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The Middle, Late Neolithic and Early Bronze Age Cemetery in Skołoszów, site 7, Dist. Jarosław, in the Light of the Results of Non-invasive Archaeological Survey in 2016

ABSTRACT

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In the autumn of 2016 a geomagnetic survey was conducted in Skołoszów, site. 7, Dist Jarosław. The magnetic prospection took place on a low hill spanning 2.12 ha in total. Distribution of the anomalies, as visible on a map depicting obtained data, reflects numerous structures related to human activity in the area during the prehistory and historic times. Among them are two features interpreted as residues of funerary rituals taking place at the site. One of them pertains to Middle Neolithic earthen long barrow, whereas the second by its shape resembles Late Neolithic/Early Bronze Age tumuli. Apart from the latter, one can discern numerous anomalies potentially related to pits and ditches. Interpretation of the geophysical imagery was based upon the results of excavations conducted in 2010 in the nearby section of Skołoszów, site 7. In the process, funeral structures in the types of earthen long barrow and a presumable tumulus were recorded. Thus, it is possible to confront observations inferred from the results of non-invasive, magnetometric survey, with data obtained by means of more direct exploratory methods. Besides the prehistoric record, our investigation resulted in reconstruction of the trenches most probably dating to the First World War.

Key words: Funnel Beaker culture, Corded Ware culture, Mierzanowice culture, tumuli, long barrows, geomagnetic, non-invasive survey

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Introduction

Multicultural site 7 in Skołoszów, Dist Jarosław undoubtedly offers considerable cognitive potential for the studies of the Middle and Late

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Neolithic, as well as the Early Bronze Age in the Carpathian loess area (Rybicka 2011, 46–51; Król *et al.* 2012; 2014). It is located in the eastern part of Rzeszów Foothills (latitude: 49°54'40,29 N; longitude: 22°48'24,56" S), on the south-eastern edge of the Rada Valley, approximately 400 m from its trough, 20 m above its bottom and up to 215 m above sea level. Site 7 was discovered in 1993 during the Polish Archaeological Record field survey (in polish: Archeologiczne Zdjęcie Polski – AZP). In 2010 it was thoroughly excavated in the course of a rescue “motorway” research. As an outcome, a long barrow attributed to the Funnel Beaker culture (FBC), as well as various types of burials affiliated with the Corded Ware (CWC) and Mierzanowice (MC) cultures were recognized (Król *et al.* 2012; 2014). Their distribution suggests that more funeral objects can be expected in previously not excavated vicinity of the motorway. In order to investigate the latter space, a magnetometric survey was conducted in the autumn of 2016².

Study area

The area of the magnetometric survey comprised the northern part of Skołoszów, site 7 (Fig. 1:a) and covered an area of 2.12 ha, characterized by relative heights up to 13 m and inclinations within an range of 8.7–17.6%. The eastern part comprises a relatively flat terrain elevated up to 214 m a.s.l. (Fig. 1:b). The entire zone covered with non-invasive prospection did not contain any regular features in land relief that could suggest presence of archaeological remains.

Methods

Non-invasive archaeological survey at Skołoszów utilised the magnetometric method performed by means of Bartington fluxgate magnetometer, equipped in a single probe containing two sensors with a vertical spacing of 1 m. The applied measurement accuracy was 0.1 nT [nano Tesla]. Adopted grid size had dimensions of 20×20 m, whereas the entire framework was composed in total of 3 grids. The measurements were taken approximately 20 cm above the ground, every 25 cm along transects, the latter spaced from each other by 1 m distance. Transects were oriented approximately along the geographic north-south axis, with the

² This survey was possible thanks to a grant from the Ministry of Culture and National Heritage of Poland awarded to Małgorzata Rybicka (1788/16/FPK/NID).

