Archaeologia Polona, vol. 53: 2015, 284-288

Geophysical prospecting of the Yamnaya barrows (3rd millennium BC) from Ciorani de Jos, Prahova county, Romania

Alin Frînculeasa[a], Mădălina N. Frînculeasa[b] and Cornel David[c]

KEY-WORDS: barrows (tumuli), Bronze Age, magnetic and electrical measurements, Cioranii de Jos

INTRODUCTION

The Titu-Sărata divagation plain, located in the east-central part of the Romanian Plain, is part of the Ialomița plain and lies between the Argeș and Sărata. It is a plain with altitudes not exceeding 20–25 m (Sandu 2011: 95), continuing to the south, the piedmont plain of the Prahova. Lithologically, fluviolacustrine deposits attributed to the Pleistocene prevail, over which Holocene alluvial and loessoid formations are deposited in sediment continuity. The microrelief comprises alluvial terraces, meadows of the alluvial lowland type, holms, alluvium banks.

In this geographic area are a number of archaeological features and standing out among them are the burial mounds (tumuli) characteristic of the Yamnaya communities, populations originating from Eurasia, occupying a vast area of 3,000 km from the Pannonian Plain to the Ural Mountains in the direction of the Caspian Sea coast and the Caucasus, dated from the late 4th to the first half of the 3rd millennium BC. In the territory of Romania, 150 tumuli have been archaeologically investigated over the years, with 13 of them located in the Piedmont plain of the Prahova (Frînculeasa *et al.* 2013a; 2013b).

Geophysically analysed tumuli lie on the left versant of the Cricovul Sărat, 2 km north of its confluence with the Ialomița, in the Cioranii de Jos village, Prahova. The first (northern) tumulus is a mound of isometric shape, 0.85 m high. The second tumulus is located 250 m south of the first, on the western edge of an erosion batter made by the Cricovul Sărat, with an uneven height of 4 m, topped by two partly deteriorated concrete topographic bollards.

[a] Department of Archaeology, Prahova District Museum of History and Archaeology, Ploiești, Romania
[b] Department of History, Faculty of Humanities, University Valahia of Târgoviște, România
[c] Geomathics One, București, Romania

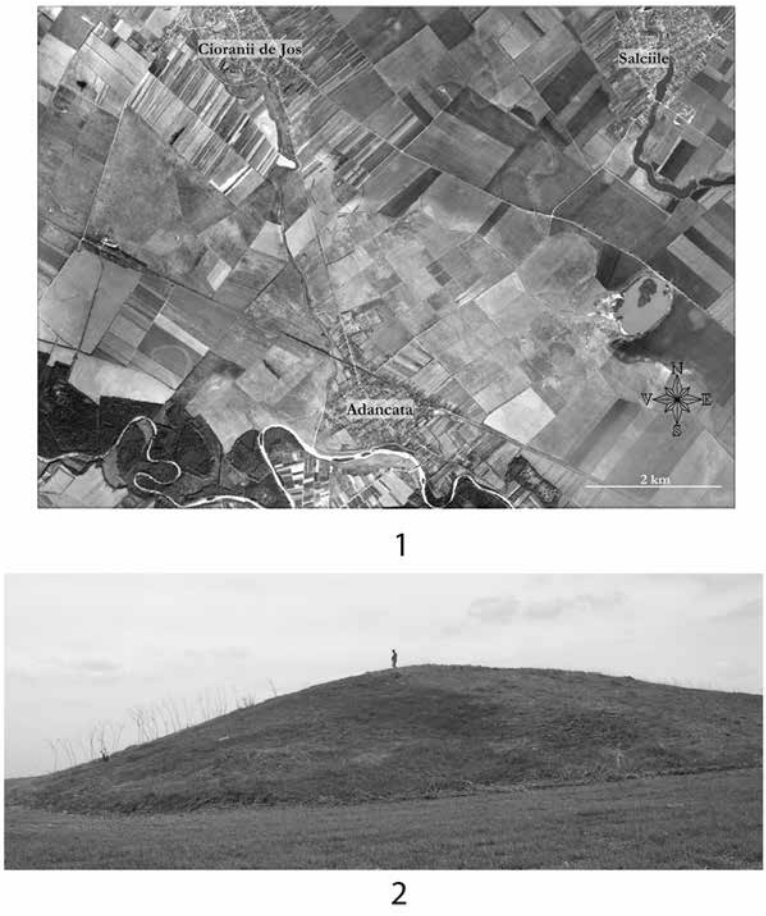

Fig. 1. Cioranii de Jos. 1 – position of the area under geophysical investigation (in circle); 2 - southern tumulus

Both tumuli are made mainly of clay loam with rounded stones. The entire area around the perimeter revealed fragmented pottery, indicating intense habitation (Fig. 1).

