Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.22559

Benthic foraminiferal $\delta^{13}C$ traces CO_2 storage in the Glacial deep Southeastern Indian Ocean and CO_2 outgassing across the last deglaciation

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The Southern Ocean (SO) is an important area for ocean-atmosphere CO_2 equilibration, as the principal location where the wind driven component of thermohaline overturning circulation brings deep water to the surface releasing its accumulated load of "excess" respired CO_2. The stable isotopic composition ($\delta^{13}C$) of this dissolved inorganic carbon (DIC) recorded in benthic foraminifera reflects the addition of respired DIC with low $\delta^{13}C$ values to subsurface water masses isolated from the atmosphere. Transfer of this DIC to the surface in polar reaches of the SO and its subsequent loss through atmospheric exchange results in a gradient of decreasing $\delta^{13}C$ with water depth today, while Nd isotopes (as ε_{Nd}) track the relative proportion of North Atlantic-sourced water. We have developed a depth transect (1.1 km to 3.2 km) of 6 sediment cores from the Southeast Indian and Southern Ocean (32° to 42° S) spanning the last 50 ka. We have determined the $\delta^{13}C$ on single species analyses of benthic foraminifera from the genus *Cibicides* (primarily *wuellerstorfi, kullenbergi* and *lobatulus*) to examine the $\delta^{13}C$ evolution of the several deep and shallow subsurface water masses present in the SO across the last half glacial cycle. Glacial $\delta^{13}C$ values are ~1‰ more depleted than Holocene values in our deepest sites, ~0.5‰ more depleted in the 2.5 km core site, and show little or no change in sites at or above 1.8 km. Values at our shallowest 1.1 km site are nearly 1.0‰ more enriched than all other depths in the Holocene and as much as 2.5‰ more enriched in the glaciation. The early deglacial shift to more enriched $\delta^{13}C$ in our deeper sites reflects the loss of a ^{12}C-rich respired DIC pool from the deep SO at the beginning of the deglaciation. This preceded the reintroduction of North Atlantic-sourced waters as defined by ε_{Nd} in three of the same cores. This relative timing suggests that deglacial CO_2 loss from the deep ocean was initiated by SO dynamics rather than the reinvigoration of Atlantic Meridional Overturning Circulation.