Geophysical Research Abstracts, Vol. 6, 04931, 2004
SRef-ID: 1607-7962/gra/EGU04-A-04931

AN EMPIRICAL SCALING LAW FOR ACQUISITION OF THERMOREMANENT MAGNETIZATION

G. Kletetschka (1,2,3), M. Acuna (1), T. Kohout (3), P. Wasilewski (1) and J. Connerney (1)

(1) GSFC/NASA, Greenbelt, MD, 20771, USA (gunther.kletetschka@gsfc.nasa.gov), (2) Catholic University of America, Dpt. of Physics, Wahington DC, 20064, USA, (3) Institute of Geology, Academy of Sciences, Prague, 16500, Czech Republic

We describe a universal linear relationship between the acquisiotion magnetic field, B, and thermoremanent magnetization Mtr(Tr) measured at room temperature Tr. The efficiency e(Tr) of a remanent magnetization (REM) is the ratio of the natural remanent magnetization Mnr(Tr) to the saturation remanence Jsr(Tr). In most fine grained magnetic material, a typical efficiency e(Tr) of thermoremanent magnetization Mtr(Tr) acquired in the geomagnetic field is about 0.01. This small efficiency is consistent with the Mtr(Tr) acquisition curves for magnetite with grain sizes covering the range from the single domain (SD) to multidomain (MD) magnetic states. However, Mtr(Tr) experiments with hematite show e >0.1. Consequently to reconcile this contrast we report a power law relationship with exponent related to Js(Tr) and unit slope indicating a simple linear relationship. Thus log e(Tr) of Mtr(Tr) in equidimensional-shaped magnetic minerals of contrasting saturation magnetization Js(Tr) plots linearly with the logarithm of the applied magnetic field B along separate grain-size-independent straight lines with nearly unit slope and offsets related to Js(Tr). This empirical relationship is well suited for paleofield-intensity estimation, predicts strong magnetization of hematite and pyrrhotite in weak fields, and can be used as an assessment tool for observed remanence in planetary and meteoritic objects.