

Dating of ancient baked clays: A combined archaeomagnetic and thermoluminescence analysis applied to a brick workshop at Kato Achaia, Greece.

Evdokia Tema^{1,2}, Giorgos Polymeris³, Juan Morales⁴, Avto Goguitchaichvili⁴, Vassiliki Tsaknaki⁵

¹ Dipartimento di Scienze della Terra, Università degli Studi di Torino, Italy

² ALP-Alpine Laboratory of Palaeomagnetism, Italy

³ Institute of Nuclear Sciences, Ankara University, Italy

⁴ LIMNA, Instituto de Geofísica, UNAM, Campus Morelia, Mexico

⁵ 6th Ephorate of Prehistoric and Classical Antiquities, Patra, Greece

Corresponding author: evdokia.tema@unito.it

Abstract: We present here the results of a detailed archaeomagnetic and thermoluminescence investigation of two ancient kilns excavated at Kato Achaia, Greece. Magnetic mineralogy measurements have been carried out to determine the main magnetic carrier of the samples and to check their thermal stability. The directions of the characteristic remanent magnetization of each structure have been obtained from standard thermal demagnetization procedures and the absolute archaeointensity has been determined with the Thellier (Thellier and Thellier, 1959) modified by Coe (Coe, 1967; Coe et al., 1978) method, accompanied by regular partial thermoremanent magnetization (pTRM) checks. The full geomagnetic field vector was used for the archaeomagnetic dating of the two kilns, after comparison with the reference secular variation curves calculated directly at the site of Kato Achaia. Independent dating has also been obtained from thermoluminescence (TL) analysis of four samples from each kiln. The dating results obtained from the two methods have been compared and the last firing of each kiln has been estimated from the combination of the two techniques. Using the independent date offered by TL dating, the new archaeomagnetic data have been compared with other data from the same time period and they can further be used as reference points to enrich our knowledge about the past secular variation of the Earth's magnetic field in Greece.

Keywords: Dating; Archaeomagnetism; Thermoluminescence; Baked clay; Secular variation

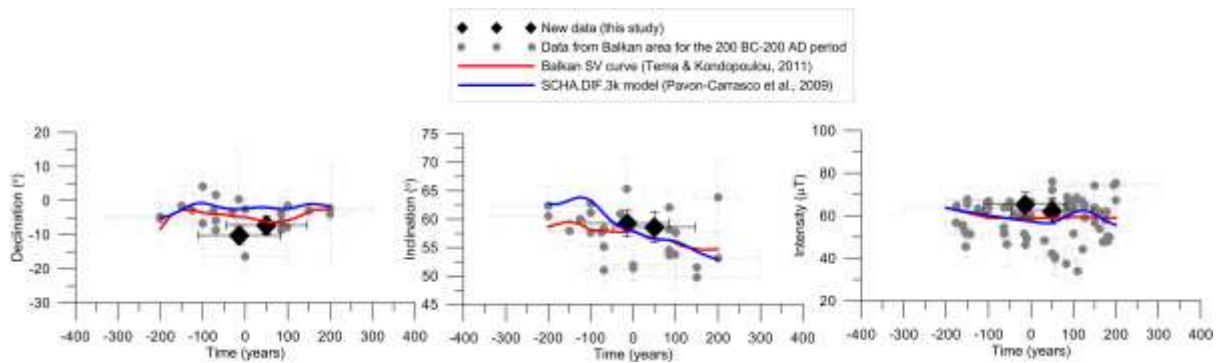


Figure 1: The new declination, inclination and intensity data obtained in this study plotted together with literature data from the Balkan area for the 200 BC-200 AD period and the Balkan (red line) and SCHA.DIF.3k (blue line) SV curves.

References :

- Coe, R. S., 1967. Paleo-intensities of the Earth's magnetic field determined from Tertiary and Quaternary rocks. *J. Geophys. Res.*, 72 (12), 3247-3262.
- Coe, R. S., Grommé, S., Mankinen, E. A., 1978. Geomagnetic paleointensities from radiocarbon-dated lava flows on Hawaii and the question of the Pacific nondipole low. *J. Geophys. Res.*, 83 (B4), 1740-1756.
- Pavón-Carrasco, F. J., Osete, M.L., Torta, J. M., Gaya-Piqué, L. R., 2009. A regional archaeomagnetic model for Europe for the last 3000 years, SCHA.DIF.3K: applications to archaeomagnetic dating. *Geochem. Geophys. Geosyst.*, 10 (3), Q03013, doi:10.1029/2008GC002244.
- Tema, E., Kondopoulou, D., 2011. Secular variation of the Earth's magnetic field in the Balkan region during the last eight millennia based on archaeomagnetic data. *Geophysical Journal International*, 186, 2, 603-614, doi: 10.1111/j.1365-246X.2011.05088.x
- Thellier, E., Thellier, O., 1959. Sur l'intensité du champ magnétique terrestre dans le passé historique et géologique, *Ann. Geophys.*, 15, 285-376.