ISAP NEWS

The newsletter of the International Society for Archaeological Prospection

Issue 22, January 2010

Contents

Editor's Note

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Welcome to the 22nd issue of ISAP News – the first of 2010. There has been an excellent response to my call for contributions which I hope will be maintained throughout the rest of the year. Not only are there some great articles to read, from large scale magnetometer surveys over difficult terrain to detailed GPR surveys of urban areas, but there are also a selection of seminars, workshops and conferences to attend.

Don't forget, your 2010 membership fees for ISAP are now due… go to http://www.bradford.ac.uk/archsci/archprospection/renew.php to renew.

If you would like to contribute or advertise in the next Newsletter, please email me content by 21st April.

Geophysical Survey at Whitley Castle Roman Fort and Hinterland, Northumberland

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The impressive earthworks at Whitley Castle in Northumberland were recognised as being an important Roman station by William Camden as early as 1599. However, perhaps due to its isolated upland location and the nearby Hadrian's Wall complex, it has received relatively little attention over the centuries, until now. This article presents brief notes on recent geophysical surveys undertaken by Archaeological Services Durham University as part of a larger research project directed by English Heritage (Went and Ainsworth 2009), which included detailed landscape survey and documentary research by the EH team. The geomagnetic survey covered 36ha, the earth resistance survey 8ha.

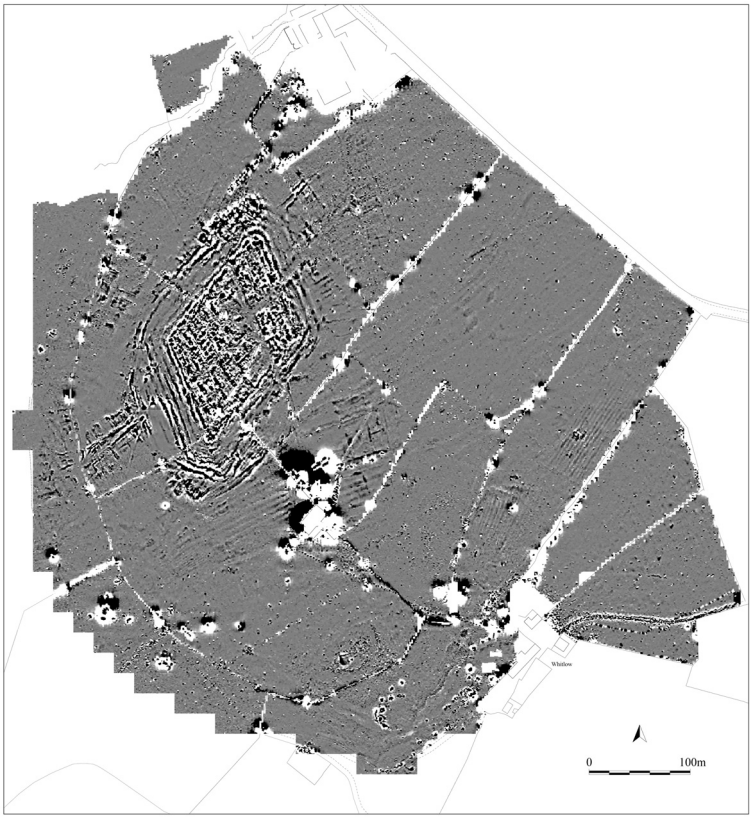


Figure 1: Whitley Castle geomagnetic survey (greyscale range: white -5nT to black +5nT)

