4_2_1_Geophysical_prospection_(Duncan_Hale)

Introduction

The overall geomagnetic survey comprised 42 separate surveys covering approximately 286 hectares. The vast majority of anomalies detected relate to burnt, partly burnt or unburnt structures and associated soil-filled pits. Over 1,350 structures, almost all assumed to be dwelling houses, were identified within an outer enclosure ditch measuring 5.9km in circumference, enclosing an area of 238ha; the scant remains of a further 200 probable buildings were also identified.

Data collection

Measurements of vertical geomagnetic field gradient were determined using Bartington Grad 601-2 dual sensor fluxgate gradiometers. Each sensor contains two fluxgate magnetometers with 1m vertical separation. The instruments were set up with a linear range of 100nT and an effective resolution of 0.03nT.

A zig-zag traverse scheme was employed and data were logged in 30m grid units. The sample interval was 0.25m and the traverse interval was 1m, thus providing 3,600 sample measurements per 30m grid. Approximately 3,600 grids were surveyed at Nebelivka, providing almost 13 million geomagnetic data points.

All data were downloaded on site onto laptop computers for verification, initial processing and storage, backed-up on external hard drives and subsequently transferred to a desktop computer for processing, interpretation and archiving. The complete data archive is held at Durham University.

Data processing

Geoplot v.3 software was used to process the geophysical data and to produce continuous tone greyscale images (ADS LINK TO 4_2_2_PLANS/4_2_2_1_Greyscale_plan). The basic processing functions applied to the geomagnetic data typically included clip, zero mean traverse, de-stagger and interpolate (typically to 0.25m x 0.25m intervals).

The principal data processing issue was the suppression of the strong magnetic signal from the underlying Ukrainian 'granite shield'. This was achieved by the application of a high pass

filter with Gaussian weighting, which preserved high-frequency, small-scale spatial detail whilst suppressing the low-frequency large-scale detail.

Notes on structural features (ADS LINK TO 4_2_2_PLANS/4_2_2_2_Interpretation**)**
There are two types of rectilinear geophysical anomaly that have been interpreted as 'houses': intense anomalies (e. g., -30 to +80nT), considered to be burnt houses, and weak anomalies (e. g., +1 to +6nT), considered to be unburnt houses. A third category comprises anomalies which are considered likely to reflect houses, but which are amorphous to varying degrees, and either weak or strong or a combination of both. What anomalies in this category have in common is that they reflect discrete magnetic variation at locations on 'streets' where other houses are better defined and where additional houses might be expected.

Using criteria of size, orientation of anomaly, strength of anomaly and location, none of the geomagnetic anomalies at Nebelivka is entirely consistent with what would be expected of a kiln anomaly. However, several possible small fired structures might be present in the data. These anomalies do not appear to be surrounded by ferrous/fired debris, as might be expected of a kiln, and could possibly reflect large or small ovens or hearths.