GEOPHYSICAL SURVEY AT BRONZE AGE SITES IN SOUTHWESTERN SLOVAKIA: CASE STUDIES OF FORTIFIED SETTLEMENT IN HOSTE AND BURIAL GROUND IN MAJCICHOV

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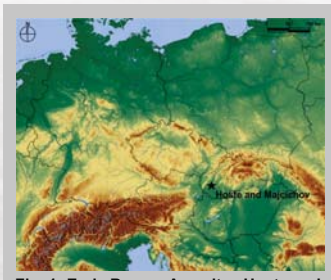

Fig. 1: Early Bronze Age sites Hoste and Majcichov on map of Central Europe.

Poster presents results of the geomagnetic prospection at two Bronze Age sites in southwestern Slovakia (Fig. 1) that are well-known in archaeological literature since the most important finds, discovered during rescue excavations in the second half of the 20th century, have been published. Nevertheless, archaeological evidence from settlement in Hoste and its adjacent burial ground

Fig. 2: Maps of anomalous magnetic fields at archaeological sites in Hoste and Majcichov.

in Majcichov can be still described as fragmented – composed of fragmentary data without any complex information.Therefore, our aim was to obtain a large-scale conclusive picture of the sub-surface both in the settlement and in the burial area (Fig. 2) using geophysical prospection methods.

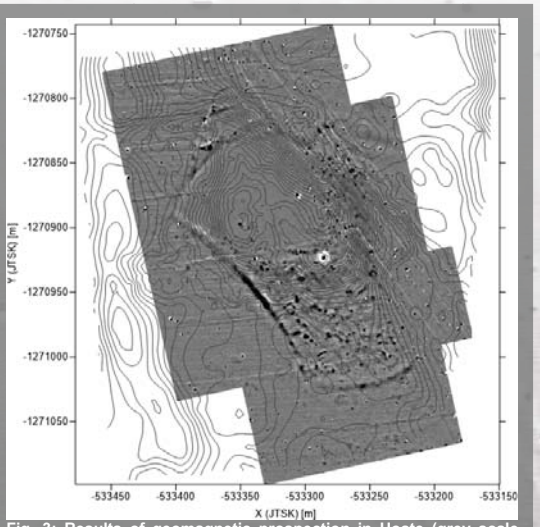

Fig. 3: Results of geomagnetic prospection in Hoste (grey scale -10/+10 nT) with contour lines of terrain (contour step 10 cm).

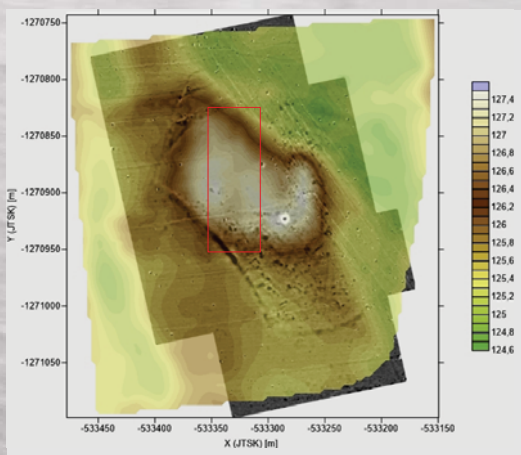

Fig. 5: Model of georelief of loess dune in Hoste compared with map of anomalies to see, if the fortification was adopted to terrain conditions.

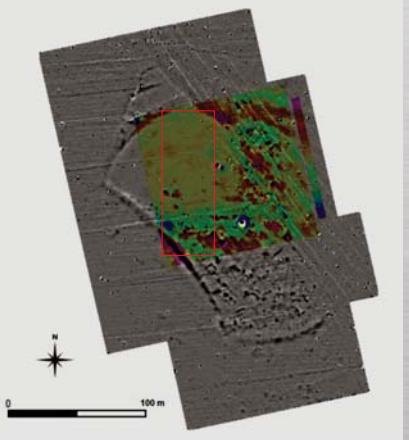

Fig. 6: Comparism of two different magnetometric methods used in Hoste. Smaller area in colour scale was measured by ceasium magnetometer (-5/+5 nT), the larger area in grey scale by fluxgate magnetometer (-5/+5 nT).

The second analysed site is located in Majcichov (Fig. 4), where a burial ground dated to transitional period from Early to Middle Bronze Age was excavated in 20th century. There were excavated inhumation as well as cremation graves. It is located 1200 m from the fortified settlement in Hoste and dated to the same period (Fig. 2). Therefore, these two sites were probably in close relationship. Our aim was to discover if there are any possible graves still and to identify the extent of the burial site. Area of more than 4 ha was geomagnetically measured. Archaeological interpretation of data from Majcichov is more complicated as the prospection revealed significant number of dipole anomalies and contemporary influences related to modern use of the site (for sand exploitation, agriculture and fishing). Nevertheless, there are some concentrations of features that could be potentially graves (intact or re-opened) according to their orientation and size.

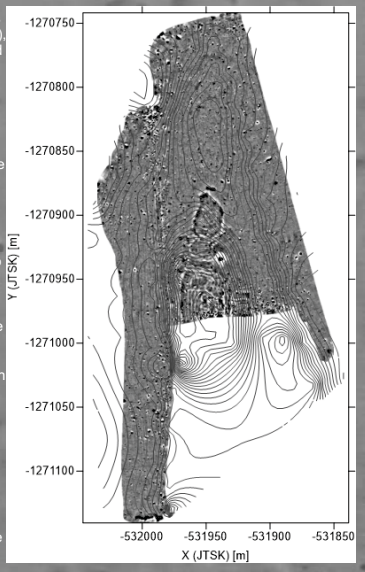

Fig. 4: Results of geomagnetic prospection in Majcichov (grey scale +- 3 nT) with contour lines of terrain (contour step 8 cm).