METHODOLOGY

Geophysical investigations consisted of magnetic measurements of the total magnetic field and Vertical Electrical Soundings (VES). Magnetic measurements were performed along NE–SW oriented profiles, consistent with the direction of furrows present only on the northern tumulus. The distance between profiles was 0.5 m, and measurements were carried out on a continuous basis, with a sampling rate of 0.5 s (4–5 samples per meter in parallel mode). GSM19W

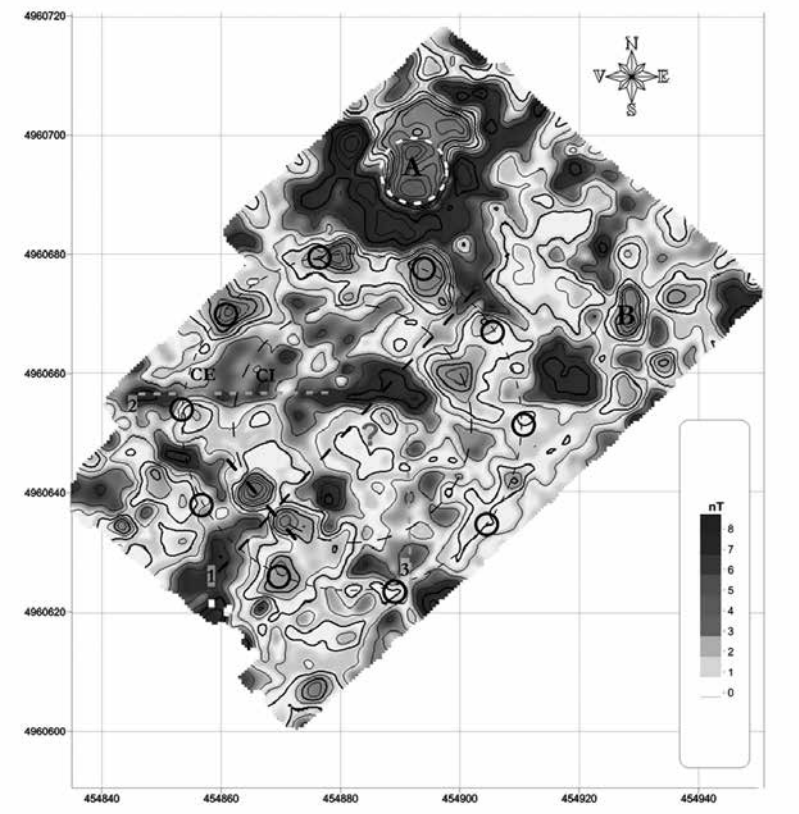

Fig. 2. Magnetic map of the northern tumulus; CE, CI – concentric circular structures identified as archaeological features, possibly remains of tumuli

Overhauser magnetometers with GPS, in base-rover system, were employed. The location of the northern tumulus was investigated in two stages as data interpretation required. First, the researched area was enlarged in order to fully investigate the perimetrical circular structure and, subsequently, to determine the intense anomaly in the northern part of the perimeter.

Diurnal variation and local anomalies were eliminated from the primary data. Low pass filters were applied to remove the effects of superficial sources and of those produced by elements of small size and reduction-to-pole calculations; calculation of the horizontal and vertical derivatives of the magnetic field and polynomial interpolations were performed.

RESULTS AND INTERPRETATIONS

The results obtained are presented as isoline maps, 3D surfaces, shaded relief maps and resistivity crossections. Magnetic investigations have revealed, in the analysis of the northern tumulus, two concentric circular structures (the outer being 55 m in diameter and the inner 40 m), marked by magnetic

