Ocean productivity and bottom water oxygenation across the onset of the Cenozoic cooling trend

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Introduction

- Reconstruction of paeoproducitivity in the Antarctic Zone (> 60°S) and the Sub-Antarctic Zone (~45–60°S) prior to Antarctic Circumpolar Current establishment is of interest.
- Study of paeoproducitivity relies on proxy reconstructions.
- Problems with proxies must be resolved for results to be understood and allow model-data comparison.

Methods

Location

- The photic zone
- The mesopelagic zone
- The deep ocean

Process

- Export production
- Arrival of Organic C (OrgC) on the seafloor
- Benthic Foraminifera Accumulation Rate (BFAR)³
- Icthyolith Accumulation Rate (IAR)¹
- Biogenic Barium (Bio-Ba)²

Proxy

- Oxygen in bottom and/or pore waters
- Ba preserved in sediments, due to reductive dissolution

Previous work established Bio-Ba can only be used in oxic sediments²,⁵. Our work reveals that use of Bio-Ba must also be carefully considered in areas with high delivery of Org C to the seafloor. Reductive dissolution of Ba mutes Bio-Ba signals, resulting in an underestimation of export production.

References

4) Ocean Drilling Stratigraphic Network online toolkit (www.odsn.de).

Could increased OrgC delivery to the seafloor cause oxygen depletion and reductive Ba dissolution?

If the hypothesis is correct, we should record high BFAR at low Mn/Al ratios.

If the hypothesis is correct, we should record lower Bio-Ba values at low Mn/Al ratios.

We'd expect a positive correlation between Bio-Ba and BFAR, and Bio-Ba and IAR.

R² = 0.023
R² = 0.292
R² = 0.280
R² = 0.016
R² = 0.012
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