

GEOMAGNETIC SURVEY OF CUCUTENI-SETTLEMENTS IN MOLDOVA – RESULTS OF THE FAU – CAMPAIGN 2015

BY

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Abstract

In spring 2015, the Cucuteni sites of Scânteia (Iași County), Izvoare, Răucești (both Neamț County), Țigănești, Stănișești and Fulgeriș (all Bacău County) were surveyed by gradiometer. At Scânteia, more than 50 burned houses, ordered in parallel lines, as well as a threefold ditch system were encountered. The magnetograms from Fulgeriș, Izvoare and Răucești revealed also the typical, massive ditch systems, which were used on most Cucuteni sites for the settlement's delimitation. To a certain extent, at Fulgeriș the spatial order of a settlement, aligned along a central pathway is visible, while the other sites were not similarly informative. As a multi-layer settlement Izvoare exhibits a condensed picture of overlying structures, while Răucești, Țigănești and Stănișești show different stages of destruction by erosion, caused by modern land-use. These range from disarticulated, but still present features up to the presumably complete annihilation of any archaeological substance. The results show the extraordinary potential of the Cucuteni sites for future, extensive landscape-archaeology, but they also indicate the probably short time during which these unique sources of archaeological information will remain intact for analysis under the circumstances of today's more and more mechanized agriculture.

Keywords: *Cucuteni Culture, geophysical survey, Neolithic, Copper Age, prehistoric settlements, prehistoric enclosures.*

INTRODUCTION

The Precucuteni and Cucuteni culture as western part of the Cucuteni-Tripolje-Complex forms the keystone in the connection of the Neolithic cultures in Central Europe and in the forest-steppe zones of Eastern Europe. With the newly intensified research on the forest-steppe zones Neolithic, especially the giant-settlements of the Tripolje-culture¹, the Cucuteni-culture inevitably also has to be focussed on again.

The exceptional suitability of Cucuteni period sites for geomagnetic surveys have been long known and proven by a multitude of measurements by a diversity of scientists, especially during the last decade². This suitability is caused by the settlements with a multitude of burned houses and by their tendency to be commonly surrounded by massive ditch-systems, both archaeological structures resulting in comparatively strong disturbances of the local earth's magnetic field. Under these circumstances given, and considering the over 1800 Cucuteni sites known from surface finds³, aerial photos and excavations, the next logical step is an extensive geomagnetic investigation of whole clusters of Cucuteni settlements in various regions. This could provide information on similarities and differences in the settlements' spatial order.

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¹ CHAPMAN et al. 2014; MÜLLER et al. 2015.

² ASĂNDULESEI et al. 2002; DUMITROAIA et al. 2012; MICLE et al. 2010; MISCHKA 2008; MISCHKA 2009.

³ LAZAROVICI, LAZAROVICI 2007: 160.

To start a project following this approach, in the spring of 2015 a team of the Institute of Pre- and Protohistory of the Friedrich–Alexander University of Erlangen–Nürnberg conducted geomagnetic surveys on six settlements of the Cucuteni and Precucuteni period (Fig. 1). This campaign was part of a joint project with the Romanian Academy, Institute of Archaeology in Iași (George Bodi, Magda Lazarovici, Alexander Rubel), “Iulian Antonescu” Museum Complex Bacău (Lacrămioara Elena Istina) and the Cucuteni Museum of Piatra Neamț (Constantin Preoteasa).

After working at Scânteia (Iași County) as example of the bigger sites in the rolling hills of Moldavia, another emphasis was laid on the Sub-Carpathian regions with surveys at Izvoare, Răucești (both in Neamț County) and Țigănești, Stănișești and Fulgeriș (all in Bacău County).

For the surveys, the long established combination of a SENSYS–Fluxgate–Gradiometer with four sensors and a DGPS for establishing the measurement grids was used. The spacing of the measured points was 0.5 m × 0.05 m, later interpolated on 0.1 m × 0.1 m resolution for easier processing in the GIS–System. Owing to the circumstances – small fields and deep–ploughed, soft and sticky soil – the use of a wheelset was often impossible and the whole sensor–array had to be carried (Fig. 2).

The result testifies once more the potential of geophysical survey, but also the growing problem of the destruction of archaeological substance by intensive agriculture.

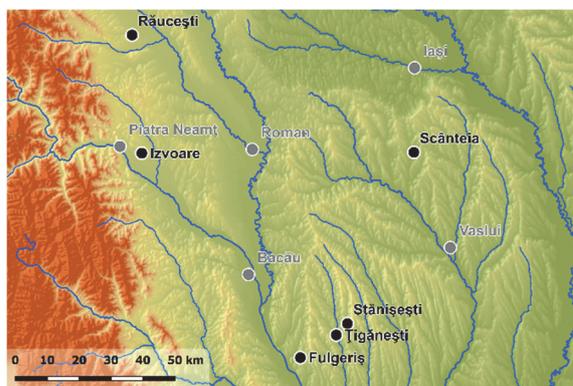


Fig. 1



Fig. 2

SCÂNTEIA – DEALUL BODEȘTI (IAȘI COUNTY)

Scânteia (National Archaeological Record of Romania – Code 98925.01) dated mainly to Cucuteni–A3 phase is one of the most intensively surveyed Cucuteni sites in Romania⁴. This is not only caused by the technical improvement of the available hardware, but also by the problem of small fields. With each of them planted with a different crop, harvested at different times of the year, it is more or less impossible to survey a big site in one campaign. Due to this fact, F. Scurtu surveyed the site in 2004, and C. Mischka in 2007 and 2015 and D. Micle in 2009⁵ (Fig. 3).