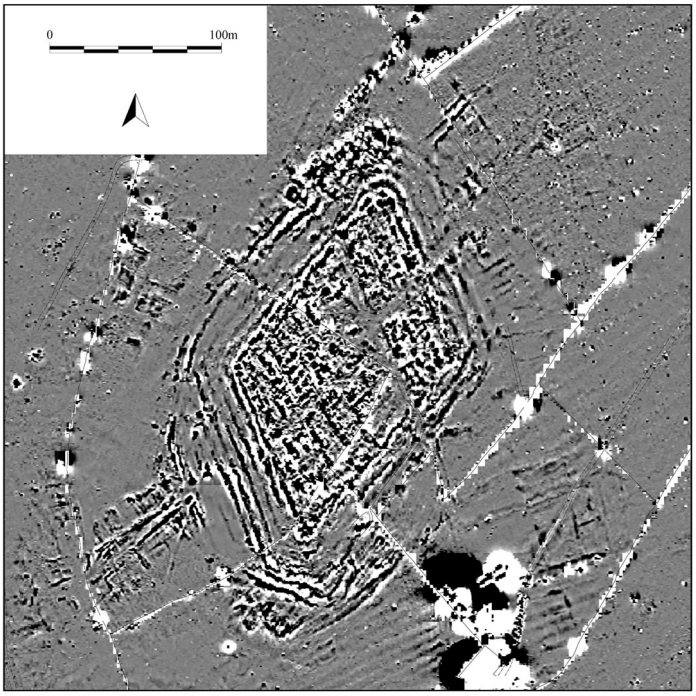
The surveys covered an unusual and well-preserved Roman fort (probably Ptolemy's *Epiacum*) and its surroundings, about 3km north-west of Alston (Figure 1). The fort stands on a spur overlooking the Maiden Way, a Roman military road which ran between the forts of *Bravoniacum* at Kirby Thore and *Magna* (Carvoran) on Hadrian's Wall. The fort has multi-vallate defences, steep and imposing banks, which proved particularly challenging during data collection in variously snow-covered, frozen, boggy or waterlogged conditions (Figure 2). The number of ramparts and the exceptional level of preservation make the fort unparalleled in England and comparable to that at Ardoch, near Perth in Scotland.

Figure 2: Geomagnetic data collection with much of the snow gone

In this instance, not only do positive magnetic anomalies reflect soil-filled features, but also earth- and rock-built features. The fort wall, which is known to be constructed of sandstone blocks, albeit now earth-covered, and the surrounding banks, constructed of clay and stone, are all evident as positive magnetic anomalies (Figure 3). The density of geophysical anomalies recorded within the fort reflects a palimpsest of features from more than one phase, as well as robber-trenches and re-deposited rubble. However, several buildings and roads can be identified to varying degrees, including barrack blocks, at least one granary, the headquarters building, parts of the commandant's house and an interval tower. Another detected building could be a post-medieval farmhouse (*ibid*).

A large concentration of anomalies just outside the fort wall's northern corner corresponds to earthworks of a bath-house which was constructed over infilled defences in the later phases of the fort. Anomalies outside the fort's southern corner,

which appear to lie beneath an early phase of ramparts, may reflect the original location of the bath-house. Both locations are next to springs. In general there is a very close correlation between the mapped earthwork features and the geophysical anomalies. Notable exceptions to this, however, concern the probable earlier defences and other features at the southern corner of the fort, for which there is no longer any surface expression. Indeed, in several extra-mural areas, notably to the west of the fort, the surveys have detected concentrations of probable



building remains and other features for which there is very little topographic evidence.

Figure 3: Extract from geomagnetic survey (greyscale range: white -5nT to black +5nT)

Outside the fort, the *via praetoria* continues north-eastwards to join the Maiden Way and appears to be flanked by some small enclosures or structures. The Maiden Way and its eastern, downslope drainage ditch were best detected by the resistance survey (Figure 4). Although not well-defined, both techniques do indicate a series of roadside plots which could represent settlement. The *via principalis* heads south-south-east and may join the Maiden Way to the south of Holymire barn. Extending north-west from the fort, in the resistance data, the *via principalis* appears to be a substantial metalled road for up to 90m from the fort wall.

