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Delayed Acquisition of Remanence in Deep Marine Sediments of the Galicia Bank Slope, Eastern North Atlantic

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A b s t r a c t

Palaeomagnetic studies of deep marine sediments have made a significant contribution to the development of secular variation and relative paleointensity records which are useful to both understand the behaviour of the geomagnetic field and to date marine sediments at very different time scales. However, the complex mechanisms of remanence acquisition in sediments, involving complex sequences of interactions between Depositional Remanent Magnetisation (DRM), Post-Depositional Remanent Magnetisation (PDRM) and early Chemical Remanent Magnetization (CRM) commonly results in inclination errors and in a time discrepancy between the magnetic and stratigraphic ages. Subsequently, the validation of individual records requires the acquisition of detailed palaeomagnetic, rock-magnetic and geochemical data to detect the occurrence of different magnetic phases and their lock-in ages.

The sedimentary sequence deposited over the last 80 kyr in the Galicia Bank slope (Eastern North Atlantic) provides an interesting case in this regard. These sediment are the result of local turbiditic/contouritic processes, the regional pelagic and hemipelagic sedimentation, the deposition of exotic IRD layers, and redoxomorphic diagenesis, which are all unsteady as a result of climate-driven forcings. This also leads to variable contributions from magnetic sources as well as spatial and temporal changes in depositional rates in the region. This sedimentary complexity, however, seems not to have compromised the preservation of a detailed secular variation record. This record can be correlated over hundreds of km to the distal slope and abyssal-plain sequences of very different sedimentary rates. These correlations lead, however, to age discrepancies of several thousand years when compared with the 14C-based age models of the cores.

The material discussed comprises three gravity cores with lengths of 67, 286, and 274 from the south-western flank of the Galicia Bank, extracted at water depths of 3363 to 4171 m. Standard cylindrical boxes were taken continuously for the uppermost 50 cm and each 10 cm throughout the remaining core. A full array of magnetic susceptibility, hysteresis, remanence, thermomagnetic measurements and geochemical analyses are used to magnetically characterise each sedimentary environment, their associated depositional rates and depth of redox boundaries.

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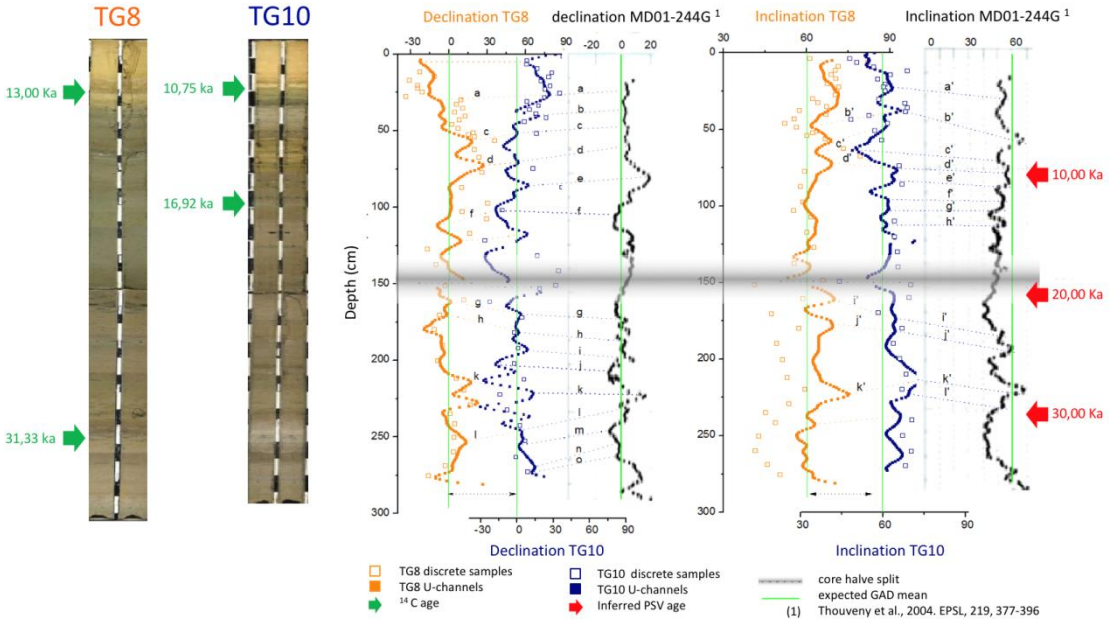

Fig. 1. Remanence record of cores TG8 and TG10 showing the discrepancy the discrepancy between PSV inferred and ^{14}C ages (after Rey *et al*. 2008, Coimbra 2007).

The results show a delayed acquisition processes which depends on the sedimentary redoxomorphic diagenesis rates which are specific of each coring site. Subsequently, and at least for marine sediments, detailed palaeomagnetic, rock-magnetic and geochemical studies are necessary to judge the validity of secular variation records to date sedimentary sequences, even when a recognisable secular variation pattern is present

Keywords: environmental magnetism, delayed remanence acquisition, North East Atlantic.

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