Geophysical Research Abstracts
Vol. 18, EGU2016-13141, 2016
EGU General Assembly 2016

Magnetic properties contribution to the identification and provenance of marine sediments: distal IRD in the Galicia Interior Basin (NW Spain)

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This paper discusses the advantages of using a combined environmagnetic and geochemical approach to the provenance and characterization of distal IRDs occurring during the Last Glacial Period in core CI12PC3 from the Galicia Interior Basin (GIB). Six Heinrich layers (HL1-6) have been identified in the area in base to the detection of distinct populations of exotic magnetic mineral assemblages alien to the local/regional sedimentation environment. Their extension has been determined by Ca/Sr and Si/Sr ratios and their provenance by 143Nd/144Nd and 87Sr/86Sr isotopic ratios and FORCs.

The sedimentary expression of HL is characterized by the presence of distal Ice Rafted Detritus (IRD). Distal IRD magnetic signatures in the GIB consist of (i) an increase of one order of magnitude in the peak amplitude of magnetic susceptibility from background values, (ii) a general coarsening of the magnetic grain size in a mineral assemblage dominated by titano-magnetites, (iii) FORC distributions pushing towards the coarse MD or PSD component, and (iv) thermomagnetic curves depicting the occurrence of several magnetite phases. These four features are very different from the fine-grained biogenic magnetic assemblages characterized by the combination of lower MS and higher coercivity values that dominate the predominant mixtures of the non-interacting SSD and PSD components in the non-IRD influenced background sedimentation.

Our results show that the last 70.000 yr of sedimentation in the GIB were controlled by the relative contribution of local detrital material derived from the Iberian Variscan Chain and IRD alien material from the iceberg melting during the Heinrich Events. They also show two main IRD provenance fields: Europe and Canada. And that the later is more important for for HL1, HL2, HL4 and HL5. FORCs analysis complemented the isotopic information and provided a very unique information, indicating that glacial flour may not always have the same provenance as IRD and that ice-melted derived suspended sediment has its own dynamics and may reach further and/or persists longer than IRD.