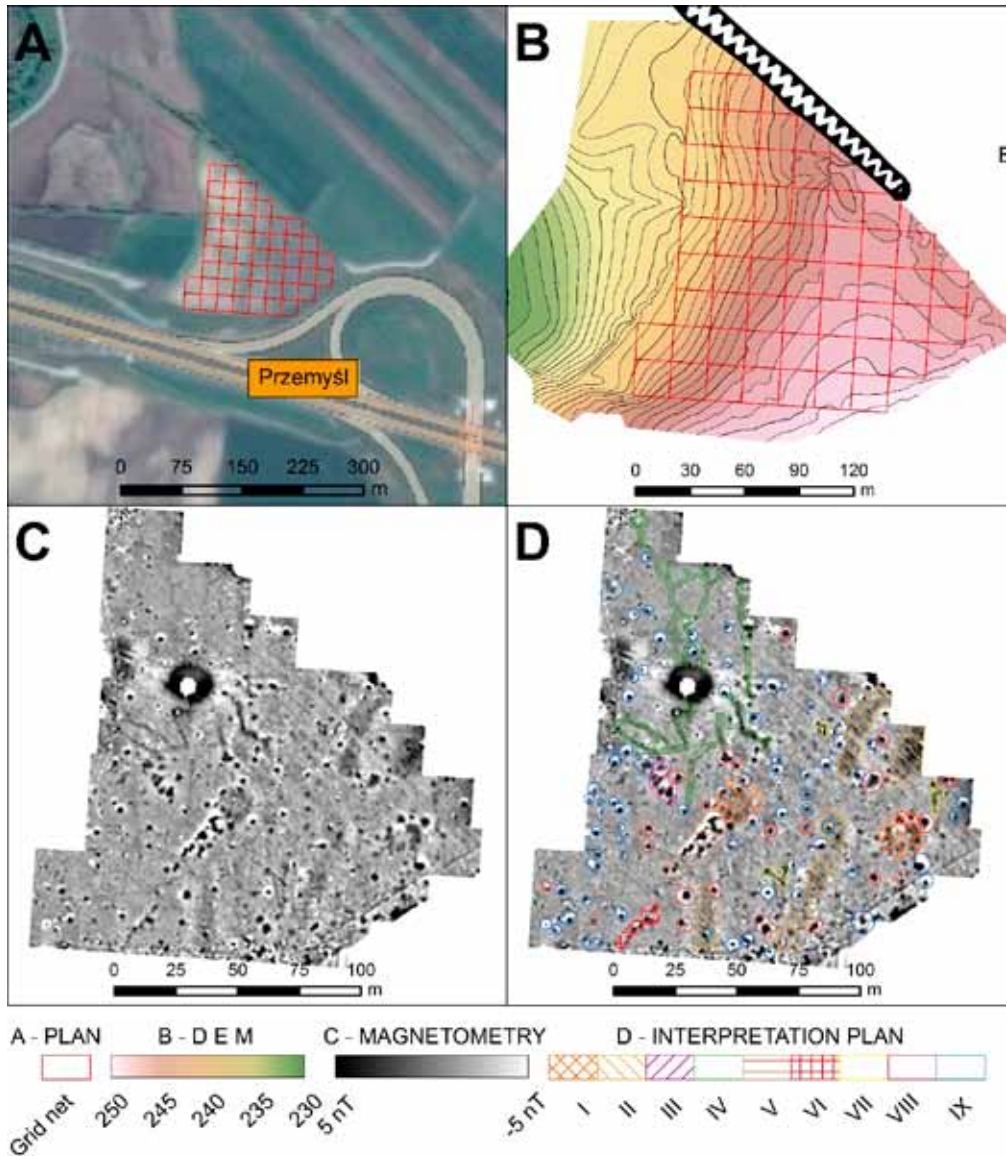


Fig. 1. Skołoszów, site 7, dist. Jarosław. Non-invasive research. A – aerial view of the site (basemap: geoportal.gov.pl); B – digital elevation model and grid net of the magnetometric survey; C – clear magnetometric view of the site; D – interpretation of magnetometric results: I – round barrows, II – ditches, III – group of triangular objects, IV – I World War trench lines, V – long barrow, VI – lines of singular pits, VII – postholes, VIII – singular pits, IX – metal waste or ferromagnetic stones

