

Evaluating the sea ice proxy IPSO₂₅ at the Western Antarctic Peninsula



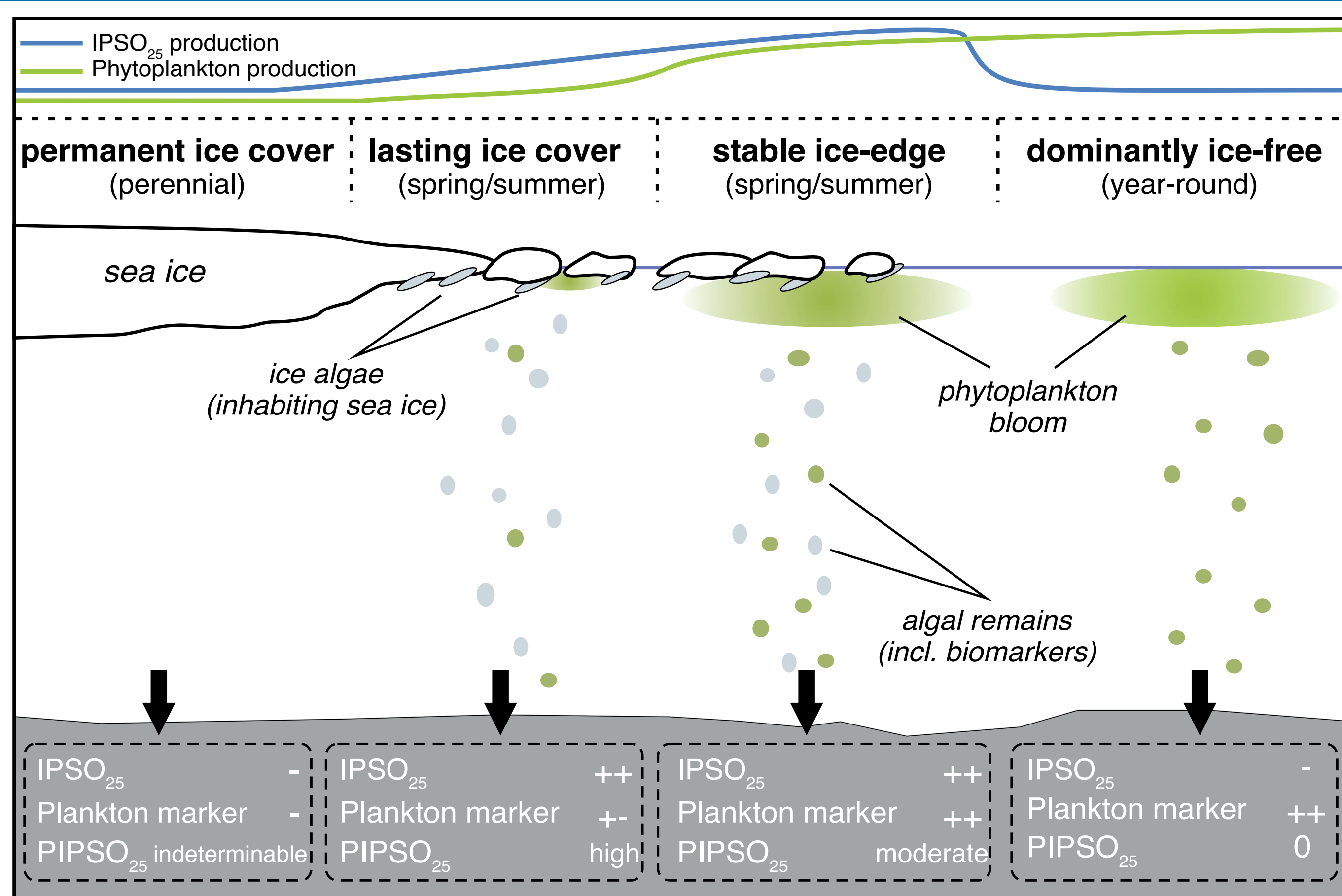
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Introduction

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 IPSO₂₅ (Ice Proxy Southern Ocean 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 IPSO₂₅ 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.