The complete magnetogram covers 11.5 ha, of which especially in the northern part is heavily affected by dipoles, caused by modern rubbish and installations. In the western part of the surveyed area, erosion gullies are visible, while the eastern part is affected by ploughmarks. In addition, tall vegetation and old excavation trenches make some parts of the site inaccessible.

⁴ LAZAROVICI et al. 2009: 147–150.

⁵ LAZAROVICI et al. 2004; MISCHKA 2008: 110–111; MICLE et al. 2010: 35.

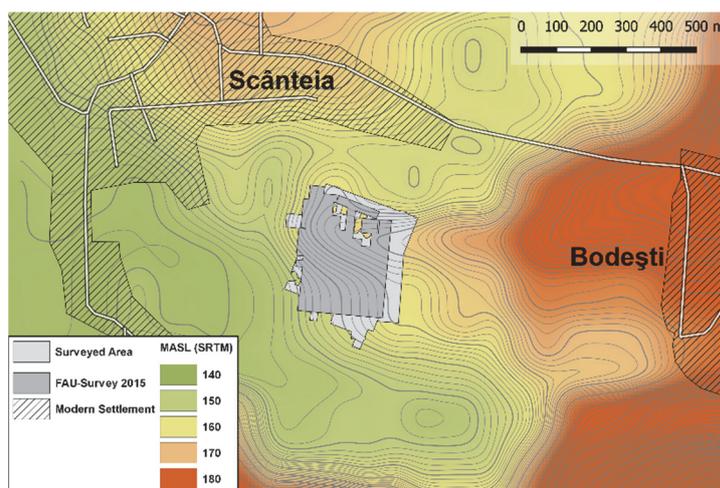


Fig. 3

Nevertheless the typical features of Cucuteni sites, burned houses and ditches, appear clearly. The results reveal a settlement, whose spatial organization, unless also situated on a promontory, is not so clearly predicted by the terrain as known from most of the other surveyed sites (Figs. 4–5).

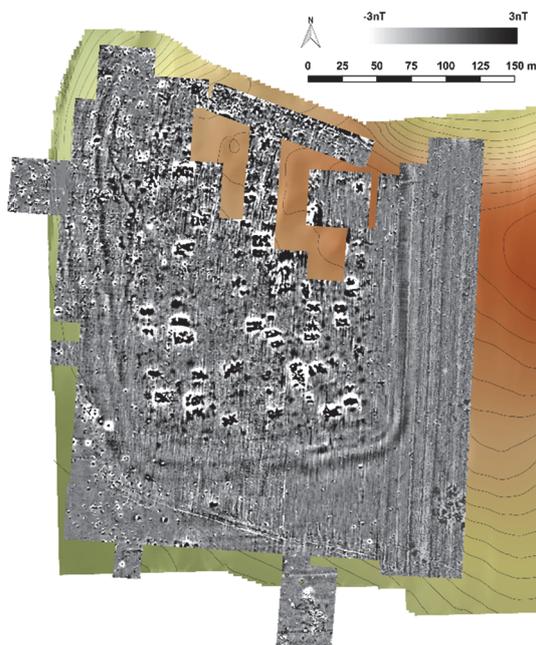


Fig. 4

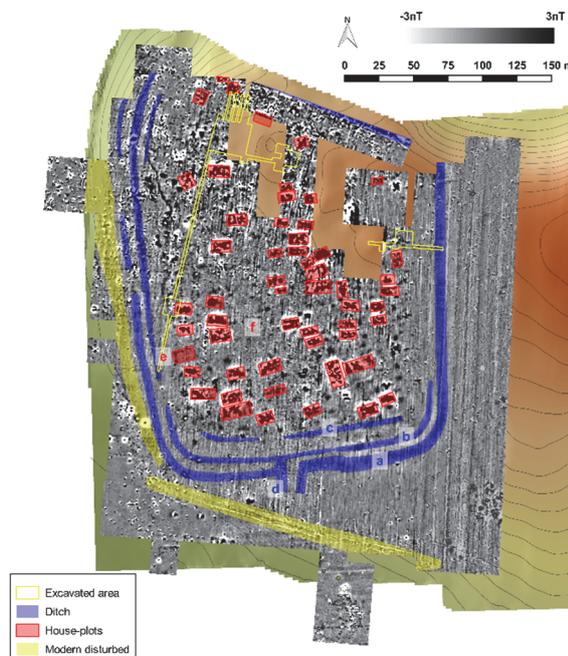


Fig. 5

Settlement delimitation/Enclosure

At least three ditches can be seen in the magnetogram. The outer one, encircling nearly the complete perimeter of settlement (Fig. 5a) shows a width of 5–8 m and encloses an area of 6 ha. In the west and south this ditch is paralleled by an inner one (Fig. 5b) with a width of 3–5 m approximately 4 ha. In the south of the settlement, another ditch (Fig. 5c) with comparable size is running parallel to the double ditch system. Measurements at comparable sites in Transylvania have shown that this is only the minimum of enclosing elements, as additional palisades with more shallow and narrow foundations can hide between the bigger structures, invisible for the gradiometer⁶.

⁶ LAZAROVICI et al. 2010.

