Geophysical Research Abstracts, Vol. 9, 04837, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04837

Coupling of North Western European Ice Sheet instabilities and Atlantic Meridional Overturning during MIS 3-2

E. Colmenero-Hidalgo (1), I.R. Hall (1), R. Zahn (2), S.R. Hemming (3)

(1) School of Earth, Ocean and Planetary Sciences, Cardiff University, Main Building, Park Place, Cardiff, CF10 3YE, United Kingdom, (2) Institució Catalana de Recerca i Estudis Avançats (ICREA), and Institut de Ciencia i Tecnologia Ambientals, Universitat Autònoma de Barcelona, 08193, Bellaterra, Spain, (3) Department of Earth and Environmental Sciences, Lamont-Doherty Earth Observatory (LDEO), Rt. 9W, Palisades, NY 10964, USA (elecolme@usal.es / Phone: +34 923 294497)

The characteristics and variability of the surface and deep-water mass circulation in the NE Atlantic proximal to the margin of the North Western European Ice Sheet (NWEIS) during most of Marine Isotopic Stages 3-2 are recorded in the multi-proxy faunal assemblage, IRD lithology, 40Ar/39Ar ages of individual hornblende grains, and planktonic and benthic stable isotopic records of the sediment core MD04-2829 CQ. This 10-m core was recovered on the SE flank of Rosemary Bank (58° 56.93'S, 9° 34.30'W) at a water depth of 1743 m during the RV Marion Dufresne Cruise MD141 (Programme SEQUOIA: Sequencing Ice-Ocean-Climate Interaction in the NE Atlantic during the Last Glacial). The age model combines 24 AMS radiocarbon ages with the fine-tuning of the relative abundance of the planktonic foraminifer N. pachyderma (left-coiling) to the GISP2 oxygen isotope record, showing that the studied sections (lowermost 7 m) cover the interval between 18.3 and 41.5 kyrs cal. BP with a mean sedimentation rate of 30 cm/kyr, with maximum rates of up to 97 cm/kyr recorded during MIS 2. Present-day surface circulation in the area is dominated by the NE flow of the North Atlantic Drift towards the Norwegian Seas, while the Wyville-Thomson Overflow Water (precursor to the North Atlantic Deep Water, NADW) and recirculating NADW are the two most important deep-water masses influencing the core site. Centennial to millennial scale variations in the stable isotopic records that are synchronous with increases in the flux of IRD and lower sea surface temperatures

(as recorded by the planktonic foraminifer assemblages and Mg/Ca paleothermometry) reveal a tight coupling between NWEIS instabilities and ocean circulation during MIS 3-2, particularly in the period of maximum ice sheet growth. Incursions of melt water reaching the core site recorded in the sea water oxygen isotopes are closely coupled to peaks in NWEIS instability, although lithological evidence indicates a superimposed contribution of the Laurentide Ice Sheet during Heinrich intervals. During these periods the strong temperature and salinity gradients between the surface and intermediate water masses indicate a strongly stratified upper water column coincident with reduced ventilation of the intermediate to deep waters, as recorded in the benthic isotopic records, and a probable arrival of southern sourced waters to the area. In certain intervals -such as DO St3- this increase in the amount of southern sourced waters would have occurred progressively over a period of several thousand years before the Heinrich Event, in concurrence with increasingly greater episodes of IRD input.