484 FIRST CONGRESS OF THE BALKAN GEOPHYSICAL SOCIETY
P-AR13 PROSPECTING OF A PREHISTORIC SETTLEMENT USING GEOPHYSICAL METHODS

Abstract
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The paper presents the possibilities offered by geophysical methods for prospecting archaeological sites, more specifically a prehistoric settlement. These methods are applied occasionally in archaeology by enthusiastic geophysicists, or very rarely by specialized organizations. An expansion of these activities began to be noticed only in the past two decades, consisting in the more extensive use of geophysical methods, as well as in developing new methods and equipment especially for the needs of archaeology, greater variety in the types of sites explored, setting up of specialized research teams and organizations and - last but not least geophysical methods acquire increasingly a leading role for starting and guiding of archaeological excavations.

In 1984, a Laboratory on Archaeometry was established with the Institute of Thracology of the Bulgarian Academy of Sciences, actively applying varied geophysical methods for prospecting, exploration and documentation of different archaeological sites located both on land and under water. A number of specialized devices were designed and developed at the Laboratory, as well as software for processing the results of the geophysical prospecting.

In 1995, a research team of the Archaeometry Laboratory conducted complex geophysical exploration of a prehistoric settlement, comprising electrical profiling, electrical sounding, gradientometry of the magnetic field and metal-detecting.

The archaeological site overlies an old non-flooded river terrace, 300-400 m long and about 150 m wide - a flat terrain with a slight slope to the east. The eastern part of the ancient settlement was explored through archaeological excavations, while the rest of its outlines have not been specified.

The measurements according to the electrical sounding method were conducted in the central and western part of the site. Restricted parametric measurements were made in immediate proximity to earlier archaeological excavations. The results of the measurement yielded information about the stratigraphic structure of the region, as well as about the structure of the anthropogenic layer.

The first layer consists of humus materials, plant roots and rock fragments. It is 0.15-0.25 m thick and is characterized by resistivity of 50-150 Ohm.m.

The second layer is entirely of anthropogenic nature, being composed of clayey materials containing an abundance of ceramic and rock fragments and stones, which are from destroyed buildings. The thickness of that layer varies, reaching 1.75 in. Its resistivity also varies within very broad limits, and according to that parameter the layer can be divided into two sub-layers, which probably resulted from two different construction stages. The layer becomes considerably thinner westward, which probably marks the boundary of the settlement.

The third layer consists of materials obtained from weathered rocks, materials transported by the erosion of the mountain slopes and alluvial materials from the river terrace. It is up to 3 in thick and is characterized by a low resistivity of 30-40 Ohm.m.

The fourth layer is the geological foundation built up of metamorphic rocks: mica shales and gneisses, cut by quartz veins, Only the upper boundary of that layer has been identified at a depth of 1. 5 to 4.5 in, sloping eastward. The resistivity of the layer varies from 80 to 140 Ohm. in.

Against the background of this four-layer geo-electrical section, a negative zone with N-S orientation and a width of about 20 in was identified in the central pan of the site. Future studies will determine the origin of that

zone - natural or anthropogenic.

Electrical profiling with Wener configuration was used to explore two sectors with a total area of 1500 m2, located in the central part of the site. The measurements localized several zones characterized by anomalously high values of the apparent resistivity. Archaeological excavations were carried out in one of these zones, revealing an accumulation of stones which came from ancient constructions. Two of the anomalous zones result from contemporary building activity. The exploration of the remaining anomalous zones is forthcoming.

Measurements of the vertical gradient of the Earth's magnetic field were made on the sectors explored by electrical profiling. The aim of these measurements was to identify zones built of fired materials: remnants of ancient fireplaces or ovens. Several such zones were localized and one of them was explored through archaeological excavations, revealing fragments of highly baked'clay materials.

Measurements with metal-detectors were carried out parallel to the magnetic measurements with a view to eliminating contemporary metal litter and false magnetic anomalies.

As a result of the geophysical prospecting, the teams of archaeologists obtained valuable information about the structure and propagation of the settlement as a whole, as well as a number of interesting and promising sections inside it. Many new questions were raised, but their answers will be found through the joint efforts of geophysicists and archaeologists.

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