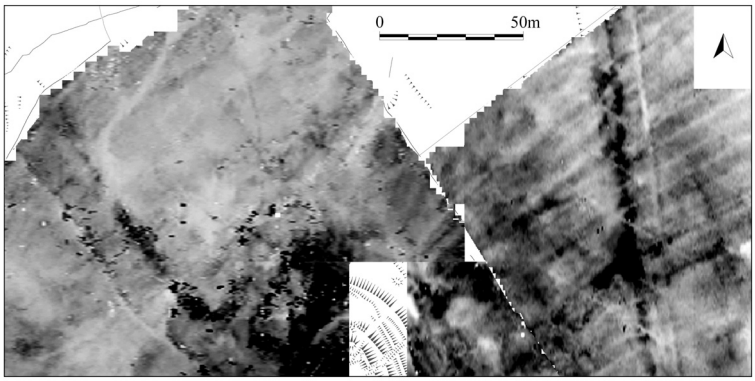


Figure 4: Extract from resistance survey around north corner of fort, Maiden Way in east (greyscale range: white low to black high resistance).

The remainder of this area north-west of the fort contains many very weak magnetic and resistance anomalies, which appear to reflect small enclosed platforms or fields. Other than the bath-house and the adjacent road, the area is characterised by a general absence of any strong anomalies that might reflect structural remains or other indicators of occupation. It seems that this area may have been used for stock or small-scale agriculture rather than a *vicus*, as previously thought. West and south-west of the fort, however, the geophysical surveys provided a wealth of evidence for buildings and roads. Two complexes of very strong, orthogonal anomalies almost certainly reflect the remains of substantial buildings sited along roads.

Several phases of activity can be interpreted from the geophysical results, including two possible phases of significant re-modelling of the defences and other structures around the fort's southern corner. Additional anomalies could reflect pre-Roman settlement, later agricultural features, post-medieval buildings and mining activities.

Archaeological Services is grateful to English Heritage, the North Pennines AONB Partnership, Natural England, the landowners and Durham County Council for supporting this research.

Reference

Went, D, and Ainsworth, S, 2009 Whitley Castle, Tynedale, Northumberland: an archaeological investigation of the Roman fort. Research Department Report 89/2009, English Heritage

Resistance vs. Radar. Comparison in a Churchyard

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This report was intended to be written jointly with Dr Philip Day of the Mellor Archaeological Society, but sadly he died of cancer in November 2009, so this paper is in his honour.

Laverton is in Somerset, about 5 km north-east of Frome. We had originally done twin probe resistance survey in 2006 (TR/CIA meter) as part of a gravestone survey in conjunction with the parishioners. This seemed to indicate a building in the south-west portion of the churchyard, an area of open grass.

We returned with new equipment in 2008. We laid out new grids to remove any possibility of grid mismatch giving a false impression of a building. The survey using an RM15 in twin probe configuration with 1 m transom produced a very different picture, but repeating the survey with 0.5 m transom gave a similar picture to that obtained with the TR device. This suggested that there was a structure but it was shallow. The line of a footpath also traverses the grids diagonally. This has no surface metalling.

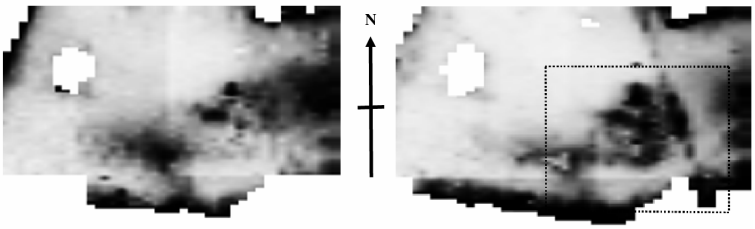

Figure 1: The RM15 results with the 1 m transom to the left, the 0.5 m transom to the right. Both plots are 40 m width (greyscale range: white low to black high resistance).

The rectangle overlain on the 0.5 m in figure 1 is the area designated for depth profiling and radar measurement. Depth profiling used the recently available attachment to the TR/CIA meter and RES2DINV freeware processing. We have developed a process of stacking profiles to produce depth slices, similar to radar time slices, but these can only be comparisons of colour, so it is essential to make sure all profiles are set to the same scale. Using the profiler as designed involved setting up each probe combination by had and was back-breaking work. We have since built a control box so that any profile can be completed while standing at the TR. We have checked to ensure both methods give the same results.