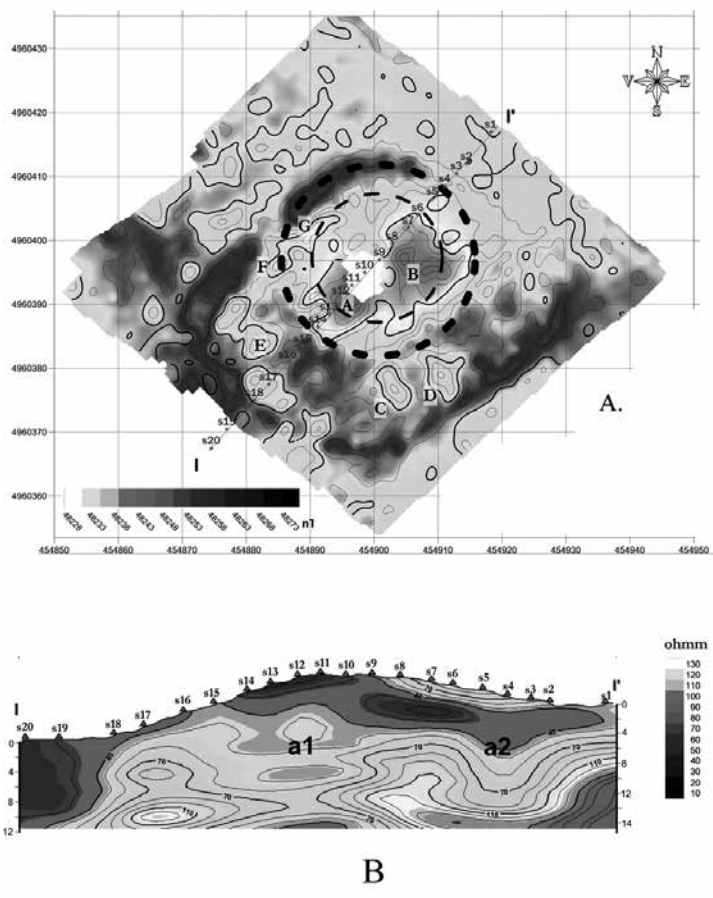

Fig. 3. Southern tumulus: A – magnetic map; B – resitivity pseudosection

anomalies of the highest values (Fig. 2). The interpretation of images present in the magnetic maps leads to establishing their symmetry with respect to a NE–SW oriented axis, 45°, and to outlining two linear areas of lowest values with E–W and N–S orientation. The latter may be ditches or access paths to the centre of the tumular structure. On the outside there are several local anomalies: in the north, an important anomaly considering the intensity and shape, which could reflect an earthen structure, 6–7 m in diameter; in the east, a group of anomalies with complex structure, implyimg the existence of several objects as a source. To the northeastern and southwestern extremity of the inner concentric structure, two pairs of anomaly maxima with a regular shape can be distinguished. Reduced intensity and shape of magnetic anomalies (interpreted as holes for fixing poles) lead to the assumption that the initial structure of the tumulus was delimited by a sun-dried wattle-and-daub structure. South of the centre of the concentric structures there is a bipolar magnetic anomaly with the positive part to

the south and the negative one to the north and 18 nT intensity. It is considered to be the result of an artificial feature, the interpretation of which requires archaeological feedback.

With the southern tumulus, the magnetic map indicates, through reduced field anomalies shaped like a parallelogram, a false structure resulting from furrows made systematically in these directions around the tumulus (Fig. 3A). This structure is inscribed in a circle 30 m in diameter and is distinguished by two magnetic anomalies with amplitudes exceeding 40 nT. A second concentric structure is not well defined and is outlined based on several amplitudes of higher values. It may be interpreted as a surrounding ditch. For this tumulus, a VES profile was carried out, applying a Schlumbereger array (Fig. 3B). The profile line, running through the central part of the mound, does not correspond to its axis of symmetry. A few main characteristics can be distinguished in the cross-section: in the lower part, anomaly maxima with values exceeding 70 ohm-m, corresponding to levels of sand and gravel at the base of the natural slope; southeastward, an area of minimum of resistivity due to water-saturated meadow deposits; the presence of a resistive horizon at the top of the section, on the northeastern slope, 1.0–1.5 m thick, the result of a predominantly argillaceous impermeable layer, settled in this perimeter, and of a conductive level, with values below 30 ohm-m, which subsides from the southwest toward the northeast, located 3–4 m deep, corresponding to a sandy water-saturated level. Furthermore, electrical investigations indicated two areas where the stratigraphic sequence is interrupted, corresponding possibly in part with the magnetic anomalies; this could be in archaeological terms the burial pits of this mound.

CONCLUSIONS

Geophysical measurements of the two tumuli have revealed the presence of structures that can be identified as funerary complexes of archaeological value. This emphasises, therefore, the importance of geophysical research as a form of non-invasive investigation preliminary to archaeological excavation.

REFERENCES

Frînculeasa, A., Frînculeasa, M., David, C. 2013a. Non-invasive archaeological research carried aut recently in northern Muntenia, Romania. In W. Neubauer, I. Trinks, R. B. Salisbury and C. Einwogerer (eds), *Archaeological Prospection. Proceedings of the 10th International Conference of Archaeological Prospection,* 45-48. Vienna.

Frînculeasa, A., Preda, B., Negrea O., Soficaru A. 2013b. Bronze Age tumulary graves recently investigated in Northern Wallachia. *Dacia N.S.* LVII: 23-64.

Sandu, M. 2011. Câmpia Ialomiței. In L. Badea and M. Buza (eds), *Unitățile de relief ale României V,* 87-99. București.