The Deep Ocean Carbon System Across the Mid-Pleistocene

LAURA L. HAYNES*[1], BÄRBEL HÖNISCH[1], JESSE R. FARMER[2], VINCENT J. CLEMENTI[3], HEATHER L. FORD[4], MAUREEN E. RAYMO[1], STEVEN L. GOLDSTEIN[1], LEOPOLDO D. PENA[5], MAAYAN YEHUDAI[1], TORSTEN BICKERT[6], & DAVID W. LEA[7]

[1]Lamont Doherty Earth Observatory, Columbia University, *correspondence: laurah@ldeo.columbia.edu
[2]Princeton University Dept. of Geosciences & Max- Planck-Institut für Chemie
[3]Dept. of Marine & Coastal Sciences, Rutgers University
[4]Department of Earth Sciences, University of Cambridge
[5]Universitat de Barcelona, Dept. of Stratigraphy, Paleontology and Marine Geosciences
[6]MARUM, Universität Bremen
[7]Department of Earth Science, UC Santa Barbara

Earth's climate underwent fundamental shifts during the Mid-Pleistocene Transition (MPT), including a reorganization of deep Atlantic ocean circulation, reduced glacial atmospheric pCO_2, and an increase in the dominant periodicity of ice ages[1,2]. Carbon and neodymium isotope records suggest an increased influence of a low-$\delta^{13}C$, southern-sourced water mass in the deep Atlantic at ~900 ka, which may have fostered enhanced deep ocean carbon storage[1]. To characterize the MPT carbon cycle perturbation, we use B/Ca in benthic foraminifera to reconstruct deep ocean carbonate ion ($[CO_3^{2-}]$) in the deep Atlantic and Pacific oceans. Pre- to post- MPT data from the Atlantic at ODP Sites 925 and 926 suggest a decrease in both glacial and interglacial $[CO_3^{2-}]$ at 900 ka, coincident with a decrease in $\delta^{13}C$ and increase in southern-sourced water presence as indicated by ε_{Nd} records[1], supporting an ocean circulation control on deep Atlantic $[CO_3^{2-}]$. $[CO_3^{2-}]$ from ODP 926 follows the 500-kyr oscillations of global $\delta^{13}C$ records[3], possibly signifying a global carbon cycle control on Atlantic water mass chemistry. B/Ca data from ODP Sites 805 and 806 from the Ontong Java Plateau will determine if there were globally coherent changes in deep ocean carbonate chemistry across the MPT.

[1]Pena, L.D. & Goldstein, S., *Science*, 345, 318-319. [2]Hönisch, B. et al. (2009) *Science*, 324, 1551-1553. [3]Wang, P. et al. (2003), Geology, 31, 239-242.