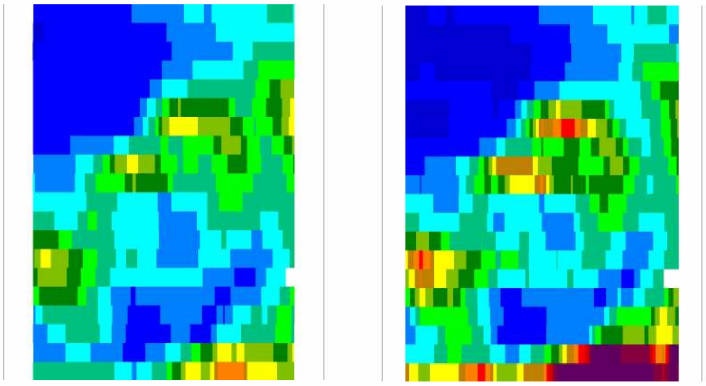

Figure 2: The resistivity depth profiling results with the 1 m depth slices to the left, the 0.5 m depth slices to the right. Both plots are 18 m high (colourscale range: blue low resistance, through green, yellow, red and purple high resistance).

As the twin probe operation covers depths nominally equal to the probe spacing, the depth slices for profiling are shown here at 0.5 and 1 m depths. Unlike radar, these are not thin slices, but aggregates over a 0.25 m depth. The slices narrow as depth increases. There seems very little evidence of a building, apart from some high readings (yellows and reds) on the north edge, and little showing where a south wall was expected. That is more true still of the 1 m depth slice. The pathway which shows strongly in the twin-probe 0.5 m appears only as a mid reading (green) in the shallower depth slice.

The radar survey was carried out in May 2009, the device being a MALA X3M, belonging to Philip Day, and now inherited by bacas. It was furnished with 250 MHz and 500MHz antennae. The 250 MHz antenna produced the best results, and only those are discussed here. Figure 3 shows depth slices from 25 to 95 cm. The path shows very strongly. The feature to the north is strongest at 40-50 cm, there are possible signs of walls to the south at slightly greater depths. By 80 cm, very little signal is returned. This is a clay site and absorption was high.

