

Deep ocean circulation and climate during the Miocene: GCM experiments applied to a marine carbon cycle model

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Research outline

We investigate changes in the marine carbon cycle by applying the output of several Miocene ocean circulation sensitivity experiments to a marine carbon cycle model (HAMOCC2s, Heinze and Maier-Reimer 1999). This model considers geochemical tracers and biogenic particulate matter in the water column as well as in the bioturbated sediment. Using $\delta^{13}\text{C}$ among others as model output variable, the geochemical simulations provide a new framework to interpret Neogene paleoenvironmental data.

Model scenarios:

EM: Early Miocene (24-15 Ma BP), open Panama gateway (depth = 3000 m) and wide Tethys (depth = 1000 m), closed Bering Strait, no sea ice
 MM: Middle Miocene (15-11 Ma BP), open Panama and narrow Tethys gateways (depth = 1000 m each), closed Bering Strait, no arctic sea ice
 LM: Late Miocene (11-5 Ma BP), open Panama gateway (depth = 300 m), open Bering Strait, arctic sea ice
 PD: Present-day control run

Model resolution: $3.5^\circ \times 3.5^\circ$, 11 levels. All simulations are integrated for 30000 years.

