Glacial-interglacial cycles of deep North Atlantic carbonate chemistry

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Over the past few hundred thousand years, Earth's climate has oscillated between cold glacial periods of low atmospheric CO_2, and relatively short, warm interglacials with high atmospheric CO_2. The mechanisms controlling glacial inception and termination are complex but involve changes in the Atlantic Meridional Overturning Circulation (AMOC). The AMOC not only plays a role in the redistribution of heat but also of carbon in the ocean-atmosphere system. Changes in the carbonate chemistry of the deep North Atlantic Ocean should provide insights into the carbon cycle, but a long, quantitative reconstruction of deep Atlantic carbonate ion concentration ($[CO_3^{2-}]$) has yet to be generated.

Here we present deep water $[CO_3^{2-}]$ based on benthic foraminiferal B/Ca in core MD01-2446 (3547 m) on the Iberian Margin in the eastern North Atlantic Ocean, a location that is ideal for examining changes in the AMOC. Our results show generally low $[CO_3^{2-}]$ during glacial periods and high $[CO_3^{2-}]$ during interglacials, a pattern that is consistent with past AMOC changes. Detailed evolutions of $[CO_3^{2-}]$ at major climate transitions (e.g., glacial inception and termination) and long-term $[CO_3^{2-}]$ changes will be investigated. Deep water $[CO_3^{2-}]$ will be considered together with other proxies such as benthic $\delta^{13}C$ from the same core to provide insights into the carbon cycle in the deep Atlantic Ocean and its impact on atmospheric CO_2.