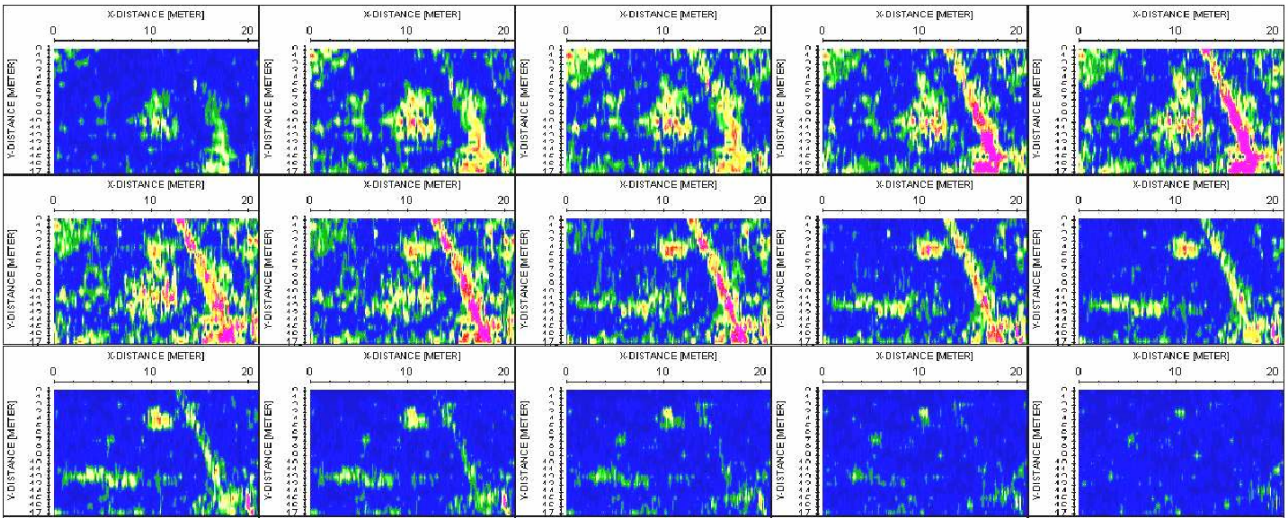

Figure 3: Radar depth slices from 25 to 95 cm. The same colour scale is used as in Figure 2.

On balance from the three methods, it would seem that there are some stone features below the churchyard, but they are not connected or form a building. The principal value of this exercise has turned out to be the inter-comparison of the methods, rather than the discovery of a new site.

Full reports can be found on the Mellor and bacas websites: www.bacas.org.uk.

GPR-survey reveals Roman chariot track in Eining "Abusina"

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Background

The Roman fort of Eining "Abusina" was built in the 1st century AD to protect the eastern end of the Raetischer Limes, the boundary of the Roman Empire to Germania libera. The location above the Danube ensured the garrison could supervise the shipping on this important transportation route. Therefore, it was one of the most important Roman military camps in Bavaria. In the 5th century AD the Alamanni destroyed the fortress. The denotation "Abusina" is based on the nearby river Abens and on the Celtic tribe Abisuntes who settled in this area.

The first time Abusina was mentioned was on the Roman road map Tabula Peutingeriana of the 4th century AD. In the 16th century Appian and Aventin rediscovered the monument. The first excavations were performed in 1879 and today Abusina is one of the best investigated Roman forts in Bavaria. Magnetometry was used between 2007 and 2009 for a large area prospection in the camp to trace the layout and size of the wooden barracks (Fig. 2).

Like each Roman military camp, Abusina has been surrounded by a civil settlement, the Vicus. Small scale excavations and aerial photographs reveal a semicircular arrangement of the houses around the fortress. Parts of the Vicus that were surveyed by magnetometers were additionally measured by radar to investigate the detailed structure. South of the battlement one of the roads leading through the settlement to the Porta Principalis was located by air photos. For a detailed result of its internal structure we carried out a GPR-survey with the GSSI SIR-3000 and a 400 MHz-antenna. We chose a point spacing of 2 cm inline and 50 cm crossline to achieve a high-resolution image of the subsurface.

Results

The results of the GPR survey reveals the Roman road at a depth of 20 cm to 100 cm (Fig. 1). In the south of the grid a second road leading through the

Vicus around the eastern side of the fortress diverges from the one to the Porta Principalis (Fig. 1 and 2).