Approach

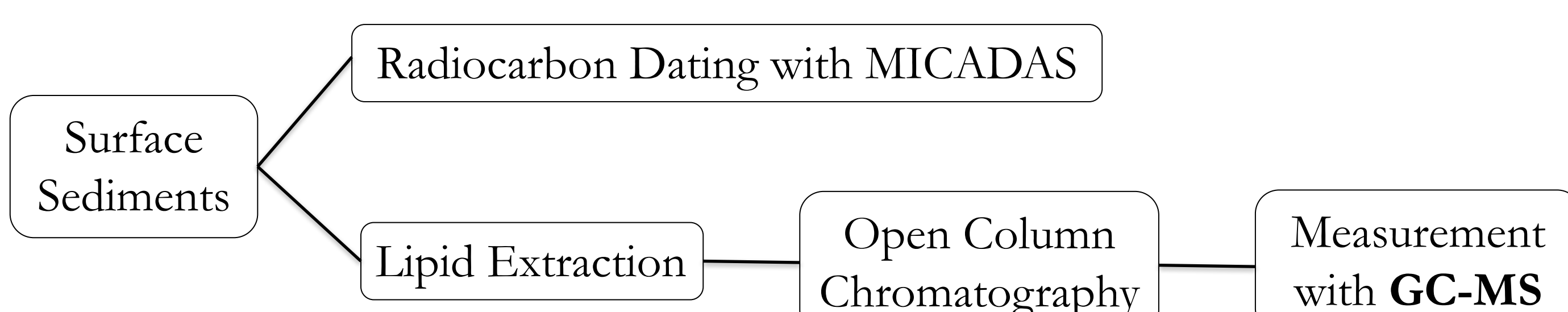


Biomarkers indicative of sea ice diatoms (IPSO₂₅) and open ocean phytoplankton (HBI Z- and E-trienes as plankton marker) are used to determine PIPSO₂₅, a concept modified after Müller et al., 2011.

Conclusions

- IPSO₂₅ is a robust and stable proxy for coastal sea ice in the Southern Ocean and Antarctica
- The sea ice index P_EIPSO₂₅ 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)
- PIPSO₂₅ 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

Method



References

Belt et al., 2011. Nature Communications, V. 7, p. 12655.
Müller et al., 2011. Earth and Planetary Science Letters, v. 306, no. 3-4, p. 137-148.
Schlitzer, R., Ocean Data View, <https://odv.awi.de>, 2018.

Acknowledgments

Thank you to all the captains and crews at the cruises ANT-VI/2 and PS97. Further, we like to thank Lester Lembke-Jene, Mandy Kiel, Liz Bonk, Hendrik Grotheer, and our student assistant Max Mues. Funding was provided through the Helmholtz Research Grant VH-NG 1101.

