

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

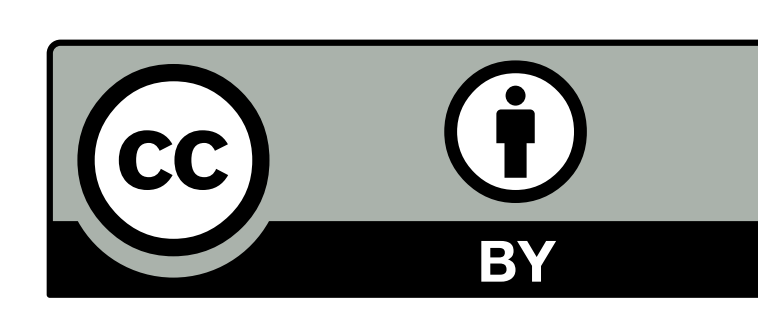
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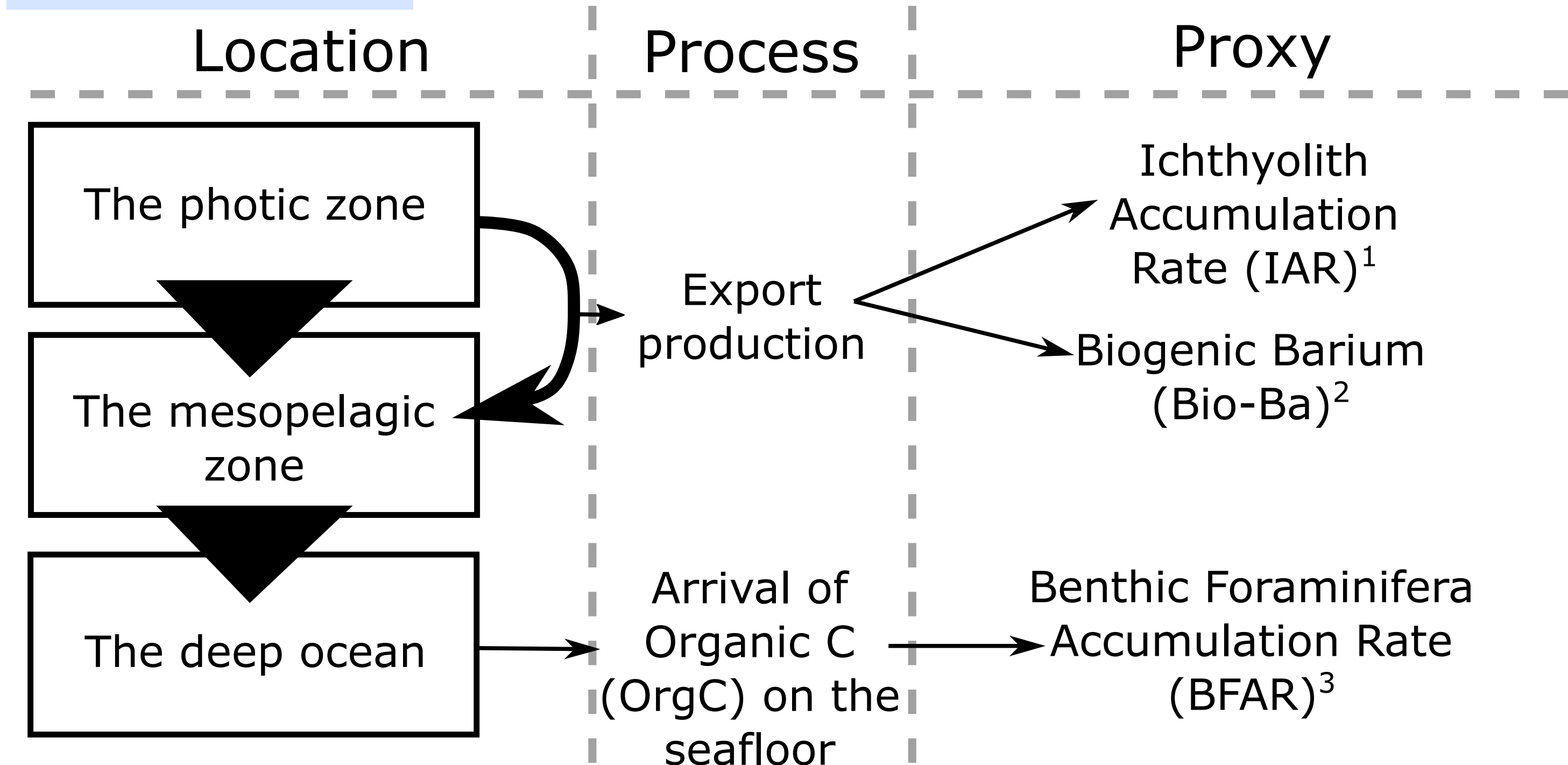
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Introduction

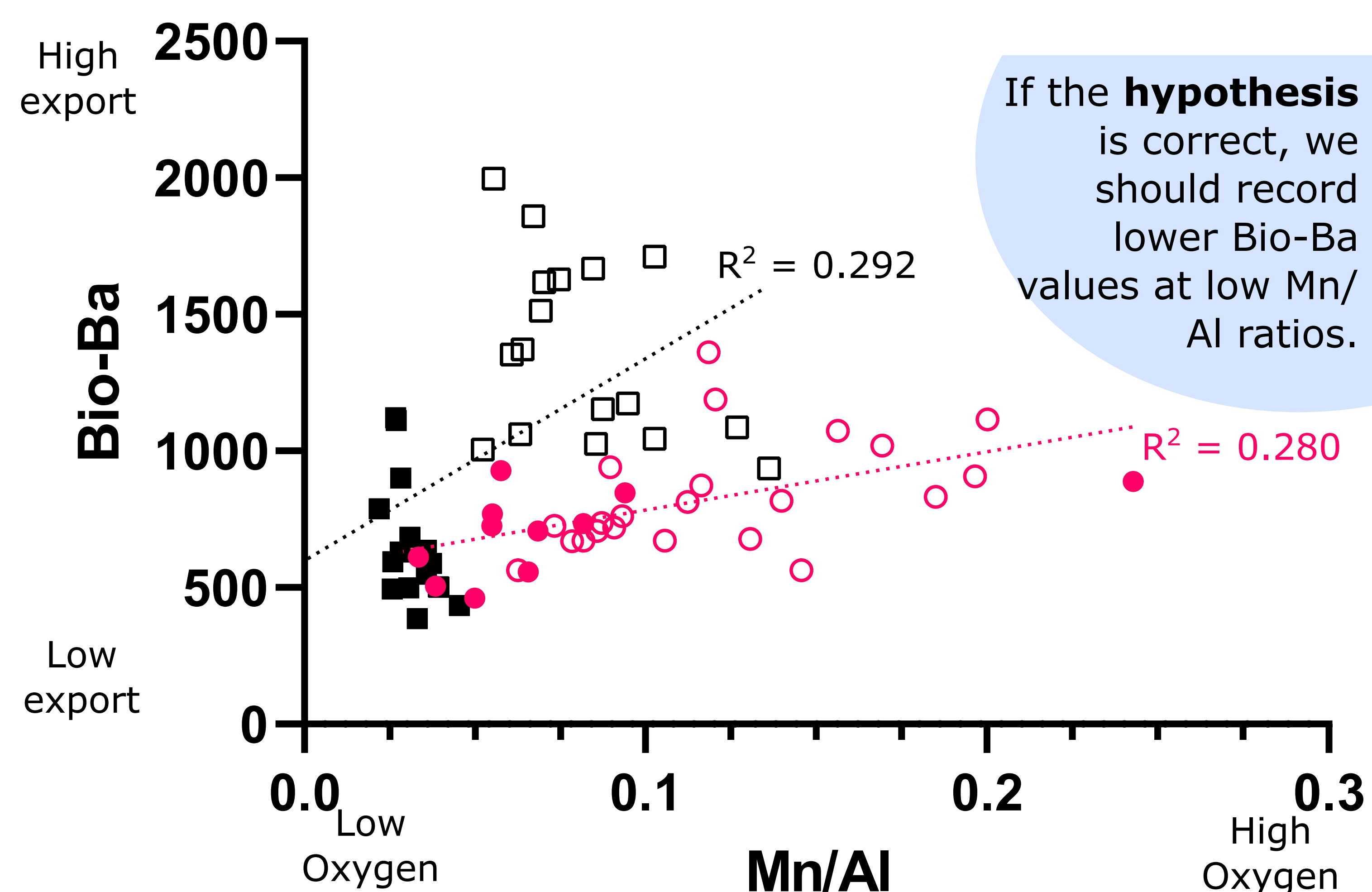
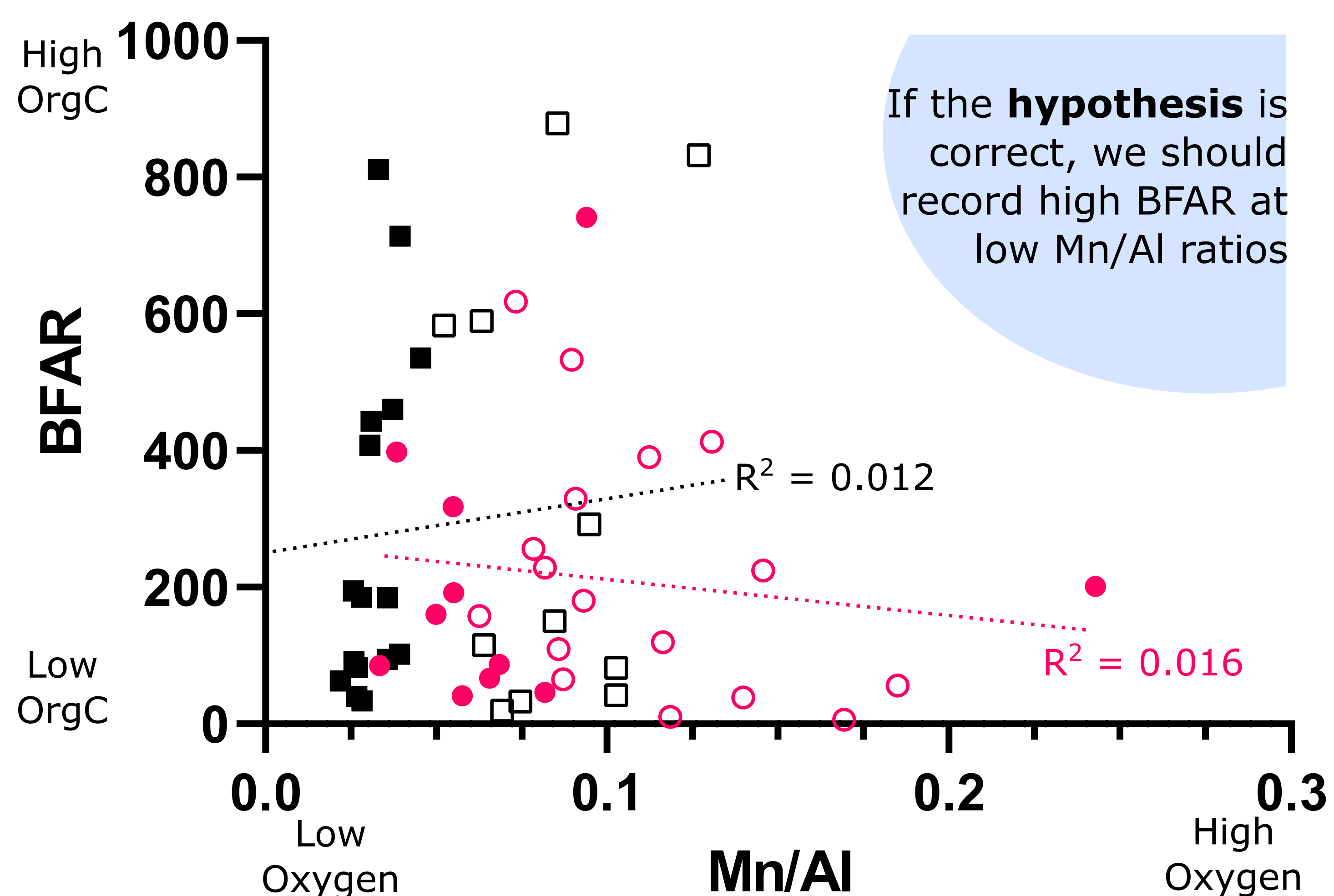
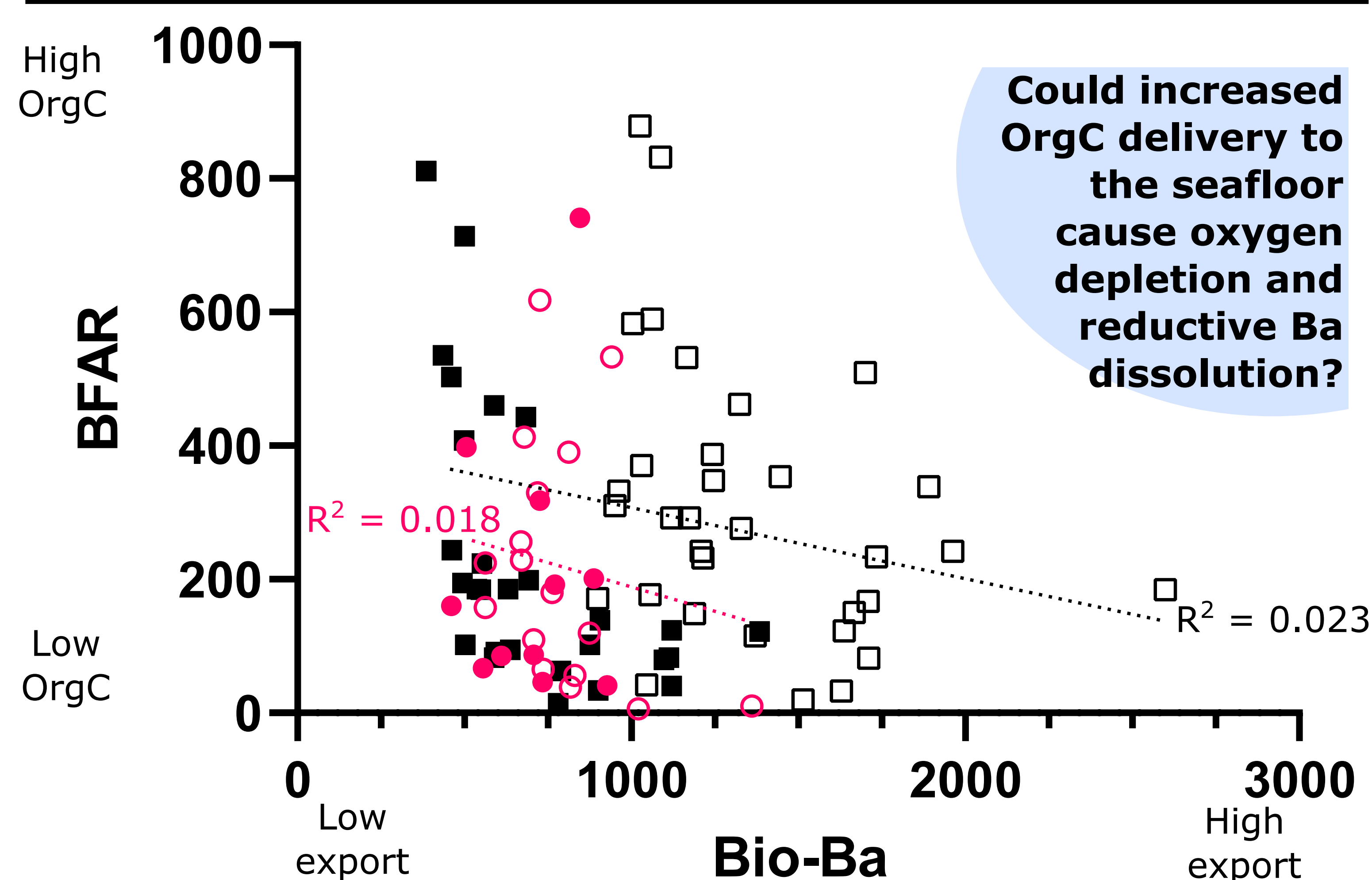
