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Recent Magnetometric Researches at Zoltan, Covasna County. Some Observations Regarding the Limits and Inner Structure of the Noua Settlement in the Place Called “Nisipărie”

ABSTRACT

Popa A. 2017. Recent Magnetometric Researches at Zoltan, Covasna County. Some Observations Regarding the Limits and Inner Structure of the Noua Settlement in the Place called “Nisipărie”. *Analecta Archaeologica Ressoiviensia* 12, 101–108

Previous field researches in the location called Zoltan-“Nisipărie” revealed a settlement with several different cultural layers, among which those of the Noua Culture seem to be dominant. Along the past years researchers have conducted both systematic archaeological diggings as well as geophysical researches. Through the scientific research presented in the following report we set out to highlight the limits and structure of the settlement with the help of magnetometry. The results we obtained allow us to outline the eastern limit of the intensely inhabited settlement. Judging by the magnetic anomalies we identified, we can speak about a large number of pits that stand at the basis of the archaeological structures found in the Noua settlement at Zoltan “Nisipărie”.

Key words: Transylvania, Bronze age, Noua culture, settlement, magnetometry

Received: 01.09.2017; **Revised:** 21.09.2017; **Accepted:** 03.10.2017

Introduction

The archaeological site found in the place called “Nisipărie”¹ has become known in the 1960s, when locals gathered and handed over to Székely Zoltán different archaeological artefacts, mainly ceramic fragments and animal bones, found when they were exploiting sand in the area. After conducting a digging campaign, Székely identified a Late Bronze Age settlement on the left bank of the Olt River (towards the east)². Researches conducted back then covered a small number of complexes, among which a so-called “ash agglomeration” belonging

¹ Zoltan locality, Ghidfalău Commune, Covasna County.

² The site's code in the Romanian National Archaeological Repertory (ran.cimec.ro) is 64381.01.

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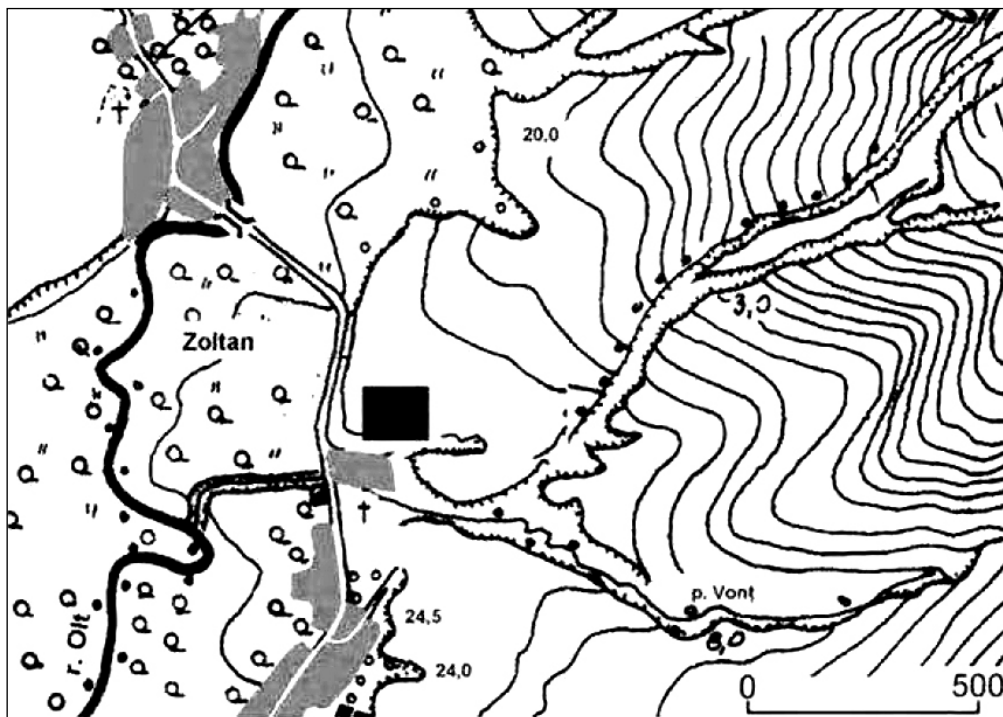


