Geophysical Research Abstracts
Vol. 14, EGU2012-7209, 2012
EGU General Assembly 2012

Multiple-specimen absolute paleointensity determination with the MSP-DSC protocol: Advantages and drawbacks.

P. Camps (1), G. Fanjat (1), T. Poidras (1), C. Carvallo (2), and P. Nicol (1)

(1) Géosciences Montpellier, CNRS and Université Montpellier 2, Montpellier, France (camps@gm.univ-montp2.fr), (2) IMPMC, Université Pierre et Marie Curie, Campus Jussieu, Paris, France.

The MSP-DSC protocol (Dekkers & Bohnel, 2006, EPSL; Fabian & Leonhardt, 2010, EPSL) is a recent development in the methodology for documenting the intensity of the ancient Earth magnetic field. Applicable both on rocks or archaeological artifacts it allows us to use samples that until now were not measured because their magnetic properties do not meet selection criteria required by conventional methods. However, this new experimental protocol requires that samples be heated and cooled under a field parallel to its natural remanent magnetization (NRM). Currently, standard paleointensity furnaces do not match precisely this constraint. Yet, such new measurement protocol seems very promising since it would possibly double the number of available data.

We are developing in Montpellier (France), a very fast-heating oven with infrared dedicated to this protocol. Two key points determine its characteristics. The first is to heat uniformly a rock sample of a 10-cc-standard volume as fast as possible. The second is to apply to the sample during the heating (and the cooling) a precise magnetic induction field, perfectly controlled in 3D. We tested and calibrated a preliminary version of this oven along with the MSP-DSC protocol with 3 historical lava flows, 2 from Reunion Island (erupted in 2002 and 2007) and one from Etna (erupted in 1983). These lava flows were selected because they have different magnetic behaviors. Reunion 2002 is rather SD-PSD-like, while Reunion 2007 is PSD-MD-like, and Etna 1983 is MD-like. The paleointensity determinations obtained with the original protocol of Dekkers and Bohnel (2006, EPSL) are within +- 1 μT of the known field for the three lava flows. The same precision is obtained when we applied the fraction correction (MSP-FC protocol). However, we systematically observed a loss in the linearity of the MSP-FC plots. In addition, like Muxworthy and Taylor (2011, GJI), we found that the Domain State Correction is difficult to apply since alpha = 0 is always found whatever we use an ordinary least square regression or a robust regression. We will present and discuss in this talk some modifications of the MSP-DSC protocol which are currently tested in our laboratory.