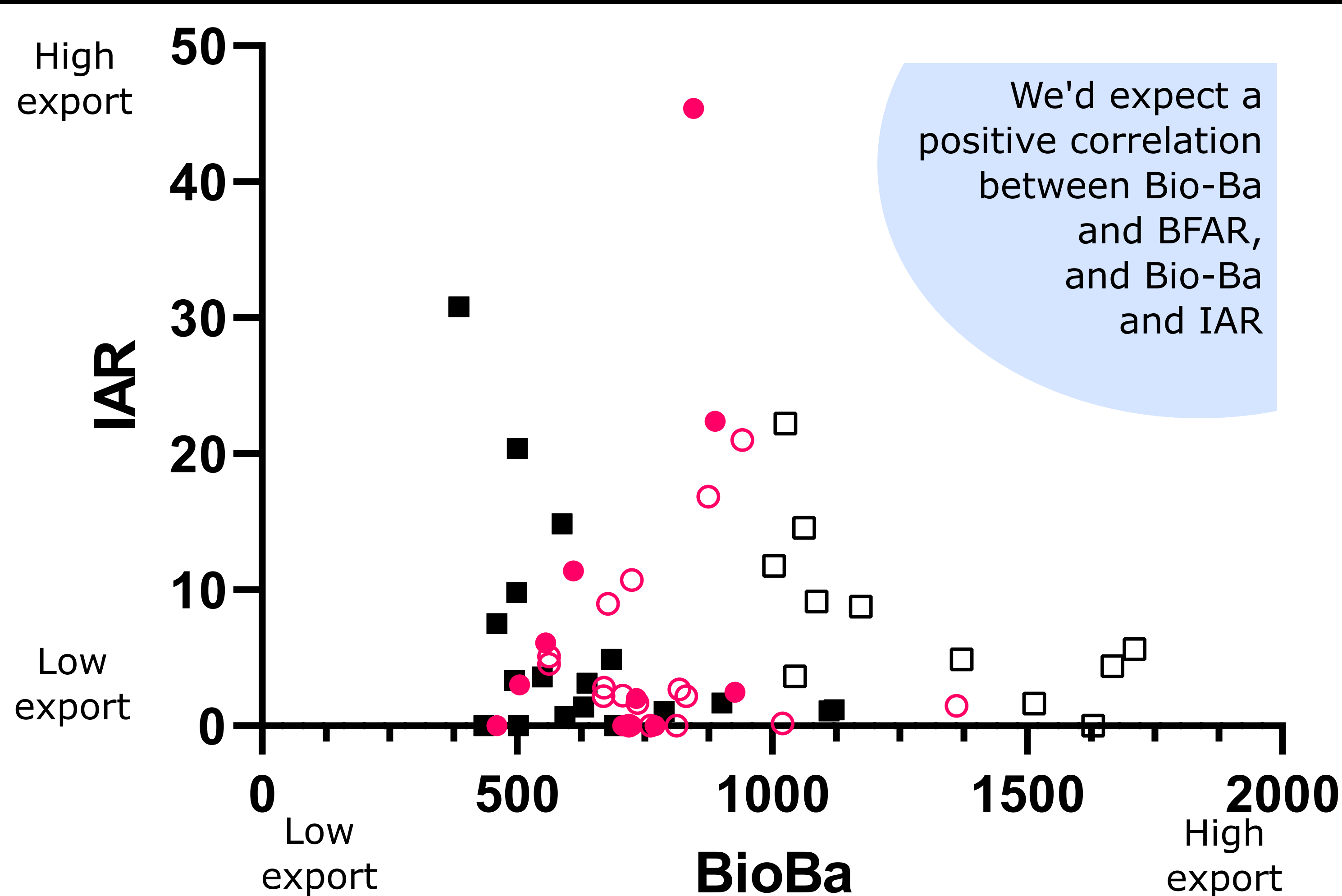
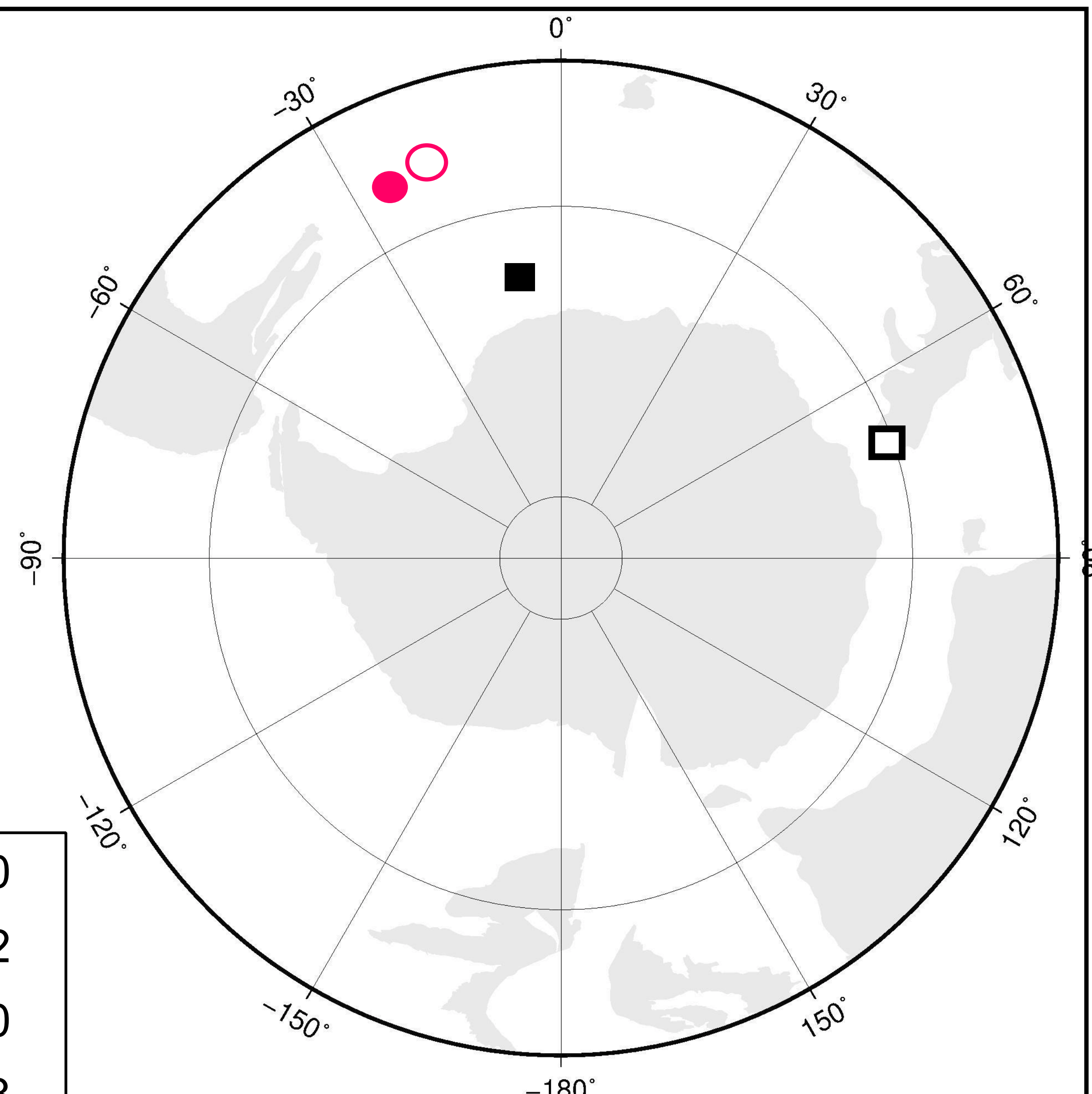
- Reconstruction of palaeoproductivity in the Antarctic Zone (> 60°S) and the Sub-Antarctic Zone (~45-60°S) prior to Antarctic Circumpolar Current establishment is of interest
- Study of palaeoproductivity relies on proxy reconstructions
- Problems with proxies must be resolved for results to be understood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