Fig. 1. The topographic position of the settlement at Zoltan (after Cavruc 2003)

to the Noua Culture (Székely 1976–1977, 26–27). Large scale researches were conducted during 1996–2001, by a team coordinated by Valeriu Cavruc (fig. 1)³. As a result of these researches (fig. 2. C1) there were identified traces of habitation dated in the late Eneolithic (Coțofeni Culture), the end of the Early Bronze Age (the Iernut – Zoltan Group), the Middle Bronze Age (Zoltan Group, mixing elements of the Monteoru, Costișa, Tei and Wietenberg cultures), as well as in the Late Bronze Age (Noua Culture, with Wietenberg elements). The research team is currently preparing the monographic report. This is the context in which, led by the need to document as thorough as possible the site, we conducted a series of interdisciplinary researches, including geophysical ones.

In the last decades the site at Zoltan became one of the most representative Late Bronze Age sites in Transylvania. Thus, the archaeo-

³ For the bibliography until year 1998, see Cavruc *et al.* 1998, 86–89. For subsequent researches see Cavruc 2003.

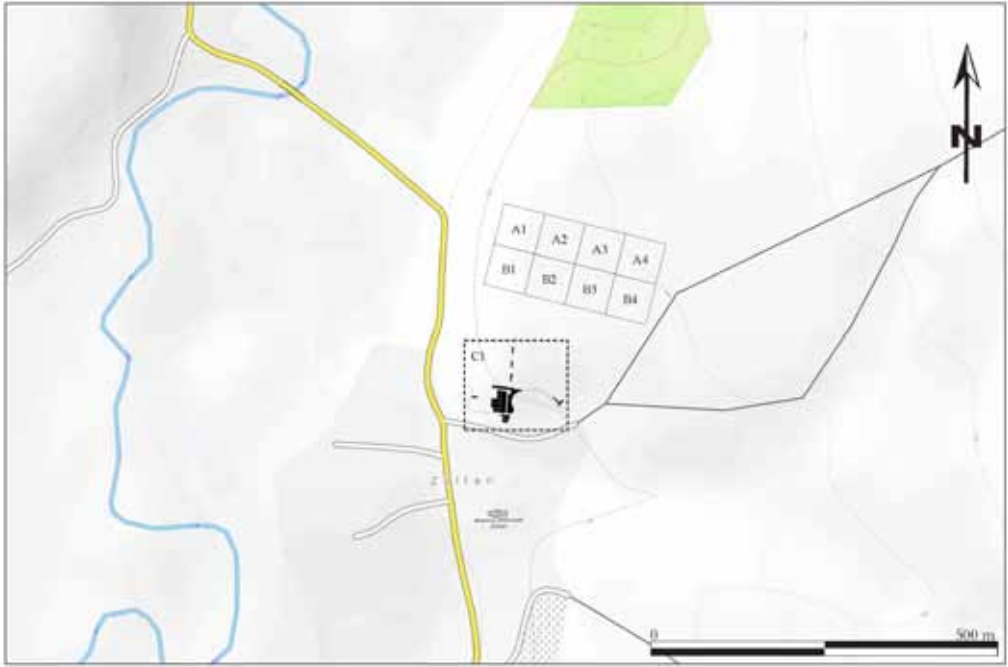


Fig. 2. The location in the field of the previously researched surfaces by archaeological diggings (C1) and the perimeters in which the vertical gradient of the terrestrial magnetic field has been measured (A1-4, B1-4)

logical monograph of the site that is soon to be published will become an important benchmark in getting closer to knowing and understanding the Late Bronze Age in Romania (Cavruc 2003, 95–96). Despite its importance, there was no possibility to continue the archaeological diggings at the site, the more so as a private investor has built an animal farm on a surface covering its northern part, previously delimited only by traces at the surface. Thus, it became more than necessary to conduct non-invasive researches in order to answer some of the most important questions related to the limits of the site and its inner subdivision. Taking into consideration the positive evolution of the magnetometric applications, developed during the last few years within our non-invasive research projects⁴, we have conducted such a research during May 2017 within the Late Bronze Age site at Zoltan “Nisipărie”.

