Geochronological value of environmagnetism in the study of late Pleistocene to Holocene near-slope marine sedimentary sequences of the NW Iberian Margin

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Abstract:

Past variations of the geomagnetic field at decadal to centennial scales are recorded with exceptional quality in lava flows, but these are discontinuous and therefore high temporal resolution analyses of paleosecular variation of the geomagnetic field (PSV) are difficult. For such purposes, marine sediments hold a better potential since they are often regarded as continuous sedimentary archives of a range of environmental processes, in particular PSV. While this assumption is generally valid for the deep oceans, it may not be necessarily true for marginal settings and the vicinity of seamounts, where discontinuous sedimentary flows (e.g. turbidites) occur with a relatively high frequency.

In this contribution, we present palaeomagnetic and magnetic properties results from two gravity cores (TG8 and TG10) obtained from the western flanks of the Galicia Bank, a structural high in the NW Iberian Margin. These cores offer a consistently continuous sedimentation record (Rey et al., 2008), since the Late Pleistocene (last 31 kyr.). The lower parts of the cores (mostly comprising MIS 2 ≈ 31,000 yr. BP and ≈ 13,500 yr. BP) are dominated by down-slope turbiditic depositional events interbedded in otherwise hemipelagic background sedimentation, and achieving sedimentation rates of 9.1 cm/kyr. In contrast, Holocene sedimentation was dominated by a mixture of pelagic, hemipelagic and along-slope depositional processes and presented considerable lower sedimentation rates (3 cm/kyr).

Contrary to what would be expected in such an episodic fast sediment rate-changing environment, PCA of AF demagnetization data showed a PSV pattern consistent with the behavior of the geomagnetic field in this region and that was correlated with nearby records from the Portuguese Margin (Thouveny et al., 2004). However, age models derived from the PSV curves were inconsistent with 14C ages, showing a

delayed and gradual post depositional remanence lock-in allowing for a continuous sedimentation-averaged record of the local geomagnetic field.

In contrast with this, the combined analysis of magnetic mineralogical data (MS, ARM, hysteresis properties, and low temperature remanence and susceptibility) made possible to refine the 14C based age model by the identification of IRDs associated to Heinrich Stadial HS1- HS4 and abrupt inter-stadial events.

The study demonstrates the geochronological value of environmental magnetism. In this case the environmagnetic identification of reference time lines in contemporary horizons from distant stratigraphic sequences constitute de basis for an age equivalence approach to dating.

Keywords: environmental magnetism, geochronology, magnetostratigraphy

References :

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