

Improved Resolution of $\delta^{11}\text{B}$ -based CO_2 estimates over the Middle Eocene Climatic Optimum

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The Middle Eocene Climatic Optimum (MECO, ~40.1 – 40.5 Ma) was a warming event where declining benthic $\delta^{18}\text{O}$ values would suggest a rise in global temperatures of 3 – 6 °C¹. It differs from earlier Eocene hyperthermal events in its much longer period of warming (around 400 kyr, compared to <10kyr) and its lack of a global negative benthic $\delta^{13}\text{C}$ excursion coincident with the onset of warming. Initial application of the $\delta^{11}\text{B}$ -pH proxy to planktic foraminifera to reconstruct pCO_2 change over the MECO found that changes in pCO_2 were asynchronous with global $\delta^{18}\text{O}$ change, leading to speculation that some change in $\delta^{18}\text{O}$ may be due to cryosphere fluctuations². More recent work has updated the age-models of some of the sites involved³ and potential for age model discrepancies to decouple trends in pCO_2 and $\delta^{18}\text{O}$ has been mooted⁴.

Here we present new planktic foraminifera $\delta^{11}\text{B}$ data for sites ODP 702 and ODP 1260, increasing the resolution of CO_2 records across the MECO. We discuss the temporal trends in pCO_2 relative to changes in $\delta^{18}\text{O}$, weathering sensitive isotopes, and circulation change, in light also of new astronomically tuned age models.

1. Bohaty, S. M. & Zachos, J. C. (2003) *Geology* **31**: 1017–1020.
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3. Westerhold, T. et al. (2020) *Science* **369**: 1383–1387.
4. Westerhold, T. et al. (2024) *Paleoceanography and Paleoclimatology* **39**: e2024PA004932.