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# Space, Time, Place

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# Archaeology and landscape features in magnetometer data

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## Abstract

While magnetometry is well accepted for detecting archaeological features it also allows to map details of the natural environment of the site. These structures can be integrated as elements of the landscape. Additionally to research at the sites archaeologists are interested in the criteria people have decided to settle in a certain landscape. The subject is mainly pictured by the case study of a site in Lower Saxony (Hünenburg, Gevensleben-Watenstedt), consisting of a hillfort and an unfortified large scale settlement during Bronze Age. Magnetometer survey has enlarged the known extension of the unfortified settlement from a small spot of surface findings up to about 15 hectares as minimum, a multiple of the size of the hillfort. Furthermore it presents its features extraordinarily well preserved due to the existence of remainders of a medieval agricultural systems. Furthermore a system of silt up creeks was revealed by magnetometry. The natural system of drainage is supposed to have had a certain impact on the decision of man where to place settlements and how to use the landscape. In detecting ancient landscape features as well as the extension of the prehistoric settlement magnetometry changed the archaeologists' perspective from site to landscape while researching the large-scale site.

**Keywords** archaeological feedback, magnetometry, landscape archaeology, neolithic, bronze age, iron age.

Geophysics, especially magnetometry, right now has become famous for detecting archeological features and mapping entire archaeological sites (Gaffney 2008). It allows to map pits, fortifications, buildings, post holes, graves etc. without excavation i. e. destruction. Nevertheless, since magnetometry plots any type of magnetic anomalies including modern disturbances and natural e. g. geological structures, it also maps the natural environment of the site. Geophysics allow to detect features concerning the history of the landscape generally (Kvamme 2003). On the one hand human beings always have shaped the landscape they lived in and their decision to settle in a certain place depended on special landscape features also. On the other hand today's face of the natural environment in fact is highly artificially shaped or has changed due to natural processes. Recently within landscape archaeology researchers are not interested in the sites merely but also in why and how people have settled in a certain landscape (Schade 2000). The paper at hand aims to picture that recent geophysical surveys have detected archaeological features of sites and also features of the landscape the site is placed in: silt up ancient streams, areas of erosion and accumulation, former systems of cultivation of soils etc. Archaeological interpretation of the geophysical data and its integration into the results of other disciplines changes the archaeologist's point of view as well as the research strategy (Meyer 2007). Also within the framework of landscape archaeology geophysics does not detect archaeological features merely but also elements of the natural setting inbetween settlements. While geophysics maps structures buried underneath invisible to modern men but which were part of the ancient landscape which prehistoric men found for placing his settlements, an assessment of the initial landscape can be gained and conclusions concerning the criteria for placing a settlement can be found (e. g. water

supply, situation of functional areas (areas of agriculture, metallurgical areas, limitations of the settlements).

This subject is pictured by the case study of a site in Lower Saxony, Germany, called "Hünenburg" (Gevensleben-Watenstedt) which is well known as a hillfort fencing in an area of about 2,5 ha defined by a rampart as well as steep slopes. Right now the site is investigated in the course of a research project by the University of Göttingen financed by the Deutsche Forschungsgemeinschaft. The *Hünenburg* has been settled on from Neolithic until Early medieval periods (Heske 2000, 2003). It is situated on a spur of a high ridge ranging up to 100 m above its surroundings including the large low-lying areas of the *Großes Bruch* to the south. In its beginning research at the *Hünenburg* focused on the hillfort with its rampart and fenced in settlement areas. Its environs bear further sites comprising graves, deposits and areas of else surface findings. Especially the latter were found at the southern slope of the hillfort but were not seen as a remnant of a separate settlement outside the ramparts. They were interpreted as the product of erosion of the hillfort down its steep slopes.

In 2001 a magnetometer survey was initialized to prove whether the surface findings from the southern slope of the hillfort are produced by a contemporary settlement outside the ramparts instead (Posselt 2001). An answer to this question would allow conclusions concerning the function and place in the hierarchy of the settlement system throughout the surrounding landscape. Finally the initial magnetometer surveys as well as further campaigns until 2008 were successful in detecting an extensive coherent settlement area to the south and west of the *Hünenburg*. Until now an area of about 18 hectares is surveyed (Figure 1).

