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Archaeomagnetic and rock magnetic study of six kilns from North Africa (Tunisia and Morocco)

M. Gomez-Paccard (1), G. McIntosh (2,3), E. Beamud (4), A. Chauvin (5), F. J. Pavon-Carrasco (3), and J. Thiriot (6)

(1) Institute of Earth Sciences Jaume Almera (CSIC), Barcelona, Spain (mgomezpaccard@ictja.csic.es), (2) Instituto de Geociencias (UCM-CSIC), Facultad de Ciencias Físicas, Universidad Complutense de Madrid, Avda Complutense s/n, 28040 Madrid, Spain, (3) Departamento de Física de la Tierra, Astronomía y Astrofísica I (Geofísica y Meteorología), Facultad de Ciencias Físicas, Universidad Complutense de Madrid, Avda Complutense s/n, 28040 Madrid, Spain, (4) Grup de Geodinàmica i Anàlisi de Conques (GGAC), GEOMODELS Research Institute, Laboratori de Paleomagnetisme CCiTUB-CSIC, Institut de Ciències de la Terra Jaume Almera, CSIC, Solé i Sabarís s/n, 08028 Barcelona, Spain, (5) Géosciences-Rennes, CNRS, UMR 6118, Université de Rennes 1, Campus de Beaulieu, 35042 Rennes, Cedex, France, (6) Laboratoire d′archéologie médiévale méditerranéenne, UMR 6572, Maison méditerranéenne de Sciences de l′Homme, CNRS, 13094 Aix-en-Provence, France

New full-vector archaeomagnetic data for North Africa recovered from the study of six kilns, five from Tunisia and one from Morocco, are presented. Archaeological and historical considerations, along with three radiocarbon dates, indicate that the age of the kilns ranges between the 9th and 15th centuries AD. Rock magnetic analyses showed that the principal magnetic carriers are magnetite and low Ti titanomagnetite, along with variable contributions of thermally stable maghemite and a high coercivity phase with low unblocking temperatures. The magnetic mineralogy of the studied material is thermally stable and behaves ideally during archaeointensity experiments. Stepwise alternating field demagnetisation isolated a single, stable, characteristic remanence component with very well defined directions at both specimen and structure levels. Mean archaeointensities have been obtained from successful classical Thellier experiments conducted on between five and eight independent samples per kiln. Thermoremanent magnetisation (TRM) anisotropy and cooling rate effects upon TRM intensity have been investigated. The results showed that these effects are low for four of the six studied kilns, with differences between the uncorrected and corrected means of less than 3%. For the other two structures differences between the uncorrected and corrected mean site intensities are 4.4% and 5.8%. These results highlight the necessity for TRM anisotropy and cooling rate corrections in archaeomagnetic studies if accurate archaeointensities are to be obtained. The new results suggest that high intensities occurred in Northwest Africa during the 9th century. Although more data are clearly needed in order to define this period of high intensity, the results are in agreement with the available European archaeointensity data. A comparison between the new data, other available archaeomagnetic determinations in nearby locations, and palaeosecular variation (PSV) curves derived from the regional SCHA.DIF.3k and global ARCH3K.1 geomagnetic field models shows good agreement between the new data and directional results derived from the models. However, some differences are observed between geomagnetic field models intensity results and available archaeointensity data for the studied regions. This highlights the need for new data for unexplored regions such as North Africa. The new data presented here better constrains the evolution of the geomagnetic field during historical times in this region. They represent a new step towards the construction of a reference PSV curve for Northwest Africa. Once established, this curve will represent a new dating method for this region.