⁴ See, for example, Popa 2015.

The research method

In order to map the magnetic anomalies in the Zoltan site we have used an installation with five “Fluxgate” cores, aimed at measuring the vertical gradient of the terrestrial magnetic field. The cores were installed on a non-magnetic mobile support. The distance between the cores was of 0,50 metres, thus the measurements were conducted in 2,50 metres wide strips. The distance between the points measured by each core was of 0,05 metres. This type of magnetometric cores measure the vertical component of the magnetic field with a margin of error of about 0,1–0,5 nT. The measurements were made in rectangular perimeters, which were georeferenced with the help of a geodesic GPS. Using the ROMPOS real-time correction system we were able to get a precision of 0,02–0,04 metres. The topographic data acquired were saved using the Romanian national projection system “Stereo 70”. The data acquired with the help of the magnetometer was interpolated following the “bi-linear quadrangle” algorithm and later on adjusted through the median filter. The results of the data interpolation were presented in the shape of a greyscale plan. The small values, corresponding to a lower magnetisation of the researched surface, are presented in lighter shades of grey, while the highest are presented in a darker shade.

In order to achieve our goals we have investigated at Zoltan eight rectangular perimeters with the dimension of 60×60 metres each (fig. 2. A1–4, B1–4). These were mapped in two rows, covering a total surface of about 28 800 square metres. Their positioning within the field was determined by the limits of the animal farm (marked by fences) towards the north and by the limits of the geophysical researches previously conducted by a team coordinated by our colleague, Dan Ștefan, towards the south.

Results

The data processing led to putting together magnetometric maps for each perimeter we have investigated. These were later put altogether in a general plan, using a GIS application⁵.

By looking at the general plan we can easily observe at least two major areas of interest, which are different from each other, based on the differences of the anomalies they present (fig. 3).

⁵ We have used Global Mapper, version 17.2.