Methods



Sites

Tectonic plate reconstruction of 48 Ma made using ODSN⁴.



▲ BFAR + IAR = ▼ Mn/Al = ▼ Bio-Ba
 ▲ Productivity + Org C delivered to the seafloor = ▼ 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 sediments^{2,5}. 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

- 1) Sibert, E., Hull, P. & Norris, R. (2014). Resilience of Pacific pelagic fish across the Cretaceous/Palaeogene mass extinction. *Nature Geosci* 7, 667-670
 - 2) Dymond, J., Suess, E., and Lyle, M. (1992). Barium in Deep-Sea Sediment: A Geochemical Proxy for Paleoproductivity. *Paleoceanography*, 7(2), 163-181
 - 3) Herguera, J. C., Berger, W. H. (1991). Paleoproductivity from benthic foraminifera abundance: Glacial to postglacial change in the west-equatorial Pacific. *Geology*; 19 (12): 1173-1176
 - 4) Ocean Drilling Stratigraphic Network online toolkit (www.odsn.de).
 - 5) Eagle, M., Paytan, A., Arrigo, K. R., van Dijken, G., and Murray, R. W. (2003). A comparison between excess barium and barite as indicators of carbon export. *Paleoceanography*, 18, 1021
- Additional data compiled from:
 - Faul, K. L., and Delaney, M. L. (2010). A comparison of early Paleogene export productivity and organic carbon burial flux for Maud Rise, Weddell Sea, and Kerguelen Plateau, south Indian Ocean. *Paleoceanography*, 25
 - Diester-Haass, L. and Faul, K. (2019). Paleoproductivity Reconstructions for the Paleogene Southern Ocean: A Direct Comparison of Geochemical and Micropaleontological Proxies. *Paleoceanography and Paleoclimatology*, 34