



Response of the British Ice Sheets to climate forcing over the last 250,000 years.

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Knowledge of the NW European ice-sheet dynamics prior to Marine Isotope Stage (MIS) 4 is, at present, poorly constrained. The giant piston core MD04-2822 was recovered from the Barra Fan, a major depositional centre for the BIS and contains two glacial/interglacial cycles. This has enabled the examination of the dynamics of the last British Ice Sheet (BIS), the penultimate BIS as well as conditions during the last interglacial to the west of Scotland. The following proxies are presented here; percentage abundances of the polar species *Neogloboquadrina pachyderma* (*sinistral*) (*Np(s)*), ice-rafted debris (IRD) counts, x-ray fluorescence core scanning (ITRAX), stable isotope analyses and environmental magnetic parameters.

The sediment core MD04-2822 was taken from the deep-water margins of the Barra Fan (approximately 56° 50'N, 11° 20'W and 2344m water depth) in the Rockall Trough. This fan complex is one of the most southerly developed glacigenic fan systems on the European continental margin (Knutz et al 2001). An initial chronostratigraphy has been derived from benthic, *C. wuellerstorfi*, stable isotopes ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) and enabled MIS designations to be made; this has been complemented by radiocarbon dating. Further age constraint has been constructed by “wiggle-matching” the percentage *Np(s)* and ITRAX calcium count records to the NGRIP $\delta^{18}\text{O}$ record back to ~123 ka BP (NGRIP members 2004, Rasmussen et al 2006, Andersen et al 2006). From this we have been able to add Dansgaard/Oeschger (D/O) age designations (Bond et al 1993, Austin et al 2004) anchored by the presence of North Atlantic Ash Zone (NAAZ) I and II (Ruddiman and Glover 1972).

We present the above records for this giant piston core and test the age at which the last BIS expanded across the shelf seas of NW Scotland to deliver IRD to the site. This is currently unknown beyond MIS 4/3. Core MD04-2822 presents an opportunity to replicate and extend the proven millennial scale records of the Barra Fan beyond MIS 4 (Wilson et al 2002) as well as providing an insight into BIS glacial inception.

Sediment core MD04-2822 has enabled an investigation of IRD provenance using detailed IRD counts and magnetic parameters. Distinct magnetic properties can be discerned from magnetic parameters for the BIS, Laurentide ice sheet (LIS), Icelandic ice sheet (IIS) and an ambient background signal. Using a magnetic un-mixing model (Peters et al 2007), quantified proportions of these sources may be obtained, thus enabling IRD provenance to be examined for the Barra Fan for both the last and penultimate glaciation. In addition, water mass conditions, in particular for MIS 4 and 5, have also been investigated using benthic and planktonic stable isotopes.

We also present a comparison of Terminations I and II from the same core. This is unusual for a core site adjacent to the British margin and will provide a first high-resolution insight into the pattern of deglaciation for the last two glacial cycles of the British Ice Sheet; was there a Younger Dryas type event within Termination II for the British margin?