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Ancient Monuments Laboratory
Report 202/88

ARCHAEOMAGNETIC DATING, GROVEHILL, BEVERLEY MEDIEVAL TILE KILNS.

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Summary

Archaeomagnetic measurements on four medieval tile kilns at Grovehill, Beverley, gave a mean date for the final firing of cal AD 1220 - 1260 at the 68% confidence level.

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ARCHAEOMAGNETIC DATING : GROVEHILL, BEVERLEY

Medieval tile kilns

Excavator: Archaeology Unit, Humberside County Architect's Department

Sampled 17 December 1986

INTRODUCTION

This group of kilns was excavated during the development of an area on the eastern outskirts of Beverley as an industrial estate.

The kilns were fairly large rectangular structures built from tiles. Each had a central spine wall between twin flues, but all superstructures had disappeared, leaving only the lowest foundation courses. There were some indications of subsidence due to the physical instability of the clay natural. Samples were taken by the disc method (see notes) from the most stable looking parts of four kilns, usually the spine wall. All samples were taken from the faces of the walls forming the inner surfaces of the flues, to ensure that there should be no doubt that the thermoremanent magnetisation was due to the firing of the kiln, and that the samples would be of material that had cooled early relative to other parts, and therefore should have been least affected by magnetic distortion. Orientation was by gyro theodolite. Most of the magnetometer measurements were made by the Archaeometry Section of the Ancient Monuments laboratory.

The following sample groups were taken:

Area 1, Kiln 7. 5 Samples from the central spine.

Area 3, Kiln 8. 6 samples from the back wall, 3 from side walls. The central spine was too disturbed for sampling.

Area 5, Kiln 89. 12 samples from the central spine.

Area 6, Kiln 57. 4 samples from central spine. Not much of this kiln was available.

RESULTS

The results from Kiln 89 showed too steep an inclination for the medieval period, and a wide spread of declination, suggesting considerable subsidence. Thus this sample group, which was the largest, unfortunately had to be rejected.

The remaining three sample sets all indicated thirteenth century dates, but it was thought unrealistic to try to give them individual dates because of the likelihood of minor subsidence. They were therefore combined. AF demagnetisation tests showed that the material was very stably magnetised, and the dating was therefore based on the original NRM measurements without further treatment, weighted to compensate for the small numbers of

samples from Kilns 8 and 57.

Measurement ref. **AJC-20**

Based on 18 samples

Dec = 13.6°E; Inc = 59.3°; alpha-95 = 2.1°

Date: cal AD 1220 - 1260 at the 68% confidence level

cal AD 1200 - 1275 at the 95% confidence level

Note: It does not seem possible to reconcile this result with the fourteenth century date deduced from the archaeological evidence in the preliminary report on the site by the Archaeology Unit. There is a substantial difference of 10-20° in declination between fourteenth century directions and the archaeomagnetic direction obtained, so that the likelihood of confusion is small.

NOTES

1. If it is used in the site report, all parts of this report printed in heavy type should be quoted as a minimum. In addition to the date and reference number, it is important that the basic measurement figures should be readily accessible to those with a technical interest; and it is also desirable to include as much as possible of the associated discussion. Fuller data will be published in consolidated lists elsewhere.

2. Dec refers to the declination, or bearing relative to true north, of the mean remanent magnetic field of the samples, and Inc is the angle of inclination or dip of this field. Alpha-95 is a measure of the precision of the determination: the smaller its value the better. Dates are prefixed by 'cal', for consistency with the internationally agreed convention for calibrated radiocarbon dates.

3. Dates are normally given at approximately the 68% confidence level, making allowance for the quality of the measurement and the estimated reliability of the calibration curve, as at present known, for the period in question. Due to crossovers and contiguities in the curve, alternative dates may be given. It may be possible to choose the correct alternative by reference to any archaeological, radiocarbon or thermoluminescence data that are available. References for calibration curves:

Clark, A. J., Tarling, D. H. and Noël M., 1988. Developments in archaeomagnetic dating in Britain. Journal of Archaeological Science 15, 645-667. [1000 cal BC - present].

Turner, G. M. and Thompson, R., 1982. Detransformation of the British geomagnetic secular variation record for Holocene times. Geophysical Journal of the Royal Astronomical Society 70, 789-792. [10000 - 1000 cal BC].

4. As the thermoremanent effect is reset at each heating, all dates for fired material refer to the final heating.

5. Sampling methods: Hard materials, typically fired clay, are sampled by the disc method. A number of small levelled plastic discs are glued to the feature, marked with an orientation line related to true north, and then removed with a small piece of the material attached. Soft materials, typically silts, are sampled by the tube method. small pillars of the material are carved out from a prepared platform, and encapsulated in levelled plastic tubes by means of plaster of Paris, the orientation lines being marked on the top of the plaster. Alternatively, the tubes can be pushed directly into softer silts. Measurements are made in a Molspin spinner magnetometer, with partial demagnetisation in an alternating field (AF) to remove viscous magnetic components if necessary. This is measured in millitesla, and any figures quoted are the peak value of the treatment.

6. Comments from excavators on the archaeological acceptability etc of results would be welcomed.