probe always heading north. The visualization of magnetometric survey was carried out in a Geoplot 3.0 software using various interpolation techniques and raster processing (shaded relief plot, zero mean grid, zero mean traverse, despise, clip, low/high pass filter and interpolate). For better visualization of discussed anomalies, on all attached figures presenting the results of the prospection the actual values of the magnetic field have been compressed to a range of +5 to -5 nT, which corresponds to the accompanying greyscales. Therefore, all the readings of +5 nT or higher and -5 nT or lower have been marked respectively with black and white color. In some cases, when -5/+5 range was insufficient to reveal the contrast between anomalies, compression of the values to a smaller range was applied. In order to supplement the results with local topography, a digital elevation model (DEM) was elaborated by the means of RTK receiver in the appropriate geodetic coordinate system.

Results

The resultant image of geomagnetic studies at the site in Skołoszów is characterized by high complexity in terms of the gradient of changes in magnetic field as well as the spatial structure and distribution of anomalies. The mean values of the magnetic field gradient recorded within the study area oscillated between 5 and 10 nT, which shows that the surface of the site itself has a slightly increased magnetic susceptibility. These values, reduced to the gradient used (-5–5 nT), correspond to a level of approximately 0 nT, characteristic of the larger part of the image. It forms a background for the anomalies dispersed on almost the entire surface, with magnetization deviating to a greater or lesser extent from the level of 0 nT. Due to the data processing, it was possible to distinguish nine types of anomalies characterized by different size, shape and level of magnetization (Fig. 1:c).

Type I (Fig. 1:d) comprised two oval anomalies of higher magnetic values. The first was located in the central part of the area, while the second latter was situated in the easternmost part of the surveyed grid. They can be seen as extensive patches of circular outline with a diameter of up to 20 meters, revealing a higher magnetization with respect to the background (the values around 1–2 nT). On the outside, they are surrounded by the envelope of negative readings, especially prominent on their north side, and in places at their circumference there are also small but stronger signals. Spatial structure and intensity

prompts to classify these anomalies as effects of inductive magnetization, while their regularity suggests anthropogenic character. Basing on their appearance and magnetic properties, these objects possibly represent barrows denudated due to plowing, as indicated by the similarity of magnetization in relation to the mounds examined by the team in Ukraine and Poland (Makarowicz *et al.* 2016b).

Type II (Fig. 1): Anomalies assigned to this type appeared in the southern and eastern part of the measurement area. They have an irregularly oval, elongated form, and their maximum sizes are up to 30 m in length and 20 m in width. They are characterized by a positive magnetization value, reaching in places up to the maximum gradient level (5 nT). Usually, however, readings oscillate around 1–2 nT. The planes with increased magnetization value are surrounded by belts of reduced susceptibility, especially visible in the case of anomalies from the eastern sector. Again, this suggests inductive magnetization. The spatial layout of the discussed anomalies gives the impression of double, wide bands separated by a gap of around 20 m in the narrowest place. What's more, the anomalies from the eastern part seem to be „moving towards each other”, thus surrounding an approximately oval patch of land with significantly weaker magnetization. Perhaps, together they form a system of wide ditches, closing from the eastern side a certain space (settlement?), already located outside the research area. Despite the most likely anthropogenic nature of these anomalies, it is impossible to make far-reaching conclusions about their sources.

Type III (Fig. 1): Anomaly of this type was identified in a single case in the central-west part of the site. With its outline it resembles a crescent with an irregular contour, bent to the east. The approximate dimensions of this anomaly are 20 m in length and 5 m in width. A closer look at this place allows to distinguish several separate signals, nevertheless located close enough to each other. Each of them has an approximately triangular shape and consists of a maximum positive (5 nT), surrounded by a negative maximum.

