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Unfolding the Neolithic wetlands landscape of Szeghalom-Kovácshalom in Hungary

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INTRODUCTION

The archaeological site of Szeghalom-Kovácshalom is located in an agricultural area to the north of the Sebes Körös River and southwest of the modern village of Szeghalom. The site represents a Tisza settlement type with some intrusive Bronze Age finds (Ecsedy *et al.* 1982: 161). The settlement covers nearly 90 ha, comprising a relatively small tell that is surrounded by an extensive flat site with origins in the Szakálhát phase of the Middle Neolithic (5200–5000 BC cal.) and undergoing expansion during the Late Neolithic Tisza phase (5000–4500 BC cal.). The geophysical campaign that continued for five seasons, from 2010 to 2014, was carried out under the auspices of KRAP (The Koros Regional Archaeological Project), which has been investigating various Neolithic and Early Bronze settlements in central-eastern Hungary since 2002. The goal of the geophysical research, which was accompanied by further modules of the KRAP project, such as surface surveying, test excavations, coring for chemical analyses, and topographic mapping, was to contribute to an understanding of tell formation processes and the evolution of farming societies in southeastern Europe (Yerkes 2010).

GEOPHYSICAL METHODS

The geophysical prospection survey around the Szeghalom-Kovácshalom tell made use of the vertical magnetic gradient for extensive mapping of structural settlement remains. Techniques of electrical resistivity tomography (ERT) and mulifrequency EM (operating at five different frequencies: 5010, 10050, 20010, 30030, 40050 Hz) were employed to investigate the stratigraphy of the tell and to confirm the location of the palaeochannels around it. ERT and ground-penetrating radar (GPR) were further used to explore the efficiency of mapping daub-based structural remains.

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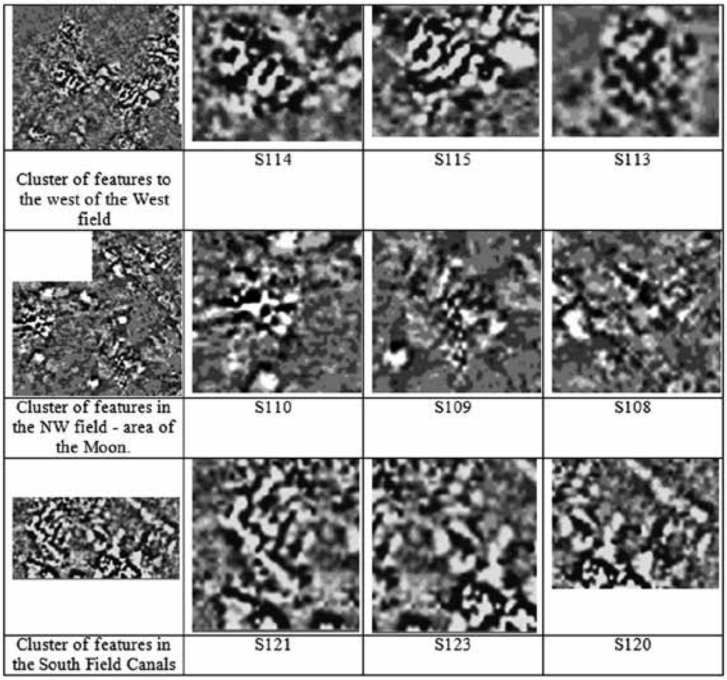

Fig. 1. Typical houses identified by magnetic measurements at Szeghalom-Kovacshalom. Magnetic signature of structures varies depending on their preservation; some are well defined with a very strong magnetic signature, whereas others are diffused, probably as a result of cultivation practices or fluvial erosion

GEOPHYSICAL RESULTS

Geophysical prospection identified numerous elements of the Neolithic settlement, which exhibits a large amount of variation in terms of dwelling distribution and house size and orientation. The magnetic signature of the structures is relatively strong, indicating burning residues (Fig. 1). Some of these features are characterized by a very clear outline, while others exhibit a fuzzy signal that can be attributed to collapsed roofs or overall burning of the houses, or to topsoil disturbance by plowing. Finally, the internal organization of the structures frequently includes inner divisions that partition the structures into three or more compartments. GPR signals above the structural remains were not that informative, probably due to the high conductivity of the clay soils. On the other hand, GPR has given some partial evidence for the location of previous excavation trenches on the tell.

More than 140,000 field data were collected from 28 ERT transects (total length of 5 km) in the area of the tell. The inverted pole-dipole ERT results indicated that the paleomeander around the tell registered with low resistivity values due to the fine clayey material that filled the old river bed and generated a large resistivity contrast with the surrounding material (Fig. 2). The paleomeander is deeper at the east end of the tell, reaching a maximum depth of 2.5 m, while its depth does not exceed 1.7 m at the northern and western parts of the tell. The top soil and