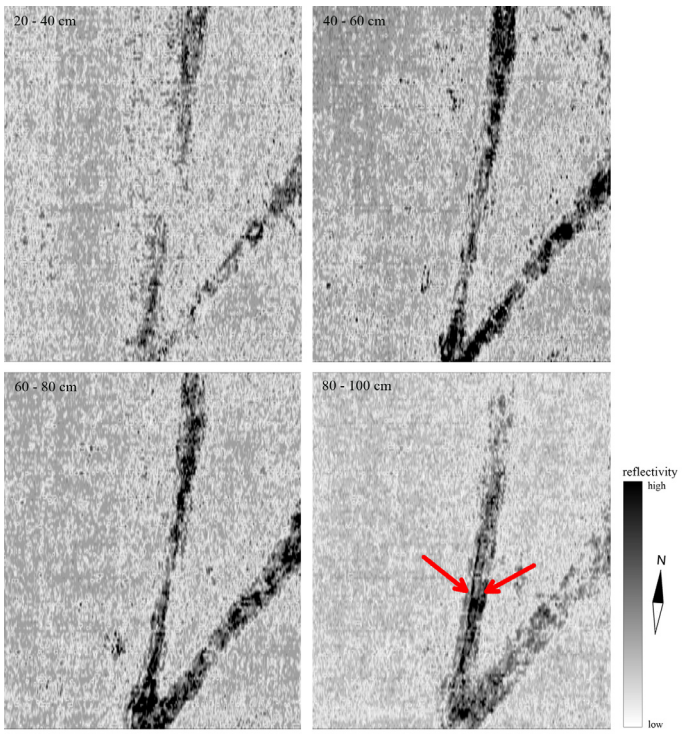

Fig 1: Roman military camp Eining "Abusina": GPR depth-slices between 20 cm and 100 cm in 20 cm steps. Grid size: 50 x 60 m. The Roman road with the two branches is clearly visible. In the slice between 80 cm and 100 cm the chariot track is marked.

Remarkable is a linear feature, with two traces of 1.2 m displacement, in the small-grained foundation of the western road branch in the 80 cm - 100 cm depth slice. The most probable explanation is to regard it as the track of Roman chariots compacting the material by using the road for years. The density of manually compacted soil is 1.4 – 1.6 g/cm, for undisturbed one 1.2 – 1.3 g/cm (Seger & Cousin, per. comm.). This distinction can be recorded as a deviance in reflectivity in the radargram. For the first time in Bavaria, it was possible to detect a relict of the Roman transport system by geophysical prospection.

The different buildings of the Vicus cannot be resolved. Eventually they had been wooden constructions and are therefore not visible in the survey's results.

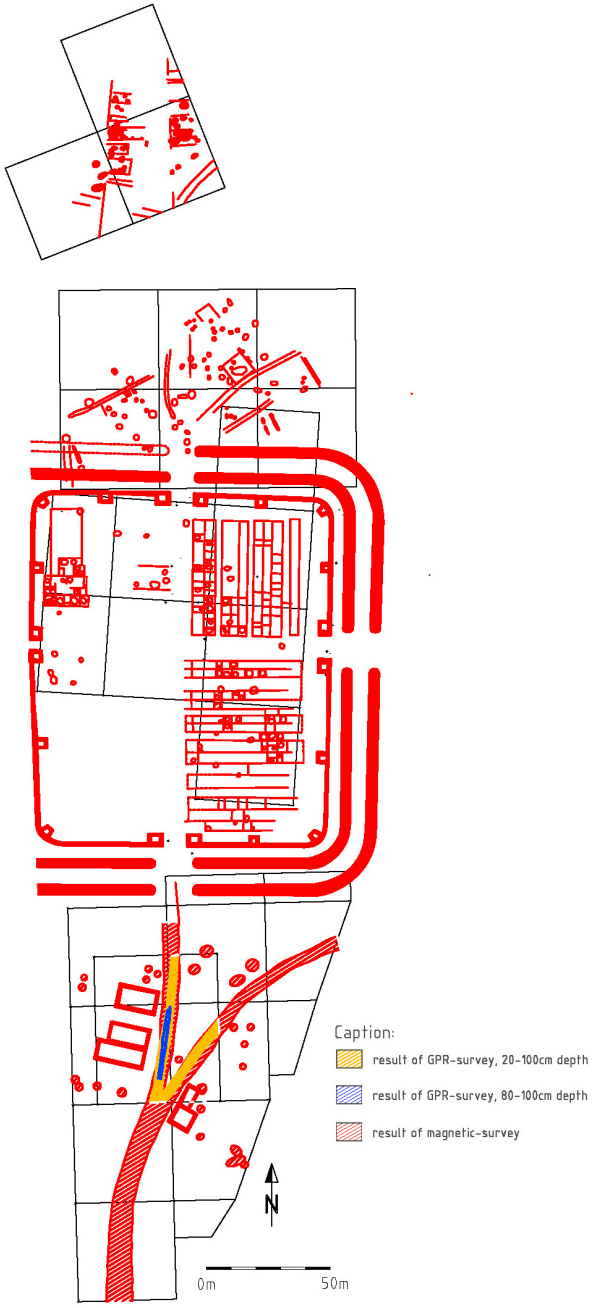

Fig. 2: Roman military camp Eining "Abusina": Map of the survey grids with the interpretation of the geophysical data illustrating the results on the area of the Roman fort and Vicus.