An interesting feature of the ditch-system at Scânteia is the fact, that except for its northern most segment, the enclosure takes only a small effort from the settlement's location compared with other Cucuteni sites. In the east it cuts the promontory diagonally in N-S direction, today still visible in the terrain model. After 190 m it turns rectangularly to the west, and after 185 m back to the north, the plan thus resembling rather a Roman fort than a Neolithic enclosure. The southwestern edge is situated already in the plain at the foot of the hill and also the western part of the ditch system keeps running alongside the promontory's foot.

A possible gate construction (Fig. 5d) is located on the foot of the hill, in the middle of the southern front. The outer ditch turns rectangularly to the outside, forming a 15 m long and 6–7 m broad passage. While the second ditch shows no hiatus, the innermost one seems to be interrupted also in this area.

Settlement interior/Houses

At least 55 house plots can be identified in the enclosed area, mostly derived from the typical massive anomalies of burned houses, but some also from rectangular ditches, suggesting foundations of unburned structures (Fig. 5e). The 55 houses are also only the minimum number, because with sizes ranging from 25 to 213 m², some of the anomalies may represent once neighboring buildings, whose collapsed walls and roofs merged with one continuous layer of burned debris, not separable by geomagnetic reading.

The buildings are roughly organized in lines parallel to the isohypses of the southwestern slope of the promontory, their gables oriented in WSW-ENE-direction.

However, the pattern of houses is not uniform in all parts of the settlement. In the southern part there seems to be an empty space (Fig. 5f) between the rows, perhaps indicating a broader road. But a cluster of unburned houses which is not visible in the magnetogram, because the anomalies are too weak, is equally probable as an explanation. Another empty spot in the northwest part of the settlement is most likely caused by erosion and modern rubbish in this area, making a clear designation of archaeological features much more difficult than on the rest of the site.

IZVOARE (NEAMŢ COUNTY)

Due to its stratigraphy, the settlement of Izvoare (National Archaeological Registry of Romania – Code 120815.01/03) is one of the most important sites for the typochronology of especially the transition from Precucuteni to Cucuteni. The site consists of at least four occupational layers, dated to the phases of Precucuteni II, Precucuteni III, Cucuteni A1 and Cucuteni A3⁷. Unfortunately, the site is much less suited for geomagnetic survey, as modern buildings, roads and very small lots, fenced with wire mesh surround and cut the archaeological site (Fig. 6). In addition, a gas pipe cuts through the site, leading to even more disturbances in the magnetogram. These circumstances allowed only the survey of 0.72 ha. Nevertheless, with the experience of the other surveyed sites even this picture can be interpreted (Figs. 7–8).

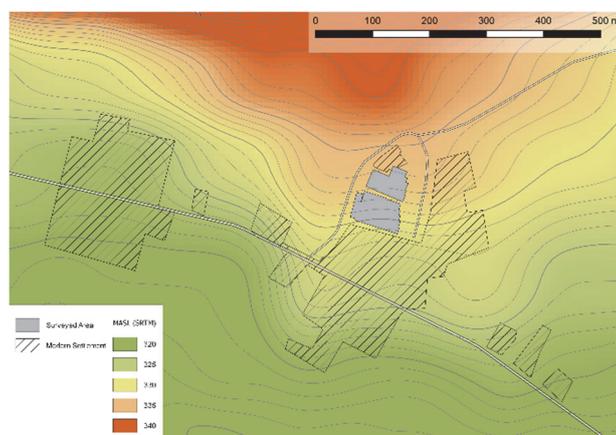


Fig. 6

⁷ LAZAROVICI et al. 2009: 125.

Settlement delimitation/Enclosure

So far, no ditch system was found during excavations⁸. In the magnetogram an enclosure systems seems to be visible now, even if it is represented only by very weak anomalies. In the northern part of the surveyed area a 2.5 m broad ditch is more clearly visible (Fig. 8a). It can also be detected in the southernmost part of the area. A second ditch (Fig. 8b) in front of it can also be seen there. This outer ditch fades further to the north to no more than an uncertain shadow, but it seems enough to allow the reconstruction of a double-ditch system, surrounding the settlement.

