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Geophysical prospection in the territory of the Roman town of Aesernia, central southern Italy

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INTRODUCTION

The geophysical prospection survey at Isernia constitutes a ground-based remote-sensing research module of the Aesernia field survey project (Stek *et al*. in press). This is a subproject of the "Landscapes of Early Roman Colonization project", funded by NWO (Netherlands Organization for Scientific Research) and based at Leiden University and the Royal Netherlands Institute in Rome, which is implemented in Molise in collaboration with the Soprintendenza per i Beni Archeologici del Molise (Stek and Pelgrom 2013). The project investigates the rural settlement organization of the Roman towns of Venusia and Aesernia through conventional surface survey techniques and remote-sensing approaches (aerial imagery and geophysical prospection).

Five different sites in the area of Isernia were prospected using an integrated strategy, namely magnetometry, soil resistance and ground penetrating (GPR) techniques. More than 16,820 m^2 were prospected with a large degree of overlap between different methods.

RESULTS

Of the five sites that were surveyed, three produced significant results. Site A205 is located in the saddle between the valley of Fonte Salomone and the plain of Perete, just north of the Fonte S. Angelo hamlet. The archaeological fieldwalking survey of the site was carried out in October 2011 and resulted in the identification of a dense scatter of pottery (including black gloss, African red slip wares, plain and coarse wares, some recognizably Late Antique in attribution,

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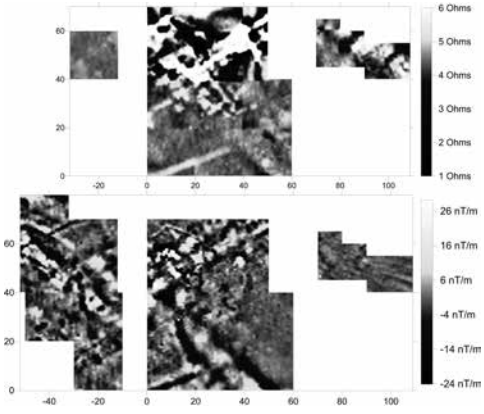

Fig. 1. Site A205. Top: results of the soil resistance survey; bottom: results of the vertical magnetic gradient survey

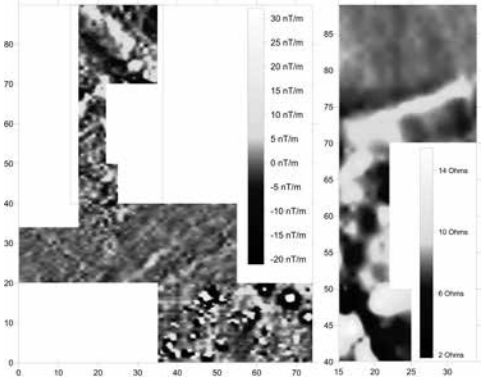

Fig. 2. Site A224. Left: results of the vertical magnetic gradient survey; right: results of the soil resistance survey limited to the upper northern part of the site

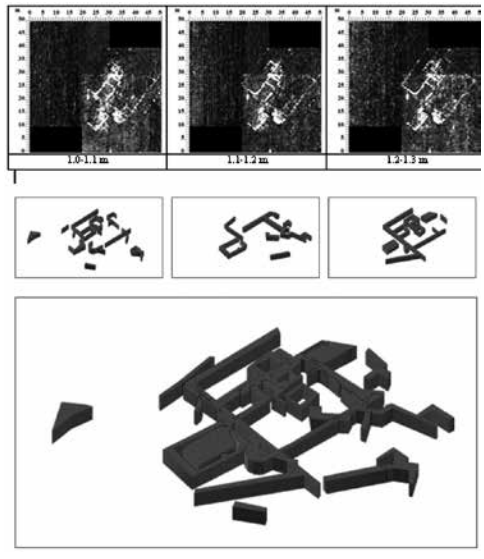

Fig. 3. Site A232. Top: GPR depth slices for depths of 1.0–1.1 m, 1.1–1.2 m and 1.2–1.3 m. The light colours indicate the intensive reflectors as registered by the NOGGIN_PLUS 250MHz GPR unit; middle: 3D reconstruction of the diagrammatic interpretation of geophysical anomalies (from left to right: GPR, magnetic, resistivity); bottom: synthesis of the 3D reconstruction indicates a clear outline of a Roman villa. The reconstruction was made as a primitive prototype, considering not so much the depth of the buried architectural remains, but traces registered by all methods, contributing in this way to a full description of the outline of the complex. The 3D reconstructions were carried out in ArcScene

amphoras and *dolia*, glazed wares) and a large quantity of roof tiles, which are ubiquitous in the field. Surface finds indicated that occupation of the site spanned a period from the Roman Republican to the late Imperial period, with some materials dating to the modern period. The geophysical results provided evidence of a number of features that could be interpreted as a large complex, 50 m (E–W) by 45 m (N–S). The clearest signals were produced by the GPR measurements, which suggested a burial depth of about 80–120 cm below the ground surface. All methods provided comparable results and their interpretation indicated that the antiquities may belong to a large installation apparently in relative good condition.

