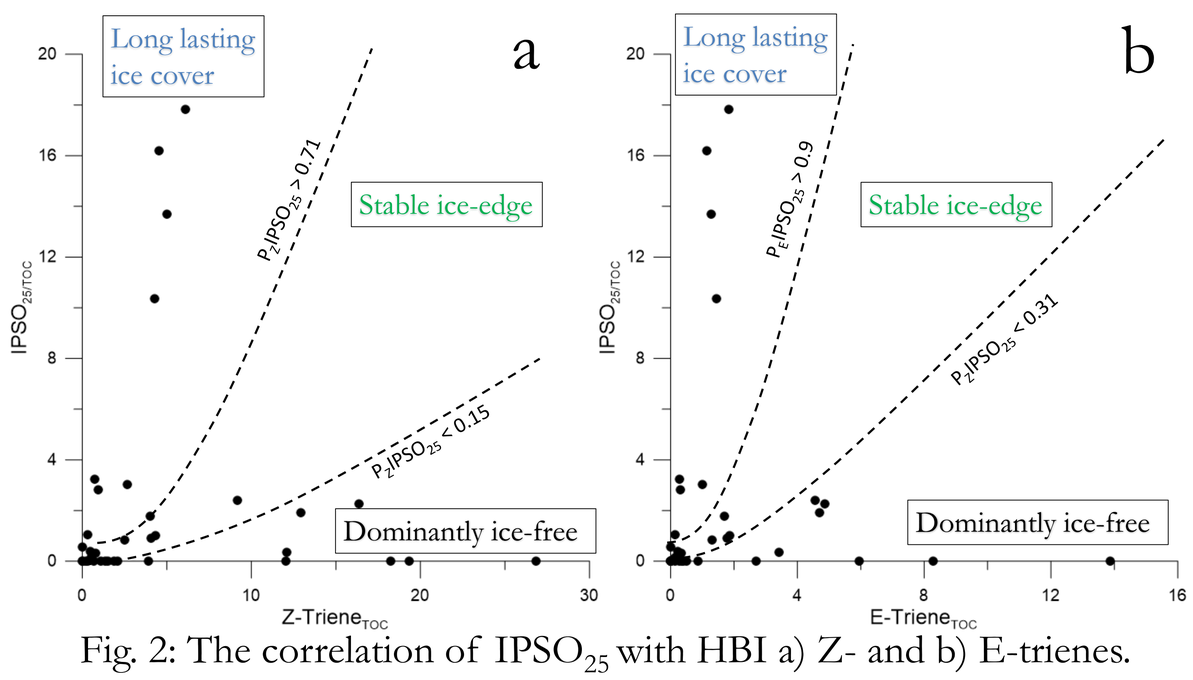


Fig. 2: The correlation of $IPSO_{25}$ with HBI a) Z- and b) E-trienes. A rough estimate of sea ice conditions is based on the calculated P_ZIPSO_{25} and P_EIPSO_{25}.

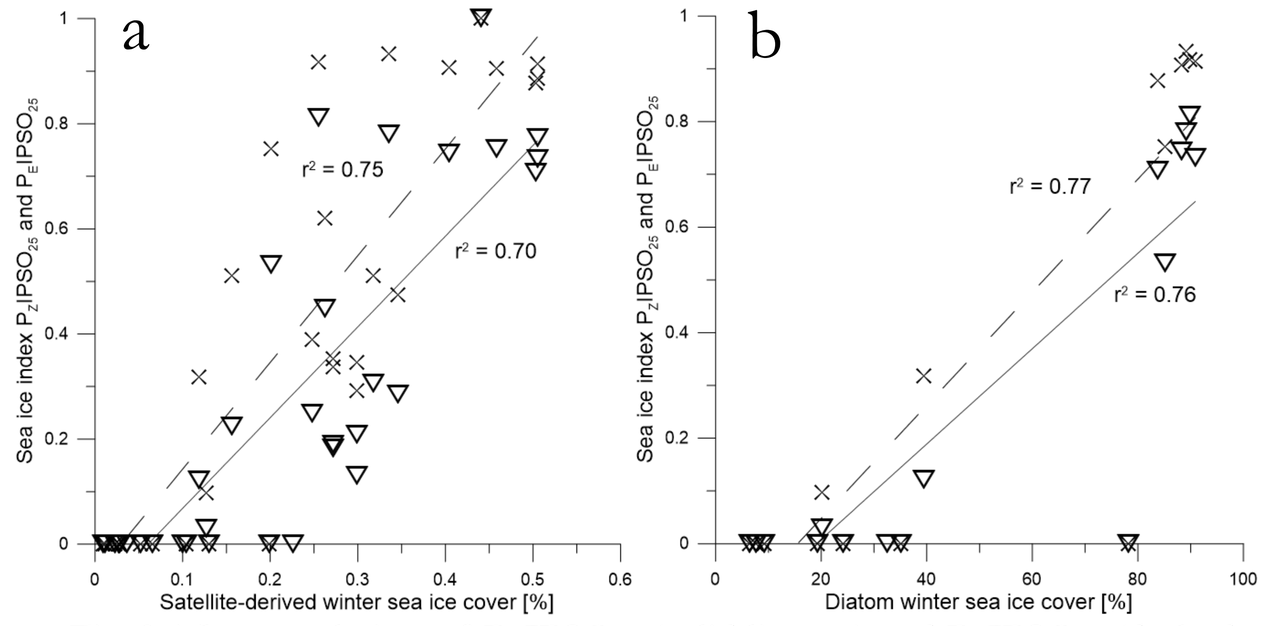
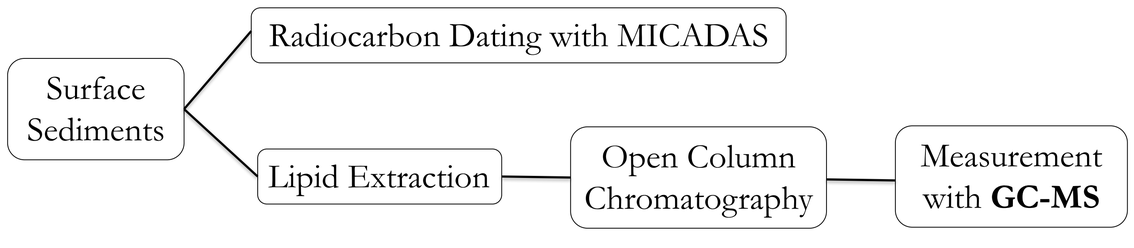


Fig. 3: The correlation of P_ZIPSO_{25} (solid line ▽) and P_EIPSO_{25} (dashed line ✕) with a) satellite-derived winter sea ice cover and b) with diatom-derived winter sea ice cover.

Method



References

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Müller et al., 2011. Earth and Planetary Science Letters, v. 306, no. 3-4, p. 137-148.

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The distribution plot was done with Ocean Data View 4.7.10 from 2017, all scatter plots with Grapher™ 13.

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