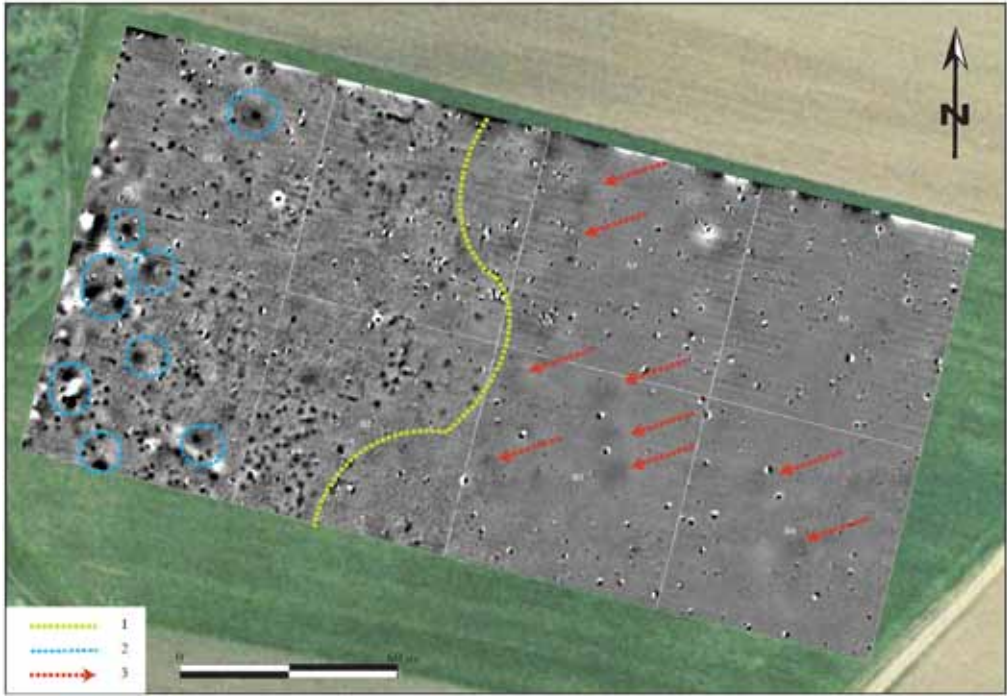


Fig. 3. The results of the magnetometric research in the Late Bronze Age settlement at Zoltan "Nisipărie", superposed on the orthophoto drawn up in 2007

In the eastern part of the researched area, mainly in the A3–4 and B3–4 perimeters, we identified a series of bi-polar magnetic anomalies that prove to be, most of the times, metallic wastes with high magnetic properties. The dimension on the magnetometric map of each of these anomalies is determined by the objects' dimension, as well as by the depth at which they are found. Another category of anomalies in the area shows a less pronounced dynamism of their magnetic values. The magnetic anomalies have an irregular shape that varies from case to case (fig. 3.3). Some of them could represent possible archaeological structures, while others seem to be traces of geological activities.

The western part of the researched area is structured differently. We refer mostly to the A1–2 and B1–2 perimeters. Here we could observe predominantly round-shaped magnetic anomalies that are sometimes grouped in larger structures. We can also observe here some large magnetic anomalies that have high positive values, and immediately next to them and around them several smaller ones (fig. 3.2).

Another specificity of the magnetic maps resulted after measuring the vertical gradient of the terrestrial magnetic field at Zoltan is the existence of some empty spaces between the agglomerations of magnetic anomalies, agglomerations which could be identified as traces of archaeological complexes. Among these we mention especially the empty space found at the intersection of the A1, A2, B1 and B2 perimeters that extends towards the southern half of the A2 perimeter.

Conclusions

The researches presented above were based on the method of measuring the vertical gradient of the terrestrial magnetic field, bringing some new elements to understanding the Late Bronze Age settlement at Zoltan “Nisipărie”. First of all we can mention the dimension of the site itself. Analysing the magnetometric maps we were able to establish that the settlement’s eastern limit is found at about 120–130 meters away from the western limit of the Olt River’s left bank. We can associate the settlement’s limit with the contact line between the two areas where the magnetic anomalies are agglomerated, mentioned above. We were not able to reach the settlement’s northern limit. According to all probabilities, the archaeological complexes we identified through the magnetic anomalies in A1 and A2 perimeters continue towards the north, under the surface on which today we can find the recently built animal farm. In the future we plan to further investigate the site, especially towards the north, behind the animal farm, if we have proper access to the surface.

Regarding the inner subdivision of the site’s researched surface, we can estimate that the settlement had some very well delimited, intensively inhabited areas, separated by areas free of buildings (empty spaces). The more intensively inhabited areas are concentrated towards the settlement’s western limit whilst towards the other direction the level of inhabitancy decreases. The character of the magnetic anomalies, and thus of the archaeological complexes changes, so based on this observation we can assume that this space has been used differently than the one close to the limit of the Olt River’s terrace. These observations could be verified in the future through punctual, small scale archaeological diggings.

Acknowledgements

I thank all my colleagues from the National Museum of Eastern Carpathians for their support given throughout the researches of this site. Special thanks go to Valeriu Cavruc, Dan Buzea and Dan Ștefan, whom have significantly contributed to carrying out this research. I am also very grateful to Mr. Jan Lapöck from the University of Regensburg, who joined me during the field researches.

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