Goldschmidt 2026 Abstract
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Searching for old radiocarbon and quantifying Ice Age changes in deep Indian Ocean ventilation

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Seawater radiocarbon content (14C/C) is a powerful tracer of air-sea CO2 exchange and ocean carbon storage. Existing observations suggest that Indian Ocean Bottom Water 14C/C was significantly lower (i.e., having a much older 14C ventilation age) than all other ocean basins during the Last Glacial Maximum (Figs. 5 and 6). Older 14C ventilation ages could reflect a much slower overturning of these waters, allowing for more carbon storage (via the biological carbon pump). If these existing measurements accurately reflect the entire Indian Ocean, they suggest we have greatly underestimated the carbon sequestration capacity of the glacial Indian Ocean. However, these anomalously old 14C ventilation ages may reflect a local anomaly or a reduced efficiency of air-sea gas exchange in the “upstream” Southern Ocean. Here, PI Rafter proposes to create six (6) new glacial-interglacial records of Indian Ocean Bottom Water 14C/C (Table 1, Figs. 2, 3, & 4) to answer the following question: Do the existing (very old) Indian Ocean Bottom Water 14C/C records accurately represent the region? In response to earlier proposal reviews requesting more quantification of the proxy results, PI Rafter has invited collaborators PI Walczak and PI Primeau to contribute measurements of Sortable Silt (proxy for near-Bottom Water circulation) and inverse modeling, respectively. Together, these measurements and modeling will provide important, complementary additions to the 14C/C that allow us to: (1) identify the cause of the very low 14C/C measurements (old 14C ventilation ages); (2) Quantify the source of the glacial-interglacial 14C/C variability (i.e., changes in circulation versus changes in Southern Ocean air-sea CO2 exchange).