Geophysical Research Abstracts
Vol. 15, EGU2013-4051, 2013
EGU General Assembly 2013
© Author(s) 2013. CC Attribution 3.0 License.

The fidelity of paleomagnetic records carried by magnetosome chains

Greig Paterson (1), Yinzhao Wang (2), and Yongxin Pan (2)

(1) Paleomagnetism and Geochronology Laboratory, Key Laboratory of Earth's Deep Interior, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 10029, China (greig.paterson@mail.iggcas.ac.cn), (2) Biogeomagnetism Group, Key Laboratory of Earth's Deep Interior, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 10029, China

Magnetotactic bacteria (MTB) and their fossilized magnetosomes are being increasingly identified in geological records from a broad range of environments and are believed to be a dominant carrier of magnetic remanence in sediments. Despite their prevalence, little is known about how well chains of biomineralized magnetic particles record the geomagnetic field. Using cultured Magnetospirillum magneticum strain AMB-1, we have conducted simple 2D (i.e. zero inclination) experiments to simulate NRM acquisition in order to assess the efficiency with which magnetosome chains align along magnetic field lines and the implications that this has for paleomagnetic records. Our results indicate that the NRM acquired by deposited MTB is near linear with the applied field, but that deviations from linearity up to 10% are discernible at high fields (120 μT). This slight non-linearity is propagated through into the calculation of both ARM and IRM normalized relative paleointensity (RPI) variations. RPI records, carried by magnetofossils, which vary by more than a factor of 5–6, are likely to misestimate the extreme values by $\sim$10–15 % due to non-linear effects. This degree of non-linearity, however, is comparable or smaller than measured from redeposition experiments using detrital material, which suggests that over the range of typical geomagnetic field strengths explored here, MTB appear to be good recorders of the paleomagnetic field. The RPI discrepancies between nearby geological records, which have been inferred to be the result of abundant biogenic magnetic minerals, are likely to be related to the mixing of biogenic and detrital magnetic components, or through chemical processes that may subsequently affect the NRM carried by fossil magnetosomes.