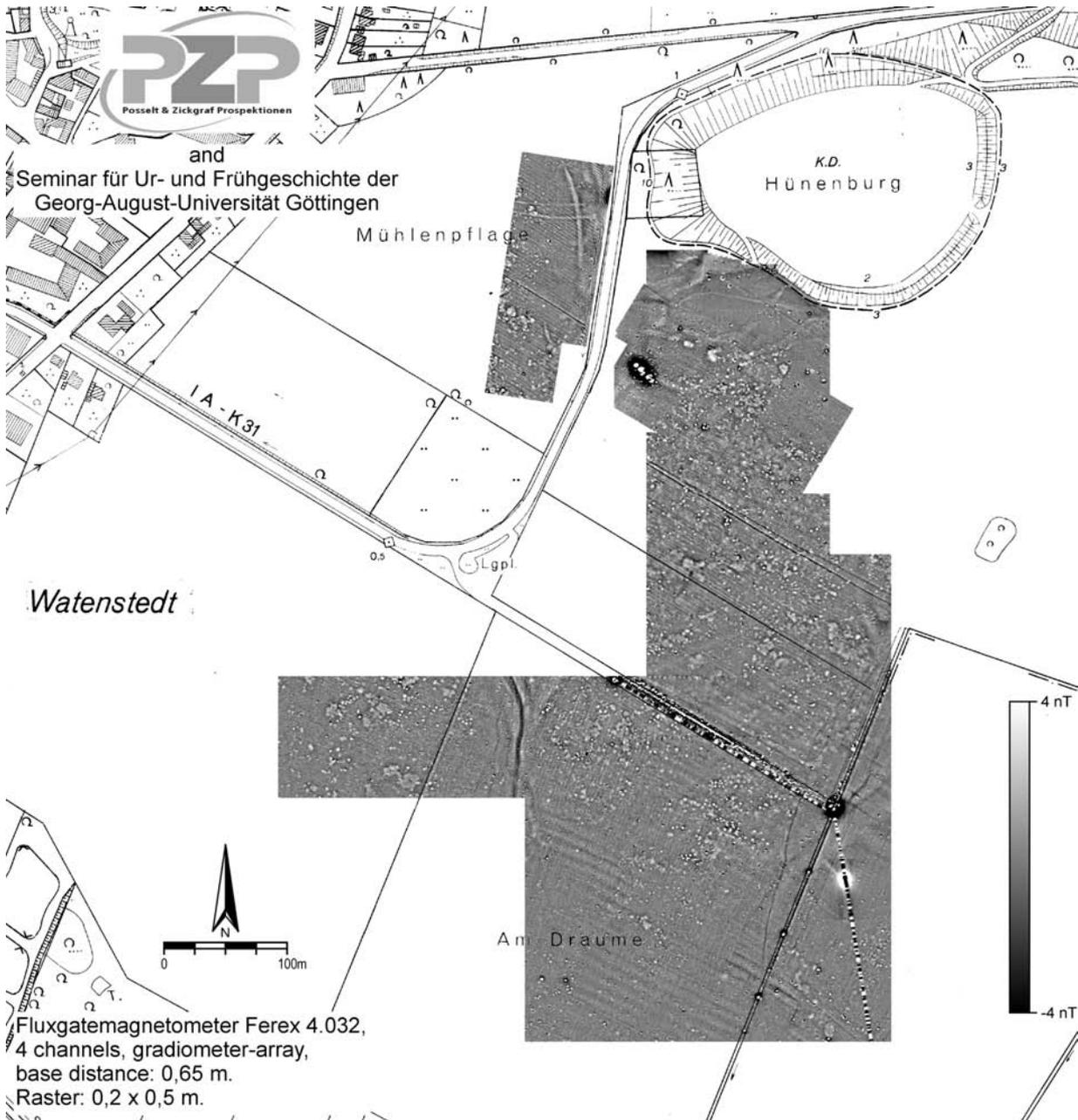


Fig. 1. Gevensleben-Watenstedt. Hillfort and settlement “Hünenburg”. Total magnetogram from the settlement south of the hillfort. State: September 2008 (map courtesy of PZP/Seminar für Ur- und Frühgeschichte Göttingen).

