The Atlantic Meridional Overturning Circulation Through the Mid –Pleistocene Transition

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The Atlantic Meridional Overturning Circulation is a major means for distributing heat between the tropics and the high latitudes, and thus its temporal variability has major impacts on ice age cycles. We present a summary of work in-progress to generate two-dimensional profiles of the AMOC from the North Atlantic to the Southern Ocean, at time slices over the past ~2 Ma, from Nd isotopes in Fe-Mn-oxide encrusted foraminifera and fish debris. Our sites show a consistent N-S gradient in the North Atlantic signal strength, which varies temporally at each site, providing strong evidence that we are following the AMOC (with one exception). Moreover, the data show strong evidence that the εNd of the North Atlantic end-member remained similar to today through this time interval.

The interval includes the Mid-Pleistocene Transition (MPT), marking the change in glacial-interglacial periodicity from ~40 to ~100 kyr cycles, and which occurred between ~1.3-0.7 Ma. *Pena and Goldstein (Science, 2014)*, from data in two South Atlantic cores, concluded that the AMOC experienced an unprecedented "crisis" between ~950-850 ka (MIS 25-21), which generated the climatic conditions that intensified cold periods, prolonged their duration, and stabilized 100 kyr cycles. Our new results document impact of the "AMOC crisis" over the entire Atlantic basin. The sites show the same history, and are consistent with southern-sourced waters filling the deep Atlantic over that period. An εNd excursion in the North Atlantic just prior to the AMOC crisis, during MIS 26, indicates a spike of Canadian or European Shield material into the N Atlantic, and evidences a northern hemisphere trigger for the AMOC crisis and the transition to 100 kyr glacial cycles. The data support important changes in the overturning circulation during the MPT, and greater glacial-interglacial variability in the 100 kyr world compared with the 40 kyr world.