Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SEM036-02 Room:301B Time:May 26 14:30-14:45

A new PDRM lock-in model for marine sediments deduced from Be-10 and paleomagnetic records through the M-B boundary

Yusuke Suganuma[1*], Jun'ichi Okuno[1], David Heslop[2], Andrew P. Roberts[2], Toshitsugu Yamazaki[3], Yusuke Yokoyama[4]

[1]National Institute of Polar Research, [2]The Australian National University, [3]Geological Survey of Japan, [4]Atmosphere and Ocean Research Institute

Geomagnetic field intensity records from marine sediments (relative paleointensity) have contributed to a better understanding of variations in the Earth's magnetic field, and have helped to establish age models for marine sediments. However, lock-in of the geomagnetic signal below the sediment-water interface in marine sediments through acquisition of a post-depositional remanent magnetization (PDRM) adds uncertainty to the temporal synchronization of marine sedimentary records. Although quantitative models enable the assessment of the delayed remanence acquisition associated with PDRM processes, the nature of the filter function and the thickness of the PDRM lock-in zone remain topics of debate. We have performed forward numerical simulations to assess the best-fit filter function and thickness of the PDRM lock-in zone in marine sediments based on a recently published comparison of Be-10 flux and relative paleointensity records. Our simulations reveal that the rate of PDRM lock-in increases in the middle part of the lock-in zone and a Gaussian function with a 16 cm lock-in zone thickness is the most suitable for representing the PDRM lock-in process in the studied core. This explains why the PDRM lock-in is largely delayed relative to the other sedimentary records, but distortion of the geomagnetic signal is relatively small. This result also implies that the PDRM is not simply locked as a result of progressive consolidation and dewatering of marine sediments, and that the arbitrary lock-in functions (linear, cubic, and exponential) that are often used to model PDRM lock-in starting from the base of the surface mixed layer cannot explain the observed paleomagnetic signal in marine sediments.

Keywords: paleomagnetism, paleointensity, post-depositional remanent magnetization, lock-in depth, Matuyama-Brunhes boundary