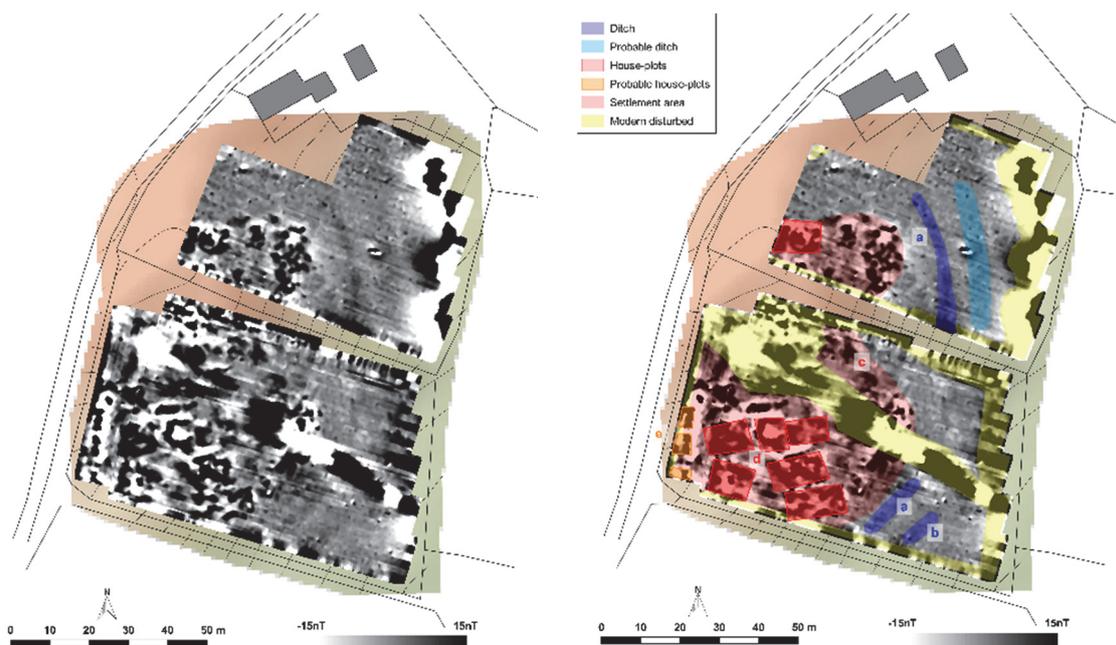


Fig. 7

Fig. 8

Settlement interior/Houses

As on all multilevel-sites, in Izvoare the interpretation of geomagnetical anomalies is problematic, since stratigraphically separated buildings and other structures are condensed to one layer. In Izvoare, this forms a 3500 m² large, dense carpet of anomalies (Fig. 8c), which strength can indicate the depth of a structure as well as the degree of inflammable and/or of burned material from specific houses.

Nevertheless the identification of at least 7 single house plots (Fig. 8d) within 60–110 m² seems justified. They seem to be oriented downhill in east–west–direction, aligned in two rows. Probable another row of houses (Fig. 8e) is just visible under the modern road in the most southwestern part of the surveyed area, but because of the massive disturbances in this strip this has to remain unclear.

Summed up, Izvoare points out the limits of geomagnetic survey. The existence and location of the archaeological features become evident, but to get a greater amount of information on e.g. building size or overlying structures, georadar (GPR) and resistivity-measurements appear to be a better option on this confined area.

RĂUCEȘTI – DEALUL MUNTENI (NEAMȚ COUNTY)

Due to the division of the site of Răucești (mainly Cucuteni A3 and B1)⁹ (National Archaeological Record of Romania – Code 123923.01) into small lots and orchards, the surveyed area is limited to a size of 0.93 ha (Fig. 9). In addition, the remains of the agricultural working make the interpretation of the geomagnetic anomalies a little difficult. For example, trees and modern ditches can appear in the magnetogram as similar to

⁸ LAZAROVICI et al. 2009: 125.

⁹ DUMITROAIA 1987: 21.

archaeological structures. (Figs. 10–11). Further on, the surrounding houses and iron fences disturb the magnetic field at the edges of the surveyed area.

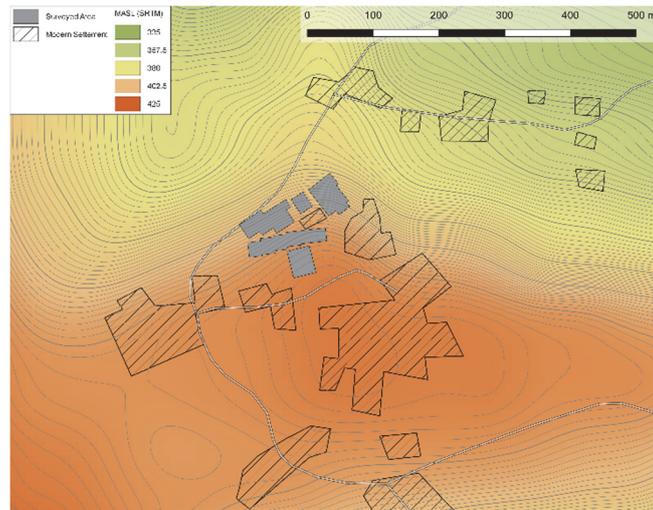


Fig. 9

Settlement delimitation/Enclosure

Nevertheless, the most typical element of a Cucuteni site is clearly visible: The settlement is surrounded by two ditches. These ditches do not form a connected system, but they seem to represent different phases of settlement. In the settlement's center, a 3.7 m broad ditch (Fig. 11a) is visible, 48 m in length. Today, it covers a quarter of a circle with a maximum of 1000 m² at the outermost edge of the promontory, but – considering the steep slopes of the hill – it is much likely that the originally fenced area was significantly larger.

A second ditch (Fig. 11b) was detected 70 – 90 m to the southwest, closer to the foot of the little hill, on which the settlement is located. This structure has a width of up to 7 m and on the lots with grass its course is still slightly visible in the actual terrain. In its southern part, the ditch is accompanied over a distance of 7 m by a smaller, parallel ditch of 1m width (Fig. 11c), perhaps a palisade foundation. The area enclosed by the outer ditch is hard to estimate, as it runs almost straight from the edge of the promontory and then it disappears under modern disturbances, the minimal estimation is about 0.78 ha.

