

Comparison of archaeomagnetic and ^{14}C datings of fireplaces discovered in a cremation necropolis of funerary urns in Belgium

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Abstract: Geomagnetic field data obtained from independently dated burnt and baked archaeological structures are strongly needed to improve archaeomagnetic secular variation (ASV) curves used for field modelling and archaeomagnetic dating. A difficulty encountered, is an increasing shift from beforehand programmed and planned excavations towards rescue or preventive excavations trusted more and more by organisations dedicated to the study and conservation of our cultural heritage to private companies. Due to the project Trilogiport, or the construction of a container harbour, in the alluvial plain of the Meuse river in Belgium, a systematic preventive excavation resulted in the discovery of 17 fireplaces (in reality ovens) in a vast cremation necropolis of “funerary urns” in Hermalle-sous-Argenteau (Province: Liège). All the fireplaces had an elliptic shape without a pedestal or raised oven floor and similar dimensions. Because of the absence of objects and artefacts in the fireplaces and the absence of other constructions, their function and the chronological relation with the necropolis are unknown. This discovery was an excellent opportunity for an archaeomagnetic investigation and dating by the archaeomagnetic method in order to establish a chronology of the fireplaces and eventual chronological relation with the necropolis.

The archaeomagnetic investigation of six ovens yielded besides some outliers, in general very coherent remanent magnetisation directions at the specimen level, with high concentration parameters K “greater than 1000” for the kilns and reliable mean kiln directions with an angle of confidence α_{95} less than 0.9° . Outliers could be attributed to mechanical disturbance caused by bioturbation and dessication cracks. The maximum angular deviation between the kiln mean directions is less than 1.6° , suggesting that the last heating-cooling cycle of the kilns is probably very limited in time.

The archaeomagnetic dating of the ovens based only on directional data and referring to the master curves of the secular variation of the direction of the geomagnetic field during the last 3 ka for France (Gallet et al. 2002) and applying RENDATE software (Lanos et al. 2005) led to three possible age intervals with 95% confidence due to field

recurrence, but suggesting that the last heating-cooling cycle of the ovens may have occurred in the Merovingian-Carolingian period. This was confirmed by six ^{14}C datings on charcoal collected in three kilns. In this case, there is a good agreement between the archaeomagnetic dating and ^{14}C dating. Both methods applied to the ovens and the study of the funerary urns indicate that there is probably no temporal relationship between the ovens and the necropolis. This investigation enabled us to compare both dating techniques and to examine their constraints and accuracies for the period involved. The archaeomagnetic results of this site may hence be considered as reference data for the Early Middle ages for which archaeomagnetic data is still limited in Western Europe.

Keywords: archaeomagnetism, archaeomagnetic dating, ^{14}C dating, Early Middle Age, Fireplaces.

References :

Gallet Y., Genevey A. and Le Goff M., 2002. Three millennia of directional variations of the Earth's magnetic field in western Europe as revealed by archaeological artefacts. *Phys. Earth Planet. Inter.*, **131**, 81-89, doi:10.1016/S0031-9201(02)00030-4.

Lanos Ph., Le Goff M., Kovacheva M. and Schnepf E., 2005. Hierarchical modelling of archaeomagnetic data and curve estimation by moving average technique. *Geophys. J. Int.*, **160** (2), 440-476.