Geophysical Research Abstracts, Vol. 8, 05785, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05785

High-resolution records of progressive AMOC reduction from the NE Atlantic prior to H1; response to NW European ice sheet instabilities?

I. R. Hall (1), R. Zahn (2,1), S. B. Moran (3), V. L. Peck (1), P. C. Knutz (4), C.-C. Shen (5) and R. L. Edwards (6)

(1) School of Earth, Ocean and Planetary Sciences, Cardiff University Main Building, Park Place, Cardiff, CF10 3YE, UK (Hall@cardiff.ac.uk), (2) Institucio Catalana de Recerca i Estudis Anvancats, ICREA, and Institut de Ciencia i Tecnologia Ambientals, Universitat Autonoma de Barcelona, 08193, Bellaterra, Spain, (3) Graduate School of Oceanography, University of Rhode Island, Narragansett, RI, 02882-1197 USA, (4) Geological Institute, University of Copenhagen, Øster Voldgade 10 DK-1350 Copenhagen K, Denmark, (5) Department of Geosciences, National Taiwan University, Taipei 106, Taiwan, (6) Department of Geology and Geophysics, University of Minnesota Minneapolis, MN, 55455 USA

Abrupt decreases of the Atlantic meridional overturning circulation (MOC) during the Late Pleistocene have been directly linked to large-scale discharges of glacimarine freshwater, triggering disruption of northward marine heat transport and causing global climate changes. A detailed understanding of the forcing and sequence of events that have led to these shifts in Atlantic MOC has not yet been achieved, due to the paucity of quantitative and fine-scale reconstruction of past changes in the MOC rate and associated surface ocean climatology. Here we present a new record of excess sedimentary ^{231}Pa/^{230}Th from a high-accumulation sediment drift deposit in the NE Atlantic (58˚58.10'N, 09˚36.75'W) that resolves the sequence of sudden variations in the rate of MOC, associated deep ocean ventilation and regional climate forcing, at $<$100 year time steps. Comparison of these data is made with benthic carbon isotope records from intermediate water depth core sites in the Porcupine Seabight (PSB; 52ºN), NE Atlantic, and the Portuguese Margin (PM; 38ºN) that trace a northwards advance of southern-sourced waters (SSW) along the European Margin coincident with meltwater release from the NW European ice sheets (NWEIS) at $\sim$21.6 ka BP. Following meltwater dispersal, SSW retreats south of the PSB, although steadily de-

creasing carbon isotopes values suggests an increasing admixture of SSW at the PM. The combined ^{231}Pa/^{230}Th and benthic carbon isotope evidence, in conjunction with fine-scale surface-ocean records from 52º and 59º N, reveal a sequential decrease in the MOC rate at $\sim$18.0 ka BP that coincides with only small and localized freshwater inputs. This basin-scale change represents a substantial, though not total, cessation in MOC that predates the major Heinrich (H1) meltwater event by at least 1,000 years. These results suggest sensitivity of the MOC to meltwater forcing from the NWEIS, as well as the Laurentide ice sheet, and prove the importance of small but targeted freshwater perturbations for promoting substantial MOC changes with implications for future ocean and climate instability. The data suggest that H1 prolonged but did not cause the cessation of the Atlantic MOC.