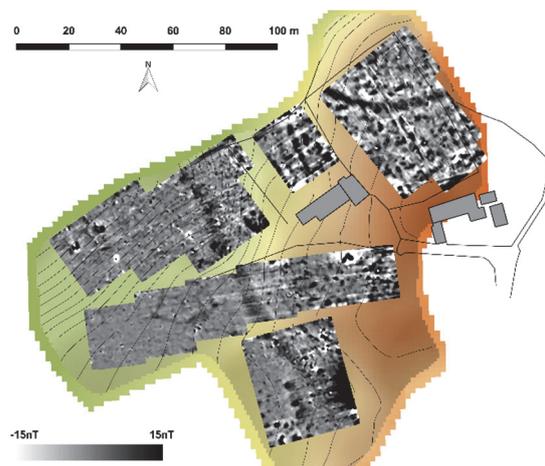


Fig. 10

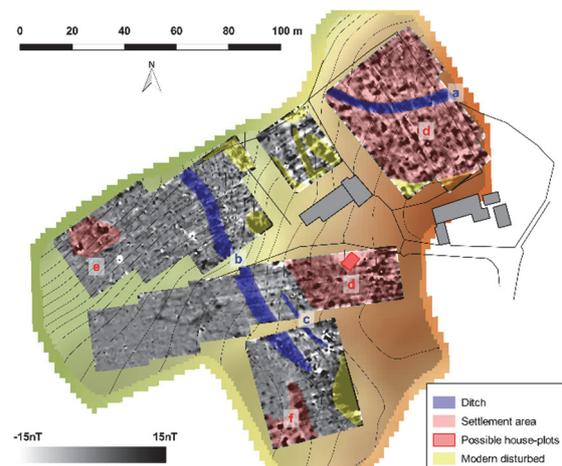


Fig. 11

Settlement interior/Houses

In the settlement, close to the outer ditch only a few pits are visible, while the inner part reveals many strong anomalies (Fig.11d). Unfortunately, no clear plots of burned houses can be detected, only a strong

anomaly in the southwestern part of the settlement may indicate such a structure. But even so, the dense cluster of anomalies on both sides of the inner ditch is an indicator of large amounts of the burned clay from houses. These appear to have been spread evenly by tilling, and this probably blocks the geomagnetic view on possibly better preserved structures deeper in the ground.

Two more areas of anomalies (Figs. 11e–f) are visible outside the ditches, but it remains unclear, if these are pits from prehistoric or from modern times; once more the limit of non–destructive survey is reached here.

FULGERIȘ – LA TREI CIREȘI (BACĂU COUNTY)

This site (National Archaeological Record of Romania – Code 24221.02) with material mainly from the Cucuteni A3 period is another example of a Cucuteni settlement that had to be visited on different campaigns in order to get a full picture of it.

Especially the central part of this site was subject to intensive geophysical survey activities. During a campaign in 2009, conducted by Arheoinvest (“Alexandru Ioan Cuza” University of Iași)¹⁰, cesium–magnetometer (0.87 ha) and, on smaller areas, also gradiometer and resistivity surveys were performed¹¹ (Fig. 12). The primary problem was the small size of the surveyed area, which always led to difficulties in the interpretation of the detected anomalies.

In 2015 the site was surveyed again by the team from Erlangen, this time including also the northwestern, uphill part of the promontory (1.49 ha), on which the site is located. The enlargement of the surveyed area (a total of 1.78 ha) allowed a much better understanding of the site's spatial organization (Figs. 13–14).

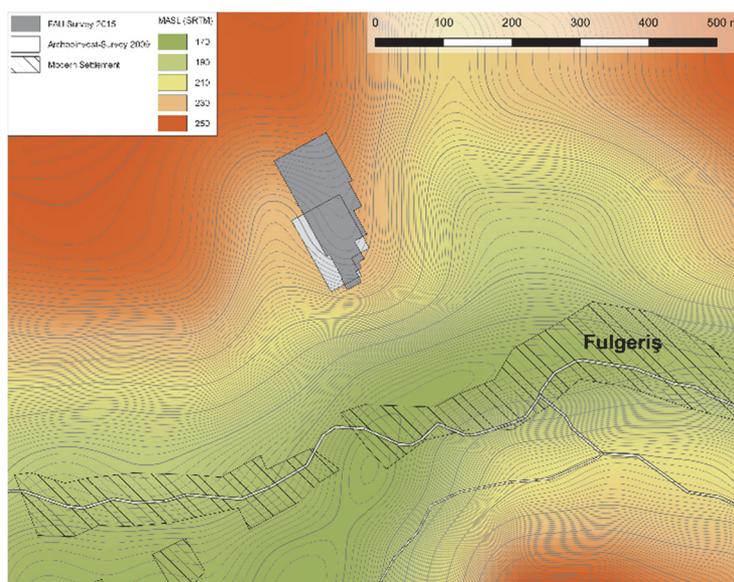


Fig. 12

¹⁰ ASĂNDULESEI et al. 2002.

¹¹ ASĂNDULESEI et al. 2002.

