



Full-vector archeomagnetic and rock-magnetic results from Portuguese kilns

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Despite the increase in archeomagnetic studies in the past few years, the number of reliable archeointensity data is still limited. At present Europe is the most widely covered region, although the variation in geomagnetic field intensity is not completely known for the last millennia and the occurrence and behaviour of various rapid geomagnetic field changes is under discussion. In this context, new high-reliable full-geomagnetic field vector determinations from unexplored regions are crucial in order to improve our knowledge of past geomagnetic field changes at regional scales. In Portugal, despite the rich cultural heritage and the abundance of archaeological excavations, archeomagnetic research is still in its infancy. To our knowledge, up to now the only available directional data obtained from more or less well-dated materials come from the study of a Late Bronze Age vitrified wall close to the city of Serpa, southern Portugal, while only two more studies have been published including archeointensity results from Portuguese pottery. We present here the first full-vector archeomagnetic results (declination, inclination and intensity) from two kilns excavated at two archaeological sites at Lisboa (Portugal). The first structure corresponds to the Largo das Alcaçarias Islamic pottery production workshop located in the eastern suburb Luxbona (current Alfama) and its abandonment has been dated as the 12th century AD. The second kiln was excavated in the Encosta Santana archeological medieval site and was abandoned during the 12th or 13th centuries AD according to archeological evidence. Detailed archeomagnetic and rock magnetic studies have been carried out in order to determine the magnetic mineralogy and investigate the thermal stability of the phases carrying the archeomagnetic signal. Both kilns exhibited thermally stability magnetic phases. The magnetic properties of the Largo kiln are dominated by a mixture of magnetite/cation-substituted magnetite and cation-substituted hematite. Those of the Encosta kiln are dominated by magnetite with limited cation substitution, with hysteresis ratios falling close to the single domain – multidomain unmixing curve of Dunlop. The new archeomagnetic and rock-magnetic data are based on the study of several samples per kiln and the archeointensity determinations were obtained using the Thellier classical method with regular partial thermoremanent magnetization (pTRM) checks and TRM anisotropy and cooling rate corrections. From the laboratory experiments, two new high quality mean intensities are now available for Portugal. The new data are the first full-vector results from Portuguese kilns. They significantly contribute to better understand the secular variation of the Earth's magnetic field in western Europe during the 12-13th centuries AD and can be used as reliable input data for geomagnetic field modelling.