Type IV: Anomalies classified this type are the least clear on the resultant image of magnetometry. They appear as a network of narrow (2–3 m wide) streaks with slightly increased magnetization relative to the environment (generally about 1nT). For the most part they are stretched over a distance of about 100 m along the N-S axis, and three main branches can be distinguished, at the southern end of the route, changing direction to the

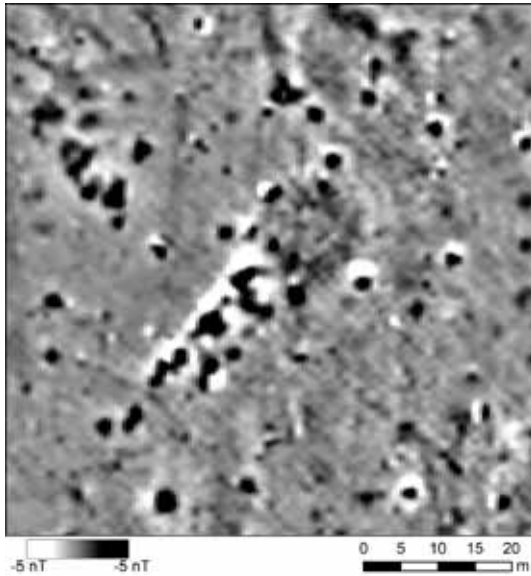


Fig. 2. Magnetometric view of the funeral structures recorded as types I and V (according to Fig. 2:c).

west or east. In some places, they are interconnected by transverse strands, and in other sections they are broken by several-meter wide gaps. The spatial layout of the discussed anomalies, as well as the degree of magnetization, suggests that they are shallow depressions in the form of ditches, with the in-filling slightly different in terms of magnetic properties from the soil in their context.

Type V: (Fig. 1 and 2): Anomaly of this type was observed only once within the whole measuring plane. It is characterized by a series of very high readings with negative and positive maxima reaching the extreme values of the gradient. These signals

differ in their shape as well as the spatial extent, but it is important that together they form a structure resembling a trapezoidal outline elongated on the NE–SW axis, tapering towards the SW (approximate dimensions: 25×10 m). Particularly clear are its northern and eastern edges, while western and southern ones are less clear. The whole feature significantly differs from any other anomalies observed in its vicinity, therefore, most probably, it should be considered as an anthropogenic object. The formation of such an intense anomaly can be explained by combustion of organic material, caused intentionally or accidentally, as a result of which processes of chemical transformation and magnetism excitation of ferromagnetic and paramagnetic minerals took place, which significantly increased the magnetic susceptibility of soil. Through its trapezoidal outline, the feature is reminiscent of Neolithic long barrows known from southern Poland, and referred to as ‘megaksylons’. It seems that the walls of the trapezium close the empty space in the middle, from all sides except the south-west. The latter seems to be „not closed”, which suggests the extension of the building’s wall further south-westerly. Remains of this type of funeral facilities were found in the site during the excavation tests preceding the motorway construction. The fact that these tombs were erected from wood corresponds well to the increased

magnetic susceptibility in the described place and makes the previously suggested interpretation of the anomaly's origins plausible.

Furthermore, the magnetization distribution of the prospected area consists of numerous anomalies, which does not allow any further interpretation. These are most certainly the remains of human activity, however their exact interpretation is highly restricted to the general indices. One of such features is type VI recorded in the south-central part of the area and it could be a prolongation of a trapezoid structure (type V). The anomalies of types VII and VIII occurred widely in the grid net, in form of a respectively singular spots and linear groups of spots, both characterized by higher magnetic values. They are most certainly the infillings of pits or posts which differs from the magnetic background noise. The last type of distinguished anomalies were classified as type IX. These were the singular spots of bipolar anomalies characterized by occurrence of adjoining extremely high and low values, thus indicating presence of metal objects.

Interpretation and discussion

Magnetometric prospection in Skołoszów, site 7 revealed numerous remains of human activity pertaining both to prehistoric as well as historic times. Regarding the latter period, the most obvious are thin, interconnected, linear anomalies (type IV), interpreted as trenches related to military struggles in the area during the First World War (the Battle of Radymno 1915 AD) (Moszumański 2007, 63–71).

In terms of prehistoric remains, it seems plausible to determine the anomalies classified as type I and V, as originating from the Neolithic. As it was mentioned before, type V comprised of a trapezoidal arrangement of anomalies, which is highly similar in its shape to the FBC long barrows. However, one should be aware that the area of Skołoszów is covered with thick loess layer, devoid of stones containing minerals prone to remnant magnetization. Hence, discussed structures should not be interpreted as stone enclosures such as in long barrow recorded, for example, in northern Poland. The anomalies are more likely related to the rotten or burnt wooden constructions, consequently acquiring induced type of magnetization (Pospieszny 2011, 72). The assumption of the presence of FBC long barrow without stones seems to be supported by the results of excavations in the nearby section of the site (see Król *et al.* 2012; 2014).