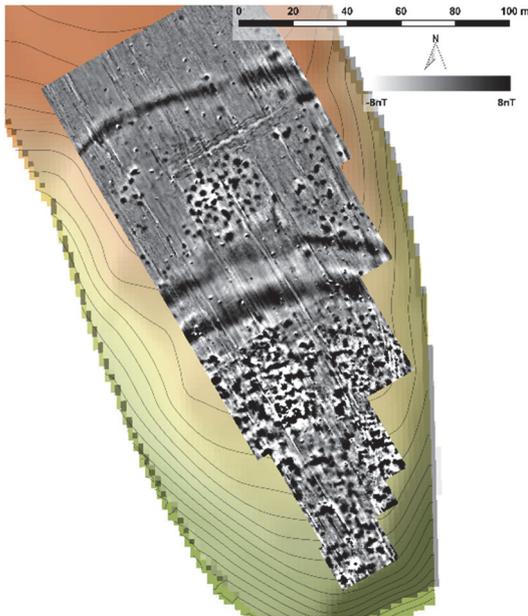


Fig. 13

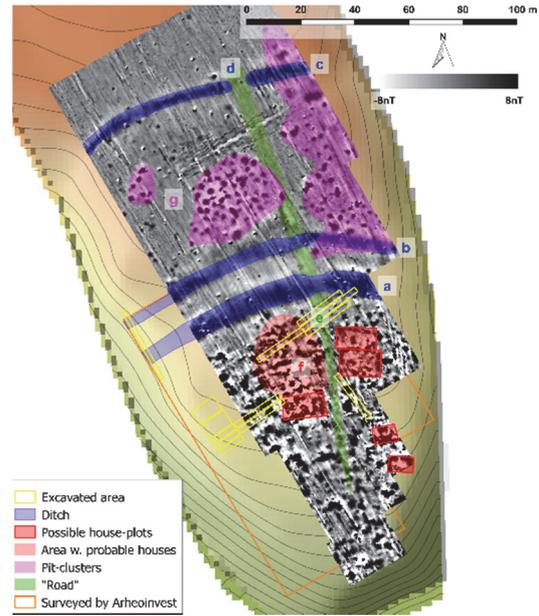


Fig. 14

Settlement delimitation/Enclosure

The magnetogram reveals that the site is secured by three ditches in all. The inner two of them (Fig. 14a–b) are running parallel separated by a distance of 9.5 m, with the inner ditch showing up to 8 m in width, while the second one measures only 5.5 m in the magnetogram. Their slightly outwardly curved course is visible for 110 m, cutting off an area of today's 0.75 ha, on its other three sides bordered by steep slopes. Surprisingly, 59 m beyond the second ditch, a third one was detected (Fig. 14c). This measures about 4 m in width and is running parallel to the two inner ones. A gap of 5.5 m width could indicate an entrance to the enclosed area (Fig. 14d).

Although no direct comments on the chronological sequence of the ditch–system can be derived from the geomagnetic survey, the fact that this gap corresponds to a slight narrowing of the two inner ditches indicates contemporaneity of the three ditches. In addition, following this course the inner part of the settlement is comparatively free of anomalies (Fig. 14e). This can be interpreted as an indicator of a road, dividing the settlement, or at least what is left of it today due to erosion, into two halves.

Settlement interior/Houses

The inner settlement is more difficult to understand. An intervallum of 8–9 m behind the inner ditch stays free of anomalies, but the rest is interspersed with numerous structures, indicating a dense settlement. Clear house plots, like the ones on other sites, are hard to identify because of the scattered pattern of the anomalies, but one can distinguish areas of strong anomalies, including a few linear, southwest–northeast structures (Fig. 14f). Only because of the much better pictures from comparable sites, this area can possibly be interpreted as a row of burned houses, lined up along the road, or rather pathway. Taking the dense cluster of anomalies as indicator of the space covered once with buildings, the built–up area had a size of at least 0.65 ha. Considering the erosion at the steep slopes of the hill, a significantly larger settlement may have existed there.

The space between the two inner ditches and the third one is partly filled with clusters of anomalies, which can be interpreted as pits up to 2.5 m in diameter (Fig. 14g). There are no signs of buildings, burned or unburned, in this area and it is unclear whether these pits are connected with the Cucuteni period¹². With a possible absence of Cucuteni structures here, the question for the sense of the outer ditch would arise. With this question of the chronological position of a single, non–distinctive feature, another limit of non–invasive

¹² A friendly remark by L.–E. Istina speaks of mainly bronze–age finds in this part of the site.

surveys is reached, but minimal–invasive methods, such as narrow–meshed field surveys or test trenches at a few of these pits could to solve this problem.

STĂNIȘEȘTI – LA CIMITIR (BACĂU COUNTY)

The promontory on which this site (National Archaeological Record of Romania – Code 25530.01) is located measures about 0.5 ha. Most of the site was covered by a transect of 0.67 ha, ranging downhill from the adjacent next hill, crossing an inter–hill saddle and ascending to the site (Fig. 15).

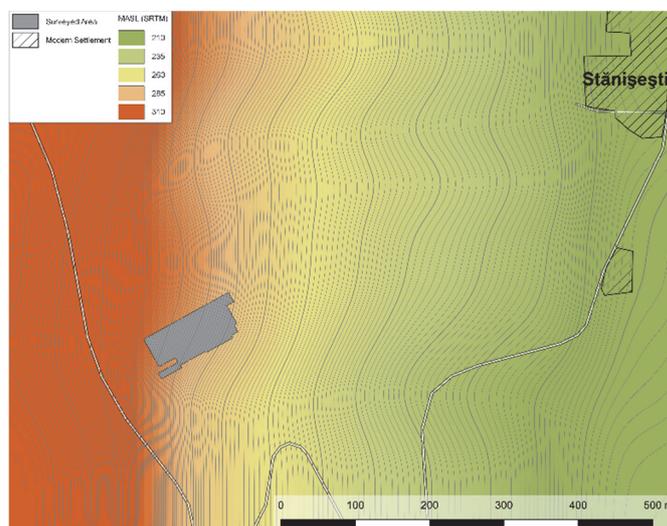


Fig. 15

Although bad surface conditions led to a non–optimal magnetogram, the result clearly indicates the absence of the typical burned houses or massive ditches, which could be expected on the basis of the surface finds – not only ceramic, but also large concentrations of burned daub (Figs. 16–17). The main geomagnetic features are large, amorphous anomalies, encircling the promontory (Fig. 17a). Because of the unclear borders of the anomalies, it is not possible to decide, whether they are caused by two surrounding ditches. An alternative would be the remains of pottery and daub, eroded from the site because of heavy ploughing and steep grades, and accumulating at the foot of the hill.