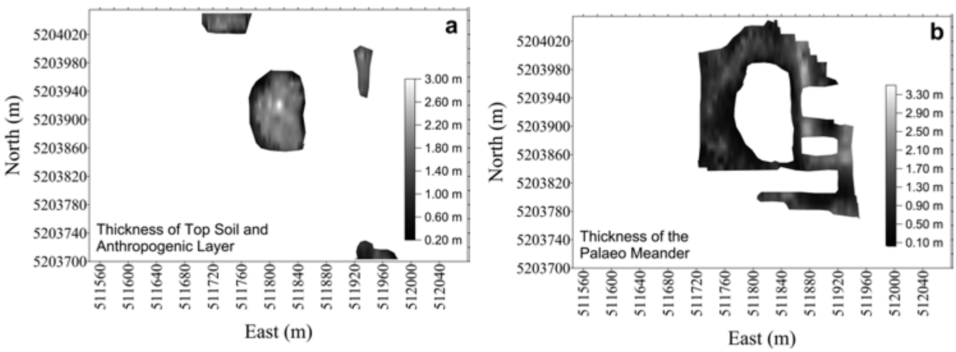

Fig. 2. Spatial variation of: (a) thickness of top soil and anthropogenic layer and (b) thickness of the paleo meander as shown by the combined interpretation of soil horizons mapped with electrical resistivity tomography

anthropogenic layer on the tell have a maximum depth of almost 3.2 m below the summit. The thickness of the cultural layers gradually decreases, reaching about 0.5 m at the edges of the tell. Correlation between the EM and ERT results indicated that the tell is more resistive than the geological banking. Three ranges of resistivity were observed: less than 35 ohm-m around the tell, between 35 and 70 ohm-m close to the elevation and more than 70 ohm-m on the top. Magnetic susceptibility seems to define clearly the outline of the tell. Based on the integrated results of the magnetic, GPR, EM and ERT surveys, the tell can be measured at about 120 m by 75 m, giving a total area of 9,000 m^2. This puts it in the smaller-size category of tells according to the classification by Kalicz and Raczky (1987: 16) for Tisza-period tells.

Magnetic susceptibility samples were collected from a profile of a trench that was opened on the tell. The results indicated that the highest values of induced magnetization of soils were correlated with layers with little or no archaeological material zones, suggesting significant disturbance of the stratigraphy, probably from past excavations. Increased magnetic susceptibility values were registered also where midden layers containing mud plaster floor remnants were found.

FINAL REMARKS

The results of the geophysical campaigns provided a more holistic and detailed picture of the settlement pattern at the archaeological site of Szeghalom-Kovácshalom. Almost 50 ha were covered with the magnetic survey (the largest high-resolution geophysical survey that has ever been conducted in Hungary), bringing to light more than 160 traces of structural remains and many more pits and other features manifesting intensive habitation of the site (Fig. 3). The structures are of oblong shape with similar dimensions around 17–25 m by 8 m and most of them can be considered as thermal features, with intense heating/crafting activities in their interior. They seem to consist of two or three compartments/divisions (representing well the Tisza settlement house type) and in between the houses a number of

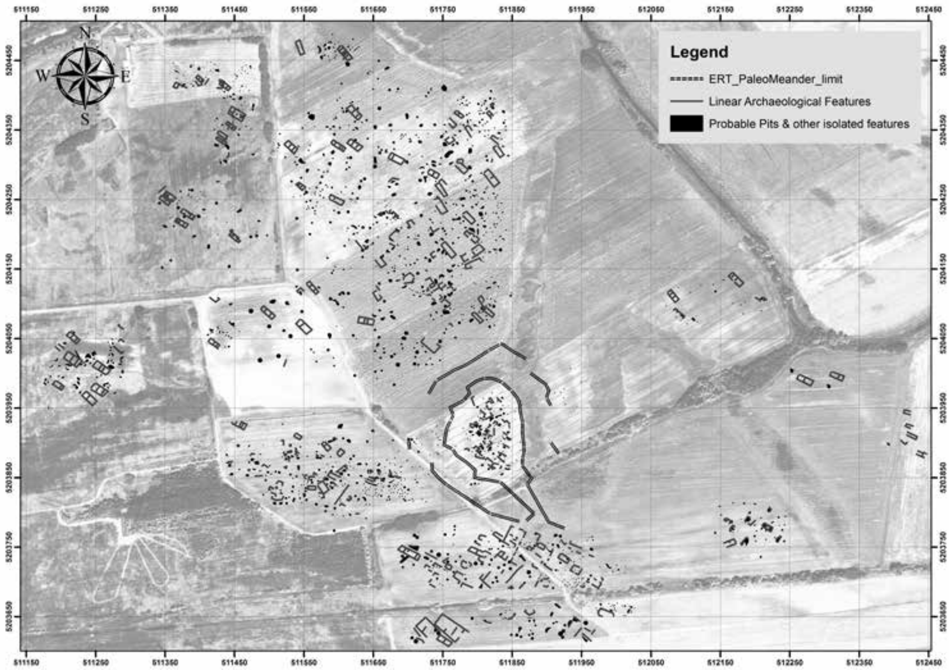

Fig. 3. Part of the integrated image of the results of the magnetic survey at Szeghalom-Kovácshalom. Diagrammatic interpretation of the geophysical anomalies overlaid on the satellite image of the region

pits can be recognized. Excavations on the spot of several structures demonstrated that the magnetic traces were produced by burnt daub.

The built environment of the site seems to have been constructed around a buffer zone of about 100–200 m surrounding the tell. It shows distinct variations differentiating two sectors, one densely settled to the south of the tell and another one with a more dispersed character represented by clusters or neighborhoods of houses. The type of houses in the aggregated flat settlement to the south of the tell deviate from the Tisza type of dispersed farmstead that is found to the north and east of the settlement. This indicates a contemporaneous phase between the tell and the flat settlement, which is also supported by radiocarbon dates. It remains unclear whether the flat settlement sectors were created as a result of gradual population shift in search of exploitable land or temporal landscape changes resulting from the dynamics of river channels in the neighborhood of the settlement. It is likely that the tell was surrounded by paleomeanders that formed a natural defensive ditch.

Having acquired such a wealth of information regarding the spatial distribution of the recognized structural remains of the site, GIS analyses using indices such as average nearest neighbor analysis, Thiessen polygons, and hot spot analysis, allowed us to trace trends and anomalies in community-level organization (Niekamp and Sarris 2014).

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