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

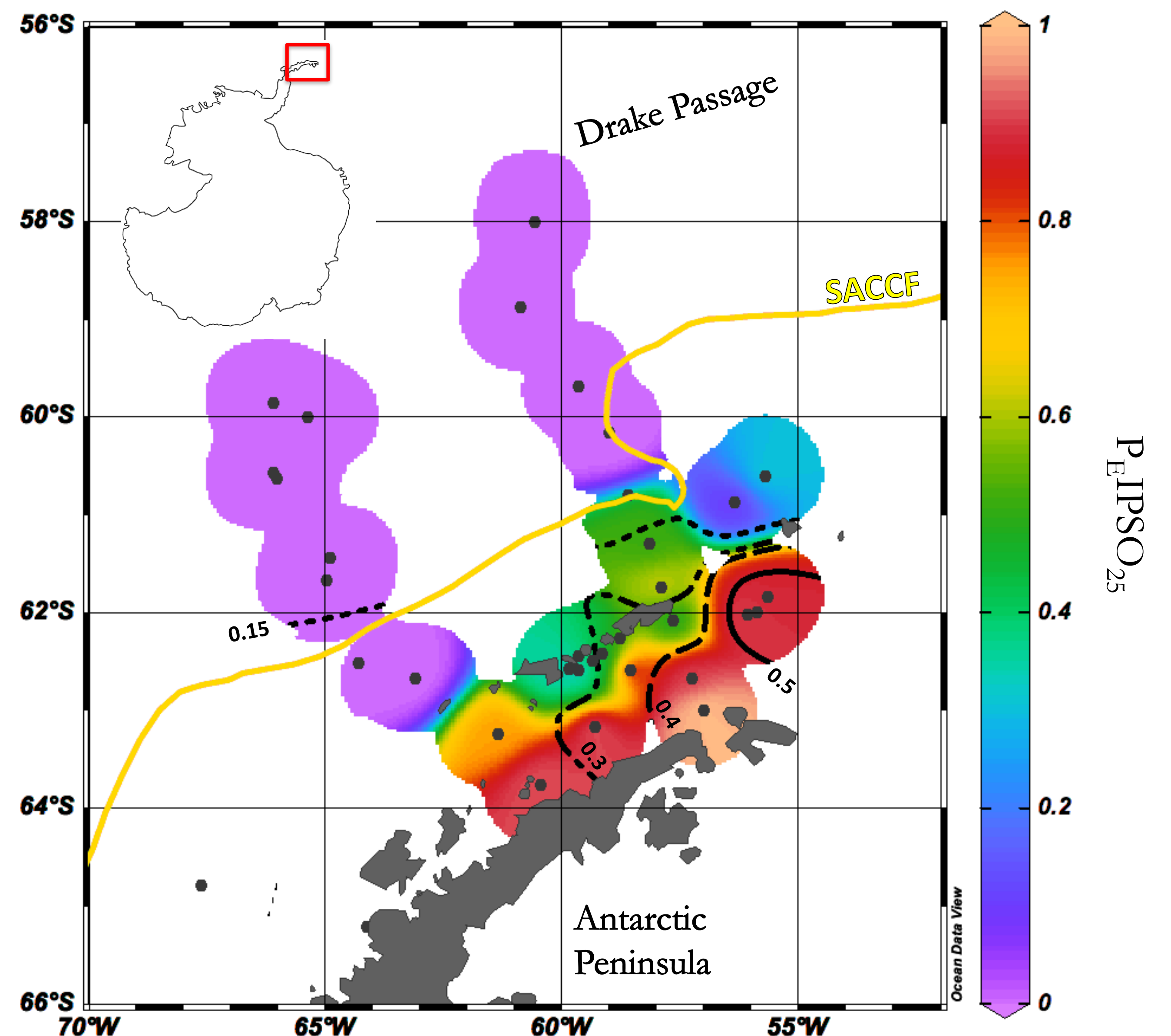


Fig. 1: The distribution of the sea ice index P_EIPSO₂₅ at the Western Antarctic Peninsula. The contour lines display satellite-derived winter sea ice concentrations (• stations).

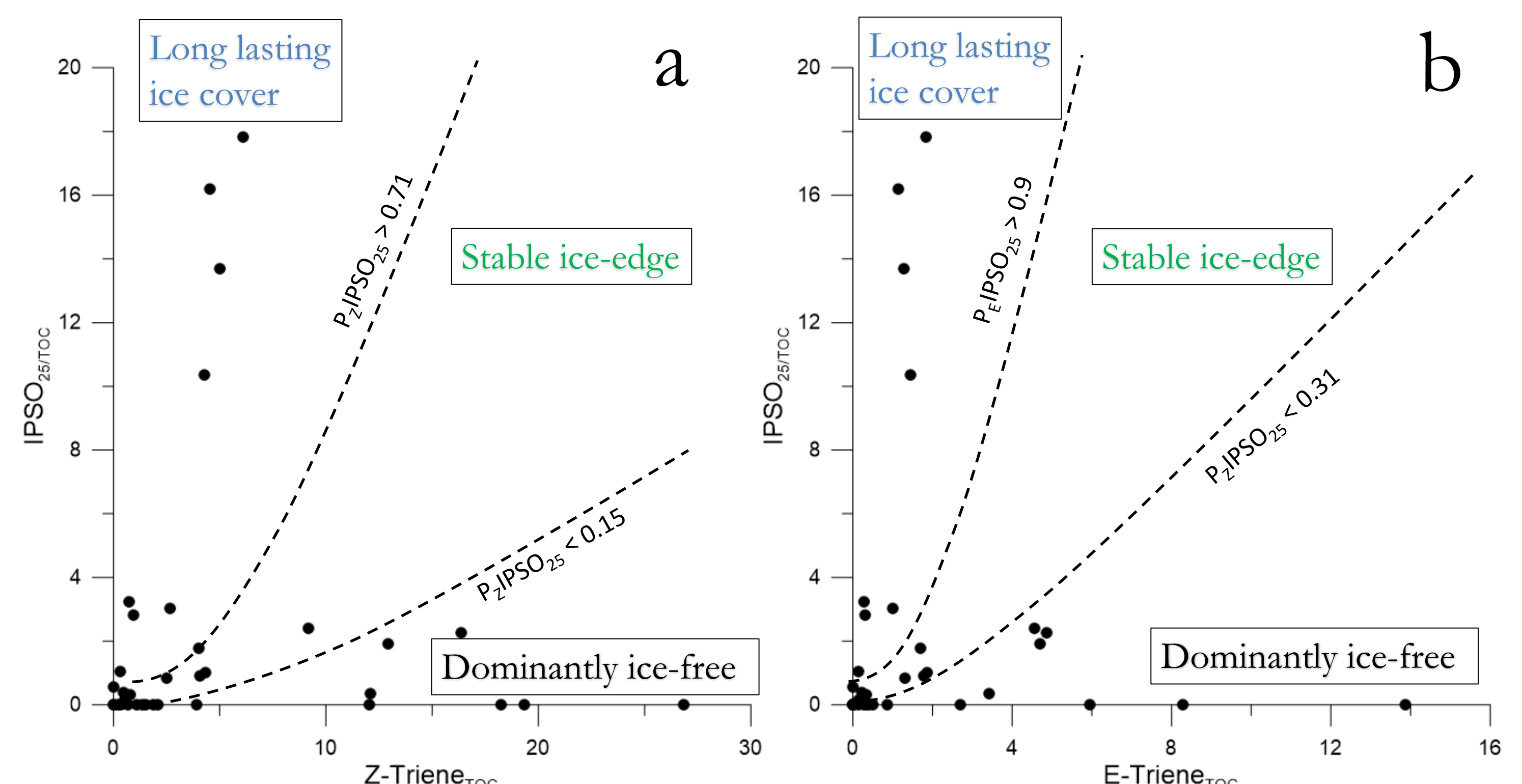


Fig. 2: The correlation of IPSO₂₅ with HBI a) Z- and b) E-trienes. A rough estimate of sea ice conditions is based on the calculated P_ZIPSO₂₅ and P_EIPSO₂₅.