The intense tilling of the site seems to have destroyed most of the archaeological structures in the ground, and only some strong positive anomalies on top of the site can be interpreted as the remains of pits and perhaps house plots. Surprisingly, in the southwest of the surveyed area, two parallel, curvilinear structures are visible (Fig. 17b). At first sight, they seem to indicate a circular enclosure with a double ditch, perhaps connected with Bronze–Age finds from this site. However, as they run directly down the steep hill, an interpretation as erosion gullies is equally probable.

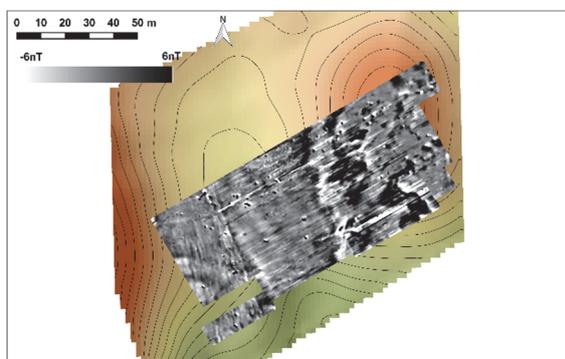


Fig. 16

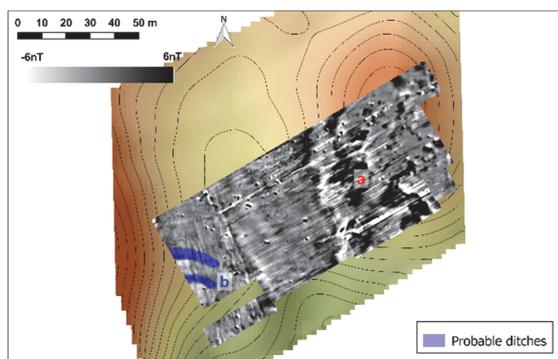


Fig. 17

To sum up, Stănișești is a good example for the limited possibilities of geomagnetic surveys on small areas with a strong relief, which makes a differentiation between archaeological features and geomorphologic effects appear as a nearly impossible task.

ȚIGĂNEȘTI – VULTURENI (BACĂU COUNTY)

The site is located on a little hill between the villages of Țigănești and Vultureni, located close to each other (Fig. 18). As the hill-top plateau measures only c. 2 ha, the surveyed 1.44 ha may be considered to cover the biggest part of the presumed settlement. Unfortunately, the magnetogram shows a good example for the impact of modern agricultural implements on archaeological sites (Fig. 19). Only a few anomalies can be interpreted as remains of pits and perhaps a house plot. In contrast, the biggest part of the picture shows only massive parallel lines as indicator of heavy, deep ploughing. Regardless the ceramic finds on the surface, any possible structures in the ground seem to have been eliminated by these activities.

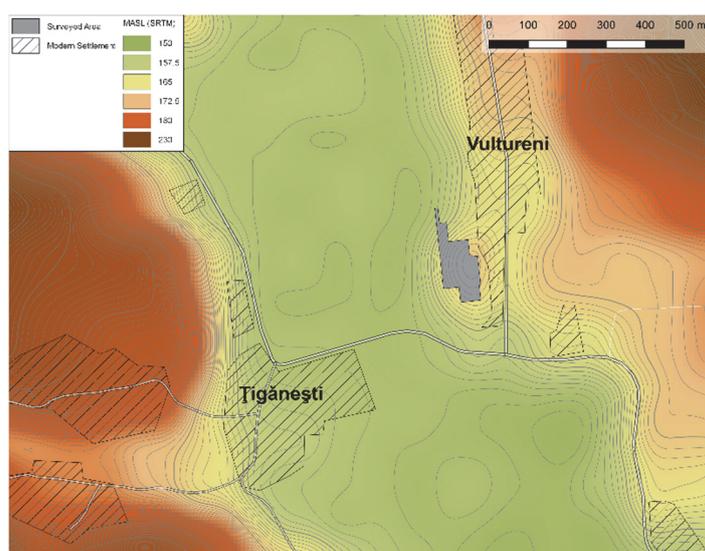


Fig. 18

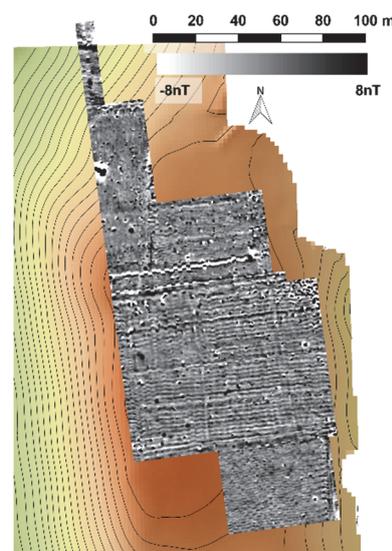


Fig. 19

CONCLUSIONS

Together with other sites, investigated already in earlier campaigns, the geomagnetic surveys in the spring of 2015 show the big range of possible layouts for Cucuteni settlements (Fig. 20). Their size, as far as it can be determined, range between 0.29 ha (Prohozești) and 6 ha (Scânteia). If the inner parts of Ruginoasa and Răucești represent particular phases rather than an “acropolis” in the center of the site – an issue that can be verified only by excavations – we have reasons to think about heavy fortified settlements of not much more than 0.1 ha in size. This would raise the question whether these small sites were really more or less economically independent villages, or part of a bigger network of interacting, specialized settlements.

