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Geophysical survey or archaeological prospection? A plea for archaeological feedback

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CONCEPT OF FEEDBACK

The feedback between geophysical prospection and archaeology works both ways. On the one hand, feedback from an archaeologist may change the layout or instrumentation of a survey or modify the interpretation regarding developing archaeological questions. On the other hand, feedback from a geophysicist can lead to modified excavation strategies or to new archaeological insight deriving from seeing the archaeological results in a geophysical context (Benech 2003). Thus, a successful collaboration between geophysicists and archaeologists stems from a feedback circuit that goes both ways. It could lead to a better understanding of archaeological and geophysical inputs and an improved interpretation of archaeological structures.

DIRECT AND INDIRECT FEEDBACK

"Direct" feedback is when geophysical data and excavation results are compared. This can be done on-site with geophysics helping to excavate features that might otherwise go undetected (Fröhlich *et al*. 2003), by a detailed examination of single features (Leckebusch and Rychener 2004) and by comparing geophysical anomalies and archaeological features on a larger scale (Buthmann *et al.* 2012); finally, by a systematic study evaluating more than a hundred sites surveyed and excavated (Bonsall *et al*. 2013). These case studies compare the physical properties (matter, size, depth) of a geophysical anomaly and the corresponding archaeological feature on different scales and levels of abstraction.

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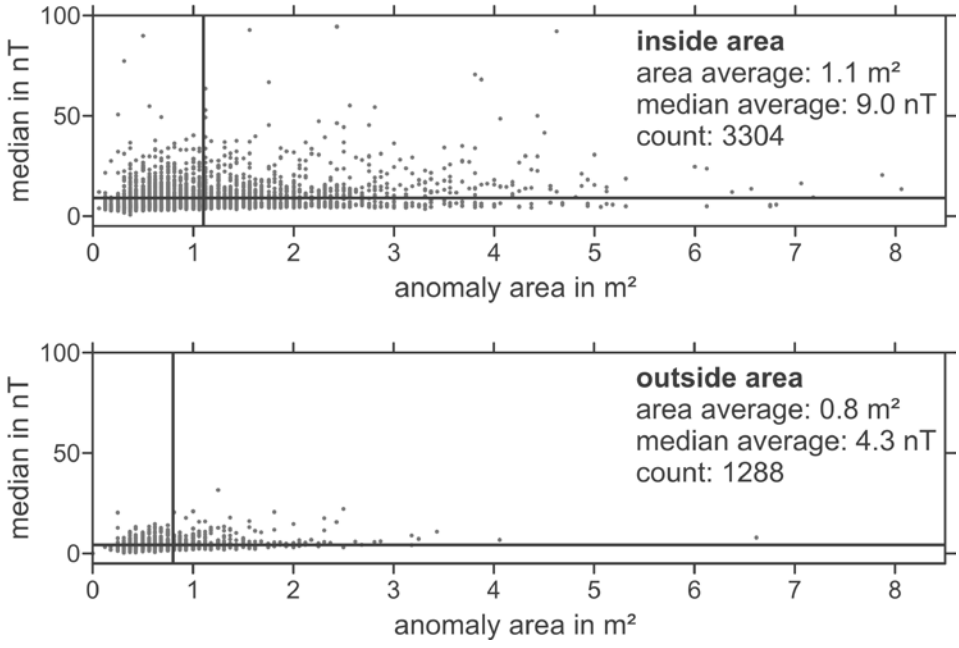

Fig. 1. Haithabu (Busdorf, Schleswig-Flensburg), magnetometer survey in 2002; distribution of two anomaly properties in two areas: inside and outside the rampart

"Indirect" feedback addresses survey strategies and the method and scope of the interpretation. In these projects survey results and excavation of different sites are used concurrently for research and for heritage purposes (Olivier and Kovacik 2007; Kastler 2015). In these projects, the focus is not on the single feature revealed by geophysics, but on larger-scale structures and patterns.

INTERPRETATION

These projects are a starting point for a discussion of how the quality of geophysical data interpretation influences the archaeological potential of geophysical surveys. Therefore, the interpretation of survey data should be the main field for archaeological feedback. But interpretation today is seldom comprehensible especially if it is nor clear how to move from a geophysical anomaly to an archaeological feature. Moreover, there is no commonly accepted methodology of interpretation that one could refer to.

The main factor in the archaeological interpretation of geophysical data is the categorization of anomalies. The first step is to classify anomalies by their physical characteristics, shape, size and spatial reference to other anomalies. This classification will be comprehensible, only if it is documented explicitly, that is, the constituent attributes for each category are named and described. In a second step, the resulting anomaly categories have to be translated into

archaeological categories (Buthmann 2015: 297–298). On one hand, it is a process of aggregation, from single measurement values to categorized anomaly, and on the other hand, a process of deconstruction, from one archaeological site to a large number of feature categories.

There are already some examples of this kind of intensive interpretation, but the discussion of the issue is at an early stage (Verdonck 2013).

INTERPRETATION EXAMPLE

One specific part of the interpretation of a magnetometer survey of the Viking-age emporium of Haithabu (Hilberg 2007) will serve as a starting point for the present discussion. Several areas inside and outside the rampart had been prospected. A high density of anomalies occurred in two directly adjoining areas, separated by the rampart wall. To answer the question of whether both areas were occupied in the same way, the magnetometer data for all interpreted features were examined. The values of size and median of all measured points inside each anomaly were plotted together with their average (Fig. 1). The statistical distribution demonstrated that the anomalies outside the rampart had a smaller statistic spread and were weaker and smaller than the anomalies inside the rampart. This was one argument for classifying the outside anomalies as being of geological/pedological origin.

PROPOSAL FOR A RESEARCH PROGRAM

Following from this rather simple example, one may propose a more sophisticated approach to a comprehensible and reliable categorization and transformation and, thereby, interpretation. To arrive at a better understanding of the anomaly-to-feature transition, the categories on both sides should be examined in depth. Each anomaly category should be described statistically, as suggested above. The excavated features have to be classified by the documented properties and their archaeological interpretation. These two sets of classes can then be compared. Where do they differ and where are they similar? Is it possible to create a more detailed classification of the anomalies, with a more precise archaeological interpretation or a more differentiated interpretation of the features by the detected geophysical properties? A corresponding pedological research program seems to be necessary. Excavations targeted specifically on the understanding of geophysical anomalies as well as on specific archaeological features could be very helpful in this respect.

Applied on a broad scale, this approach might lead to a better understanding of the constituent elements of particular categories and how their function and history is reflected in the geophysical data.

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