



Mineral magnetic signature of European margin sediments: provenance of ice-rafted debris and the climatic response of the British Ice Sheet during Marine Isotope Stages 2 and 3.

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Mineral magnetic measurements have been used as a proxy to (i) identify Dansgaard-Oeschger (D-O) cycles and trends within Bond cycles, (ii) identify different ice rafted debris (IRD) sources and phasing within stadials surrounding Heinrich (H) Layers and (iii) suggest evidence of growth/decay of the British Ice Sheet (BIS). The measurements were carried out on giant piston cores recovered from the Barra Fan off the north-west coast of Scotland, the major deposition centre of the last BIS. The climatic signal of D-O cycles is shown by the correlation of anhysteretic remanent magnetisations with the record of the polar foraminiferal species *N. pachyderma* (sinistral). Trends in proportions of hard magnetic minerals reflect the longer-term Bond cycles. Magnetic measurements can distinguish IRD from the BIS, the Laurentide Ice Sheet (LIS), and the Icelandic Ice Sheet (IIS), along with an ambient sediment background signal. A magnetic unmixing model quantified proportions of the sediment sources during Greenland Stadial (GS) 16 to GS2 spanning H5 to H2. The magnetic model suggests LIS IRD was only dominant as an interval during GS9, assigned to H4. H2 is masked by BIS IRD input as a result of BIS expansion across the continental shelf of NW Scotland. Prior to H4 low proportions of BIS IRD suggest the BIS was not able to deliver IRD into the marine system. An increase of BIS IRD deposition was observed at the MIS3-2 transition, but an earlier increase was also observed at the end of GS9 following H4 suggesting BIS input during much of MIS3.