In any case, the missing uniform pattern not only in size, but also in the spatial order of the examined sites leads to this question. Even with all of them located on the “classical” promontory position, the only connecting feature are the massive, multiple ditch-systems, surrounding all sites far beyond the simple need of delimitation. Even small, probably only seasonal settlements, such as Prohozești¹³, boast a triple ditch, not to mention the probably sevenfold ditch-system at the only slightly bigger site of Ruginoasa. As settlement size and complexity of delimitation are obviously not connected at all, once more possible differences in function and/or importance, be it economic or spiritual, must be taken into consideration.

¹³ CHAPMAN, MONAH 2007: 87; MISCHKA 2009: 8–9.

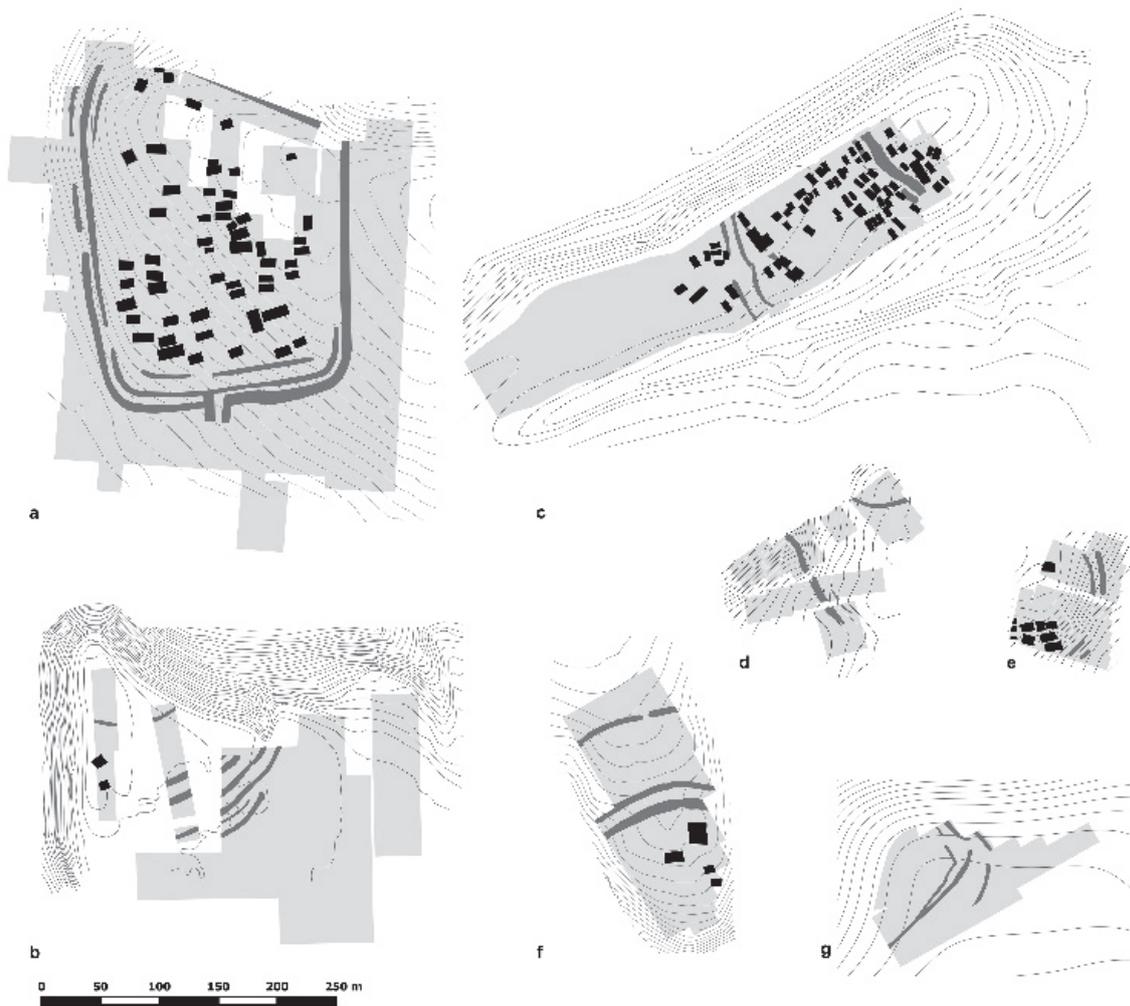


Fig. 20

Such issues lead to the next stage of investigation. The information derived from geophysics can now be combined with the technique of cost-effective “target excavations”¹⁴. Test trenches should deliver ceramic and lithic finds, combined with an archaeozoological assemblage, botanical macro-remains and radiocarbon-datings at the level of single households, for a bigger number of houses in each settlement. Hopefully, these data can provide new knowledge on possible inter- and intra-site specialisation, chronological development and diverse regional trends. Such a combination could lead to a much enlarged understanding of the Cucutenian social order and evolution. Without such knowledge the processes specific to the connected regions of prehistoric eastern Romania will remain impossible to understand.

¹⁴ MÜLLER, VIDEIKO 2015: 71; BURDO, VIDEIKO 2015: 113.

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All pictures by Carsten Mischka, except no. 2 by Imren Tasimova; no. 20 uses information from the magnetogram in DUMITROAIA *et al.* 2012.