The newly registered structure discussed above is situated a little over 150 m north of the long barrow no. 1, which was discovered in 2010. Both of these structures are separated by vast and empty zone. They also have different orientation: the long barrow no. 1 is aligned E–W with slight deviation towards NE–SW (Król *et al.* 2012; 2014), whereas tentatively labelled long barrow no. 2 is, apparently, oriented exactly along NE–SW axis. It is worth noting that the different orientations of FBC long barrows in cemeteries were also identified in the Polish Lowland (e.g.: Leśniczówka, site 1; Obałki, site 1; Sarnowo, site 1; Jażdżewski 1936; Chmielewski 1952; Wierzbicki 1991; 1992; 1994) as well as in the loess areas in the south-eastern Poland (e.g. Pawłów, site 3; Słonowice, site 5; Bargieł, Florek 2006; Tunia 2006). However, in the second case, these differences are less noticeable. When it comes to the aforementioned empty space, it seems that the following two scenarios are worth consideration. Such relations are quite rare in the FBC, but this may be the result of incomplete examination of cemeteries. However, such examples have been identified in Kuyavia, e.g. in Sarnowo, state. 1 and in Obałki, site 1 (Chmielewski 1952). At the first of these sites, the distance between the long barrows no. 8 and no. 9 is about 70 m. If we consider the poor state of preservation of long barrow no. 1 in Skołoszów, it cannot be ruled out that the discussed empty zone could have been originally used by FBC people.

One should also consider a possible continuation of funeral landscape in the vicinity of Skołoszów during the Early Bronze Age. Adjoining northwards to the FBC long barrow is the circular anomaly type I, which was interpreted by means of its shape and magnetic properties, as remains of denudated round barrow (conf. Czebreszuk *et al.* 2013; Makarowicz *et al.* 2016). Therefore, it should be considered if these two objects are homogenous in terms of chronology, or if the round barrow was erected afterwards, when the communities of the CWC and MC were inhabiting this area (Król *et al.* 2012). Moreover, between these two structures, a line of singular anomalies was recorded and consequently classified as the type VII. Their origins could be related with possible infillings of the pits or post holes as well as the hearths. Potentially these anomalies present an evidence of specific kind of mortuary practices, such as constructing and subsequent deliberate burning of tombs made of wood (houses of the dead?). However, it should be stressed that the magnetometric method shows only the horizontal distribution of anomalies and, as such, it disallows any stratigraphic interpretations.

Nevertheless, the data acquired during the archaeological excavation in close proximity to the site, suggest possible interference of the CWC or MC funeral structures with the FBC long barrow erected much earlier. In 2010, a trench opened southwards revealed a presence of the CWC and MC graves, established on a margin of the wider width edge of the FBC long barrow no. 1 (Król *et al.* 2012; 2014).

Besides the funerary remains, the anomalies of type II resemble a probable ditch-like structures in the western part of the research area. Their spatial arrangement as well as dimensions might suggest that we deal with enclosures in form of a ditches, which could delineate the settlement.

Final remarks

As a summary, it is worth noting that geomagnetic survey at the site in Skołoszów provided interesting results revealing the cognitive potential of this place. The abundance of various types of anomalies discernible with the help of a magnetometer allows us to think that we are dealing with a place with a rich and complex history of human activity from the earliest times to the present. Although geomagnetic surveys alone do not allow unambiguous identification of sources of anomalies, structural similarity of the latter to objects found as a result of excavations in the southern part of the site allows them to be considered as residues of various types of structures, sometimes with a distinct landscape form (eg tumuli, megakylons, ditches). The final verification of the proposed interpretation requires to the scope of research to be continued and broadened to include other methods, both non-invasive – geophysical and invasive – drilling and excavations.

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