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Planktonic Foraminiferal $\delta_{13}C_{org}$ as a novel proxy for Carbon Cycling

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It has been hypothesized that lower atmospheric CO_2 concentrations and lower temperatures during glacial times caused the enrichment of carbon isotopes of particulate organic material ($\delta^{13}C_{org\text{-}POM}$) produced in the surface ocean. Some downcore measurements of organic carbon isotopes of bulk sediments show such a trend, however, others do not. The lack of a coherent picture could be due to issues relating to the bulk sediments, including diagenetic alteration, the nature of the organic material, input of allochthonous material, and sediment redistribution.

Recent work by Hoogakker et al. (2022) shows that planktonic foraminifera-bound organic carbon $\delta^{13}C$ values ($\delta^{13}C_{FBOM}$) are remarkably similar to those of $\delta^{13}C_{org\text{-}POM}$. Here we present the first down-core organic carbon isotope record of planktonic foraminifera-bound organic carbon ($\delta^{13}C_{FBOM}$) from the Southern Ocean (ODP Site 1088), to test for a glacial enrichment in $\delta^{13}C_{org\text{-}POM}$. The samples (*Globigerina bulloides*, *Globorotalia truncatulinoides,* and *G. inflata*) cover the last 20,000 years.

Our $\delta^{13}C_{FBOM}$ results show a slight positive trend toward the Last Glacial Maximum (LGM), in accordance with the hypothesized $\delta^{13}C_{org\text{-}POM}$ trend, but not to the extent as shown in some bulk sediments from more tropical latitudes. We discuss our results in the context of predicted past $\delta^{13}C_{org\text{-}POM}$ using ice core atmospheric pCO_2 concentrations, *G. bulloides* calcification DIC (from inorganic carbon isotopes), and temperature (using Mg/Ca).