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Geomagnetic Secular Variation in the Eastern Mediterranean: First directional data from Cyprus

Evdokia Tema (1), Ian Hedley (2), Walter Fasnacht (3), and Christina Peege (3)

(1) Dipartimento di Scienze della Terra, Università degli Studi di Torino, Torino, Italy, (2) Mineralogy Department, Section of Earth and Environmental Sciences, Université de Genève, Genève, Switzerland, (3) Institute of Archaeology, Department of Prehistoric Archaeology, University of Zurich, Zurich, Switzerland

The island of Cyprus, lying in the eastern Mediterranean, has a very long and rich archaeological heritage, with the earliest known human occupation dating to around the 10th millennium BC. This very important archaeological past together with its strategic geographical position, make Cyprus a potentially unique source of information about the past geomagnetic field variations for a large area that is still very poorly covered by archaeomagnetic data. To our knowledge, no directional results are available from in situ archaeological structures in Cyprus for the last 3000 years (Geomagia database) whilst directional data from nearby Turkey and Syria are very scarce. We present here the first directional results from Cyprus, based on the study of seven baked clay structures excavated at the copper smelting site of Agia Varvara- Almyras, situated some 20 km south of Nicosia. This ancient copper working site represents the only complete chain of primary production of the copper metal in Cyprus. In total five furnaces, one ore roasting pit and an oven were sampled in situ for an archaeomagnetic investigation. All the studied structures are well dated, based on pottery finds and radiocarbon dates, with ages ranging from 600 BC to 50 BC. Several rock magnetic experiments were performed on the studied baked clays in order to determine their main magnetic carrier and also to investigate their thermal stability. To determine the Characteristic Remanent Magnetization (ChRM) direction for each structure, between 7 to 15 independently oriented samples have been stepwise demagnetized in alternating magnetic fields up to 100-120 mT. Mean directions were calculated assuming a Fisherian distribution and are well defined for five out of the seven structures studied. The new directions are compared with the few directional data available for the area, mainly coming from Crete, and with the predictions of global geomagnetic field models. They are an important contribution to improving our knowledge of the geomagnetic field variations in the eastern Mediterranean, and emphasize the need for more directional data from well dated structures in order to acquire a better understanding of short-term variations of the geomagnetic field in this region.