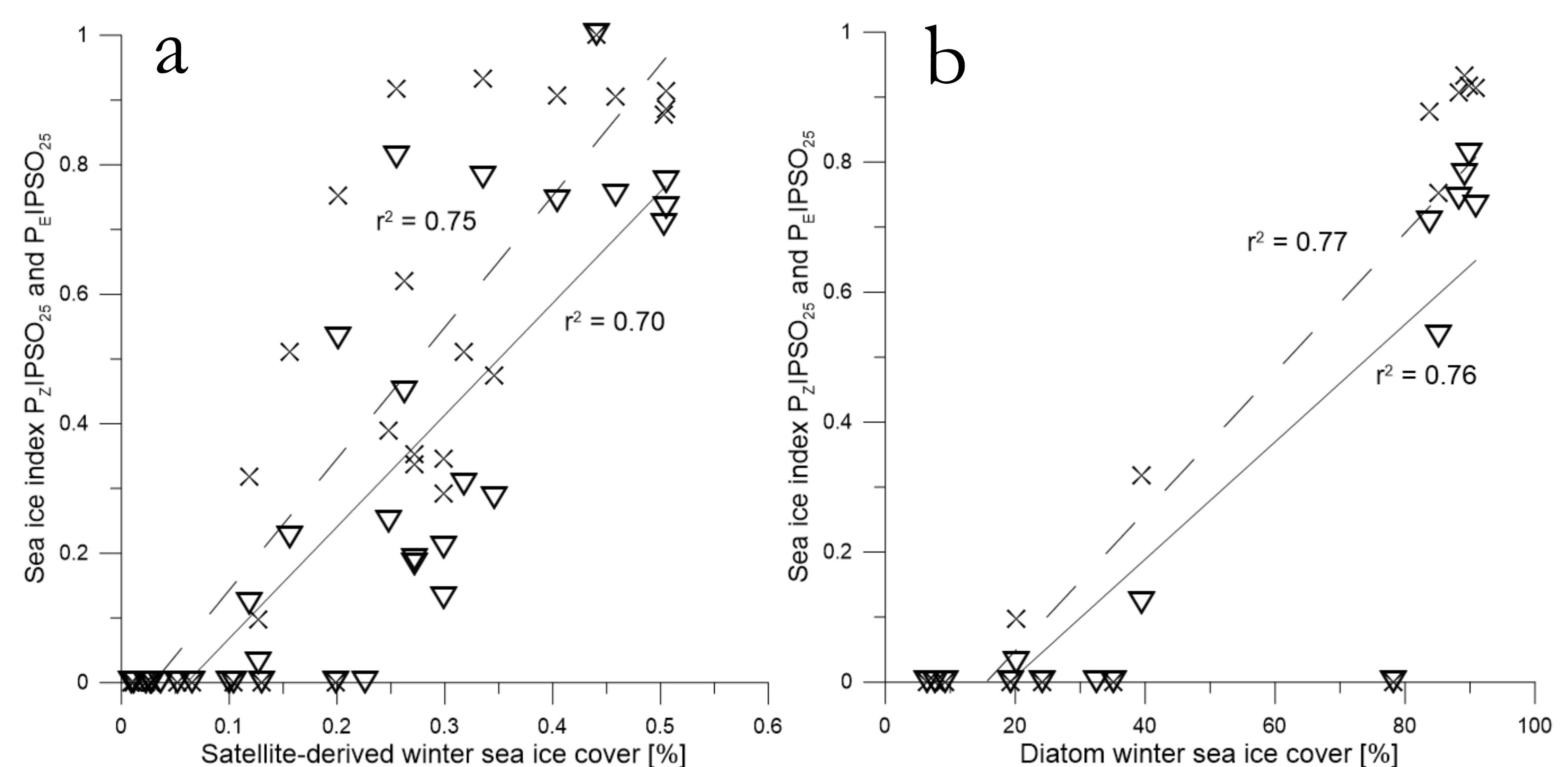


Fig. 3: The correlation of P_ZIPSO₂₅ (solid line ▽) and P_EIPSO₂₅ (dashed line ×) with a) satellite-derived winter sea ice cover and b) with diatom-derived winter sea ice cover.