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Near-Surface Geophysical Surveys at Neolithic Locality Petnica, Serbia

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SUMMARY

In September 2012, at the location in front of the Petnica cave, geophysical surveys were carried out. The Petnica site is well known for its archaeological value. The cave and its immediate surroundings are the oldest evidence of human life in western Serbia. The first complete Neolithic habitat in Serbia, some 6000 years old has been dug out right in front of the entrance to the cave. The main goal of the research was to help archaeologists determine, through various geophysical methods, the boundaries of the archaeological site in front of the cave and the depth of the layer with potential archaeological remains inside the cave. To obtain this goal we apply magnetic, resistivity, and GPR surveys. In this paper we will present results of resistivity survey. We determine existence of archaeological remains at all three investigate locations.

Introduction

In September 2012, at the location in front of the Petnica cave, geophysical surveys were carried out. The purpose was educational and demonstrative for the students-participants of 2nd International Archaeogeophysical Student Field Camp and geology and archaeology program of Petnica Science Centre. The Petnica site is well known for its archaeological value. The cave and its immediate surroundings are the oldest evidence of human life in western Serbia. The first complete Neolithic habitat in Serbia, some 6000 years old has been dug out right in front of the entrance to the cave, the second site, discovered inside the cave dates back to Roman times.

The main goal of the field camp was to help archaeologists determine, through various geophysical methods, the boundaries of the archaeological site in front of the cave and the depth of the layer with potential archaeological remains inside the cave. To obtain this goal we apply magnetic, resistivity, and GPR surveys. In this paper we will present results of resistivity survey.

Methods

In practice the limitations of a specific method and site-specific constraints are commonly confronted during geophysical studies. During this field camp the problem was reduced by combining and integrating the results from different methods (von der Osten-Woldenburg H., 2005).

For the archaeological surveys, we used GPR (Ramac, Mala) consist of Central unit CU II, 250, 500 MHz shielded antennas with a distance measuring wheel. GPR survey was undertaken at Petnica in front of Petnica cave on three fields 10x11m. Spacing between profiles was 1m. Measure information: Sampling Frequency 6122 MHz, Number of Samples 446, Time Window 73 ns .Processing information: move start time, background removal, band pass frequency.

For the geomagnetic survey, we used Gem Systems Overhauser GSM magnetometer with two probes (gradiometer). Geomagnetic data acquisition was carried out in three areas. Each individual area is 110m². Magnetic profiling were oriented approximately in a north-south direction, and opposite. Distance between profiles was 1m, sampling was 1s.

Geoelectric data acquisition was carried out in three areas within parallel profiles. Distance between profiles was 1m, spacing between geoelectric measuring points was 1 m, too. It was used earth resistivity meter SAS 300 B (ABEM, Sweden). Wenner's electrode configurations was used. In Area 1 there were three depths of investigation per measuring point 0.5, 1 and 1.5 m (three different spacing between electrodes). In Area 2 there was only one depth of investigation 0.5 m. Area of investigation was extended in 2 directions because of anomaly. In Area 3 there were two depths of investigation 0.5 and 1.5 m. Inside the cave, Schlumberger geoelectric sounding was applied.

Results

The measurement results of all three methods partially coincide. At the first investigation area, anomalies of all three methods match in the central part (shown with red lines) and eastern part (shown with black lines) of investigation area (Figure 1). The anomaly in the central part of the area is observed at a depth of about 20 cm at GPR slice, while the of apparent resistivity anomaly is observed at depth of 0.5 m. Anomalies in the eastern part of the area is observed at a depth of about 20 cm at GPR slice, while the apparent resistivity anomaly is observed with the depth level of 0.5 m. Anomaly at the beginning of the first profile (marked as red ellipse), which can be seen on the apparent resistivity map partially coincide with anomaly on radargram. On the apparent resistivity map, this anomaly is seen within three depth levels and extends to area 2, while this anomaly on the GPR slice is only on 0.33 m depth. At the investigation area 2 there is anomalies both on GPR slice and apparent resistivity map. The depth of this anomaly is less than 0.5 m. At the investigation area 3 anomalies are observed on all three applied methods. Estimated depth of these anomalies is 20 cm on GPR slice. Apparent resistivity anomaly expands with depth increasing.

Figure 1 Correlation between applied geophysical methods in Area 1.

Conclusions

Neolithic archeological site is very complex, and remains can be found at different depth levels. Our research concludes existence of archeological remains at 0.5m, 1m, and 1.5m depth level. Furthermore, to do valid archaeological interpretation of geophysical data, we need to extend research area, so we can see better geometry of anomalies and make better interpretation of objects causing them.

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References

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