The survey was done using a four channel Fluxgate-magnetometer (Förster Ferex). The archaeological features extend throughout almost the whole investigation area. According to magnetogramm the settlement seems to continue to the west and to the south. Yet it is not proven of what age the sections of the settlement are. The detailed small scale excavations (fig. 2) yet undertaken have gained some information about character and age of the features.

Beside numerous small features (waste pits etc.) the magnetogram (Figure 3) shows large anomalies, which usually would be interpreted as geological patterns. But excavations have proven, that such anomalies are produced by cultural layers below the topsoil of some decimetres in thickness covering further small features (Heske et al. 2009). Some of these cultural layers extend up to hectares in size. Excavations could identify the numerous small features as the usual waste pits, storage pits, post holes etc. Unusually also graves were found within the settlement area.



Fig. 2. Gevensleben-Watenstedt. Hillfort and settlement “Hünenburg”. Airphoto summer 2008, from west (photo courtesy of Andreas Gruetemann).

Furthermore in the places of high magnetic amplitudes conglomerations of stones have been found, which then could be interpreted as hearths or ovens (Heske 2002, 2007). Several groups of these ovens can be identified throughout the ca. 18 ha magnetogram.

On the one hand the site presents its features extraordinarily well preserved. On the other hand the huge size of the settlement area has remained unrecognized for long time. The reason therefore could be, that a medieval agricultural systems (*Wolbäcker*), also detected by magnetometry as broad weak lineaments, have prevented a huge amount of the site from destruction by ploughing. In fact there seems to be a negative correlation of the visibility of the lines of the medieval agricultural system and the prehistoric features in the magnetogram. This phenomenon allows to conclude that areas of excellent visibility of *Wolbäcker*-structures may hide supposed archaeological features completely. For such areas magnetometry needs to be substituted by other fieldmethods, but in case archaeological features do exist they should be preserved in a quite good state. The excellent state of preservation of archaeological features is quite seldom within middle-Europe especially in the case of soils used for intensive agriculture.

Furthermore a system of stream beds, partly silt up or changed in course heavily due to natural processes or for meliorization reasons was revealed by magnetometry. Today

the surroundings of the *Hünenburg* are coined by extensive acres and willows. The nearest body of water is the stream Soltau situated some 900 m southwest of the hillfort, while the area inbetween is an acre prepared for up to date industrial agriculture without any natural structures and obstacles. In one case further east of the site a ditch for water drainage runs dead straight aside a margin of an acre. But the results of magnetometer survey have changed our view of that part of the landscape. It was used for settlements and according activities throughout several periods of prehistoric ages according to magnetic data. A system of a huge settlement area towered above by an hillfort. Furthermore – as magnetically detected stream beds prove (Figure 3) – the settlements were placed in a natural system of water supply and drainage much more detailed than the recent landscape gives the impression.

The reconstruction of the initial situation of the landscape which prehistoric men found at the scene might allow further arguments concerning history and function of the settlement. Which elements of such a settlement system and the landscape are of the same age and what function they have has to be researched in much more detail yet. Nevertheless in the case of the *Hünenburg* magnetometry changed the perspective of the archaeologist when investigating why men decided where to place settlements and how to use the landscape concerning water supply, use of natural resources and areas useful to place dwellings.