The fieldwalking surface survey in October 2012 at the cluster of sites A224/A225/A226, which is located on the top of a ridge that extends south from the village of Colle Cioffi, produced fragments of painted plaster, roof tiles, *opus spicatum* bricks and *opus caementicium* rubble. Pottery included a wide range of wares (*impasto*, *bucchero*, black gloss, Italic terra sigillata, African red slip wares, plain and coarse wares, amphoras and *dolia*, glazed wares), reflecting long occupation from the Late Iron Age/Archaic period through modern times, with the bulk of the material dating to the Roman Republican–late Imperial period. Despite the small size of the surveyed grids, geophysical techniques proved that there is substantial evidence for the presence of architectural relics possibly extending further to the central eastern and western sectors of the surveyed area. The subsurface relics seem to be buried within a depth of 1 m below the surface and strong reflectors may have been caused by collapsed building material.

The most striking data, however, were produced at site A232, which is located on the southern slopes of the Colle Facora, with a view to the south over the ridges of Campo Largo and the Cavaliere valley. Personal communication with the field owners indicated that a brick floor and marble fragments had been found in the past. The archaeological fieldwalking survey in September 2013 yielded a high sherd density (about 12 sherds per square meter despite poor ground visibility at the site), consisting mostly of roof tiles, but with some pottery (coarse wares, amphora and *dolia*). Despite the difficulties in dating the site more precisely than generically to the Hellenistic–Roman period, it was interpreted as a structure or multiple structures with possible storage function (as indicated by the *dolium* and amphora fragments).

The results of geophysical surveying verified the finds of the fieldwalking surface prospection. They showed the clear outline of a building complex consisting of multiple rooms. All three of the applied geophysical techniques (magnetometry, resistivity and GPR) resulted in complementary outcomes. GPR signals registered reflectors from 1.0–1.5 m below the surface, with the northern anomalies lying deeper than the southern ones (with respect to current ground elevation). Geophysical measurements outlined an architectural compound, 35 m by 37 m, consisting of various compartments laid out on a plan that resembles a typical Roman villa or large farmstead. At the western end of the complex there is a rectangular building, 9 m by 7 m in size, outlined as an intense reflector (possibly caused by collapsed building blocks), as a high resistance anomaly (for the same reason) and as a high magnetic anomaly (probably due to heating activities occurring inside the building). To the south-east, an aisled building is projected in front of the complex to the west. The outer diameter of it is about 5.5 m. Taking into account the continuity of the western sustaining wall to the north, the possible entrance to the compound is suggested on the southwestern side. The large open space (~18 m by 10 m) to the east of the aisled structure may belong to the inner courtyard of the house. A rectangular

anomaly is outlined at the center of this suggested courtyard. To the north side of the courtyard, a long corridor is recognizable. This is not the case for the southern side of the complex, where its limits are not easily distinguished. Three internal divisions (rooms) are identified between the courtyard and the northern corridor, mainly from the GPR and the soil resistance measurements. Another elongated room is suggested on the eastern side of the complex.

FINAL REMARKS

Having a good responce from the surface surveying techniques, geophysical approaches proved extremely efficient in identifying a number of architectural structures most probably related to villas, farmsteads and agricultural installations. The geophysical survey proved a successful addition to the archaeological field survey of the territory of the Roman town of Aesernia to enhance the understanding of surface scatters of archaeological material, and the importance of applying multiple geophysical techniques (manifold approach, Sarris 2013) was clearly demonstrated. In some cases, such as site A232, the complementarity of the various techniques could be exploited in order to produce primitive 3D reconstructions of the various architectural compounds. In the next phase of the "Landscapes of Early Roman Colonization" project, a selection of sites in the research area around Aesernia (including the three examples given here) will be subject to a detailed intra-site study, using a high-resolution, gridded point sampling technique, in order to enhance the chronological and functional interpretation of the sites and to identify possible areas of internal functional zoning.

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