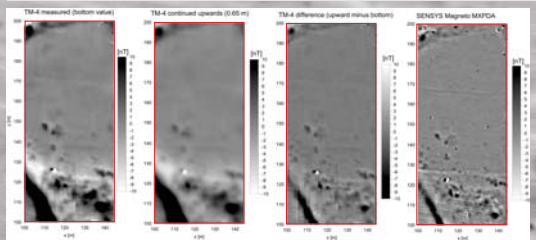

Fig. 7: Comparison of measured data from caesium and fluxgate magnetometer.

A part of the data from Hoste was acquired using TM-4 caesium magnetometer at first and later it was measured again and in a wider area using Sensys Magneto MXPDA fluxgate magnetometer (Fig. 6), what enables comparison of sensitivity and accuracy of both used methods (Fig. 7). As it is clearly visible in Fig. 7 (right-hand situated 2 maps), resolution of directly measured gradimetric data is higher than the numerically evaluated version from caesium magnetometer (this is partly given by a different separation distance among acquisition lines).

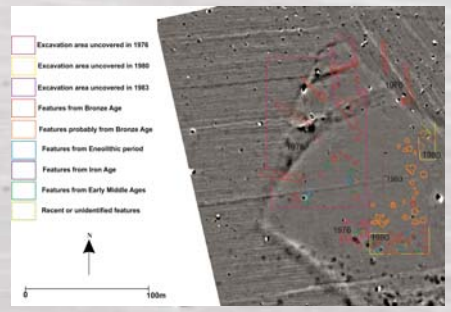

Fig. 8: Areas uncovered during rescue excavations in Hoste.

Very important advantage of obtained results is possibility to reconstruct extent (Fig. 8) of previous rescue archaeological excavations in the 20th century. There is missing information about exact uncovered area and geomagnetic data helped us to get more precise overview. As it is visible on geophysical map (here the majority of magnetic anomalies is missing) (Fig. 3, 5, 6) excavations were focused on the northern part of the site which was most dominant in the past compared to surrounded flat land.

Fig. 9: Georeferenced trench from 2016 on map of anomalies. Burned daub layer in the ditch filling corelates with measured signal.

Magnetometric results helped to identify fortification system of settlement in Hoste as a whole (Fig. 3, 6). It consisted of large and deep enclosure ditch with a system of smaller ditches on the northern part. Comparism of excavation results from 2016 with map of anomalies (Fig. 9) proved that the most significant feature is ditch and that the signal comes from burned daub layers in the ditch. The unique shape of the fortification (in terms of Central European Bronze Age research) together with its size and the fact that the settlement is not completely destroyed (Fig. 3, 5, 6, 8) confirmed that the geomagnetic research is valuable for our purpose.

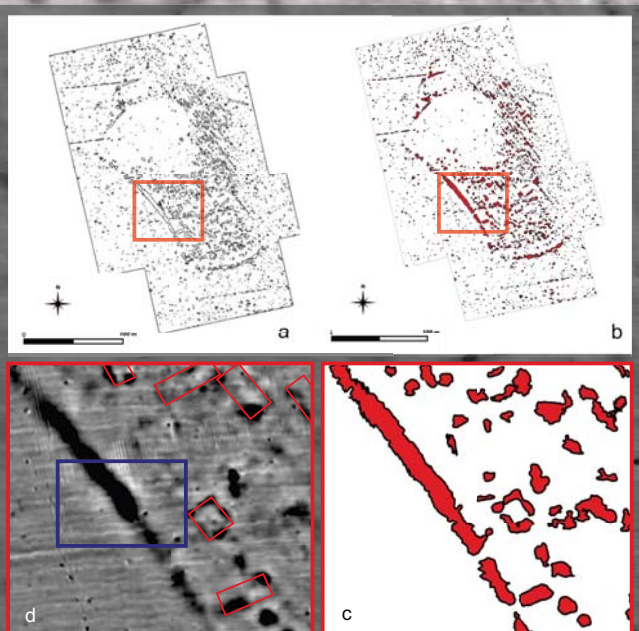

Fig. 10: Work flow (a, b) and example of result of Q-GIS using (c); a - creating contour lines (r.contour level); b - creating polygons from contours (lines to polygons); c - chosen part with already filtered data (using geometry tools and filters); d - intepretation of possible residential features.

Poster was supported by projects: MK-665/2016/1.3; APVV - 14 - 0550; VEGA 0150/15

Similarly, no features that could be traditionally interpreted like houses or residential structures have been excavated in Hoste so far. Our results show an area of smaller rectangular features which are presumably remains of houses (Fig. 10:d). However, using only typical archaeological interpretation of magnetometric data could lead to focus attention only on possible residential structures. Therefore, we used also Q-GIS (Fig. 10), where it is possible to calculate area of features and to filter it afterwards as well as to filter data based on their nT values. These values vary for different deposits and contexts. Prehistoric features with significant contrasts include pits with organic content, ditches filled with various layers,fire hearths and kilns, burned houses, etc. Furthermore, the results indicate that the settlement was concentrated inside of the fortification, without any marked extensions or re-buildings of the settled area. These values vary for different deposits and contexts.