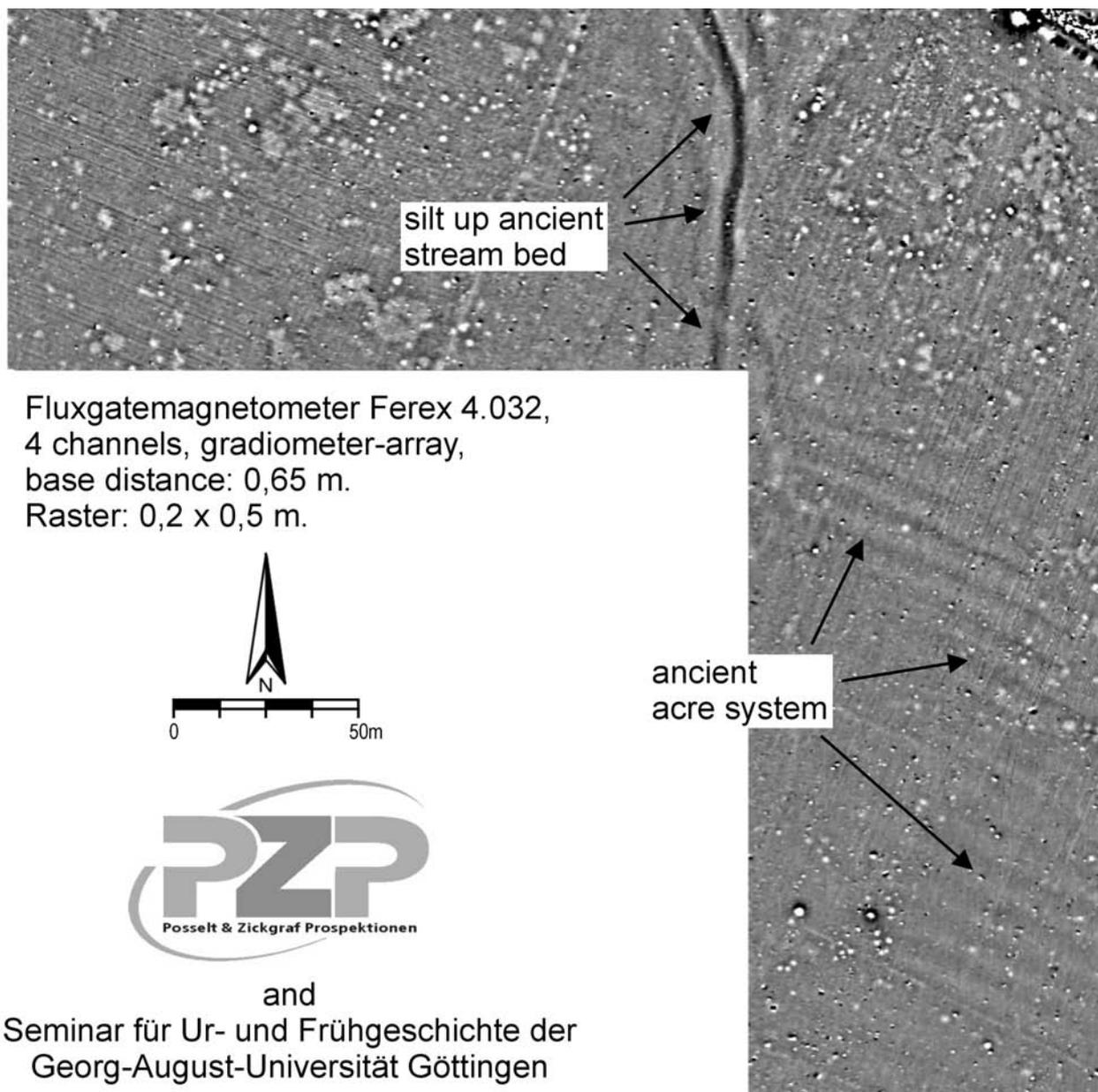


Fig. 3. Gevensleben-Watenstedt. Hillfort and settlement "Hünenburg". Detail of the magnetogram from the settlement south of the hillfort including archaeological features, landscape features and medieval acre systems. State: September 2008 (map courtesy of PZP/Seminar für Ur- und Frühgeschichte Göttingen).

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