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Gschwind, M. (2004): Abusina: Das römische Auxiliarkastell Eining an der Donau vom 1. bis 5. Jahrhundert n. Chr. Verlag C.H. Beck (München): 438 p., 142 tables.

Seger, M., Cousin, I., Giot, G., Boizard, H., Mahu, F., Richard, G. (2009): Characterisation of the structural heterogeneity of soil layer by using in situ 2D and 3D electrical restivity measurements. ARCHEOSCIENCES, revue d'archéometrie 33: p. 349-351

Urban Archaeological Investigations using Ground Penetrating Radar: A case Study from Heraklion, Crete (Greece)

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Laboratory of Geophysical-Satellite Remote Sensing & Archaeo-environment, Crete, Greece

Ongoing and extensive urbanisation, which is frequently accompanied by careless construction works, may threaten important archaeological structures that are still buried in the urban areas. Recently the field of "urban geophysics" has emerged, focusing on the geophysical exploration of cities in order to investigate and characterize the subsurface properties of urbanized environments and to provide effective solutions to specific problems. In this work, urban geophysics, in terms of Ground Penetrating Radar (GPR), is used as a tool to explore an archaeological site along the north coast seaside in the central part of Heraklion city in northern Crete, Greece (Fig. 1). During sidewalk construction work (along the seaside avenue), a palaeochristian church was found and was partially excavated.

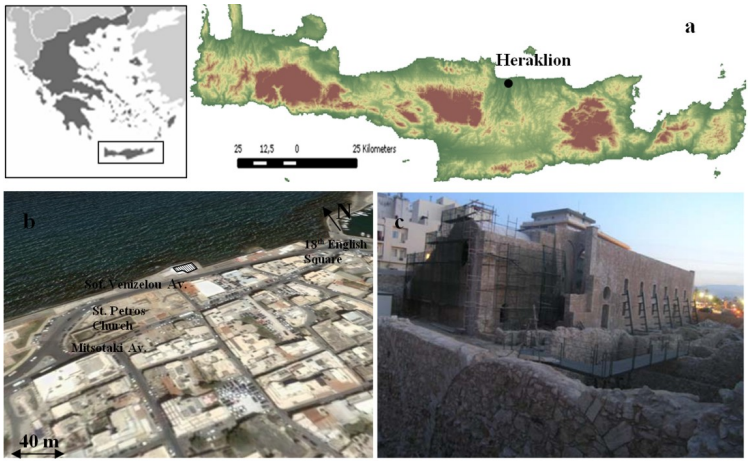

Figure 1: a) Map of the island of Crete, which is located south of Greece in the area enclosed by the rectangle, along with the location of Heraklion city. The location of the city of Heraklion on the north coast of the island is marked. b) Panoramic view of the investigated area at the centre of Heraklion city. c) Recent view of the Saint Petros church, which is located along the Sof. Venizelou Avenue.

Due to the urgent construction works that were being carried out in the region to restore the seaside avenue, the area was prospected using the GPR technique. The fieldwork had to be conducted during the night in order to meet special requirements for traffic management.

An area of more than 2000 m^2 was explored in a systematic way. The goal was to cover as much of the area as possible, but surface obstacles like ditches, pipelines, and parked cars limited the area coverage. A systematic workflow was used to process the collected GPR data and the final integration of the data was accomplished through a Geographical Information System (GIS) platform.

Strong reflections appeared at the west and south of the excavated palaeochristian church (GRID0 and GRID6). The semicircular anomalies at the south of the excavated palaeochristian church were probably related to the continuation of this church to the south. A strong diagonal reflection was recorded at the depth of 1.4–1.6 m below the surface in GRID1. A north-south anomaly at the west edge of GRID 2 was considered to be an extension of the wall that is located at the east side of the Saint Petros excavation. Furthermore, some relatively strong reflections were located within the area of GRID5.

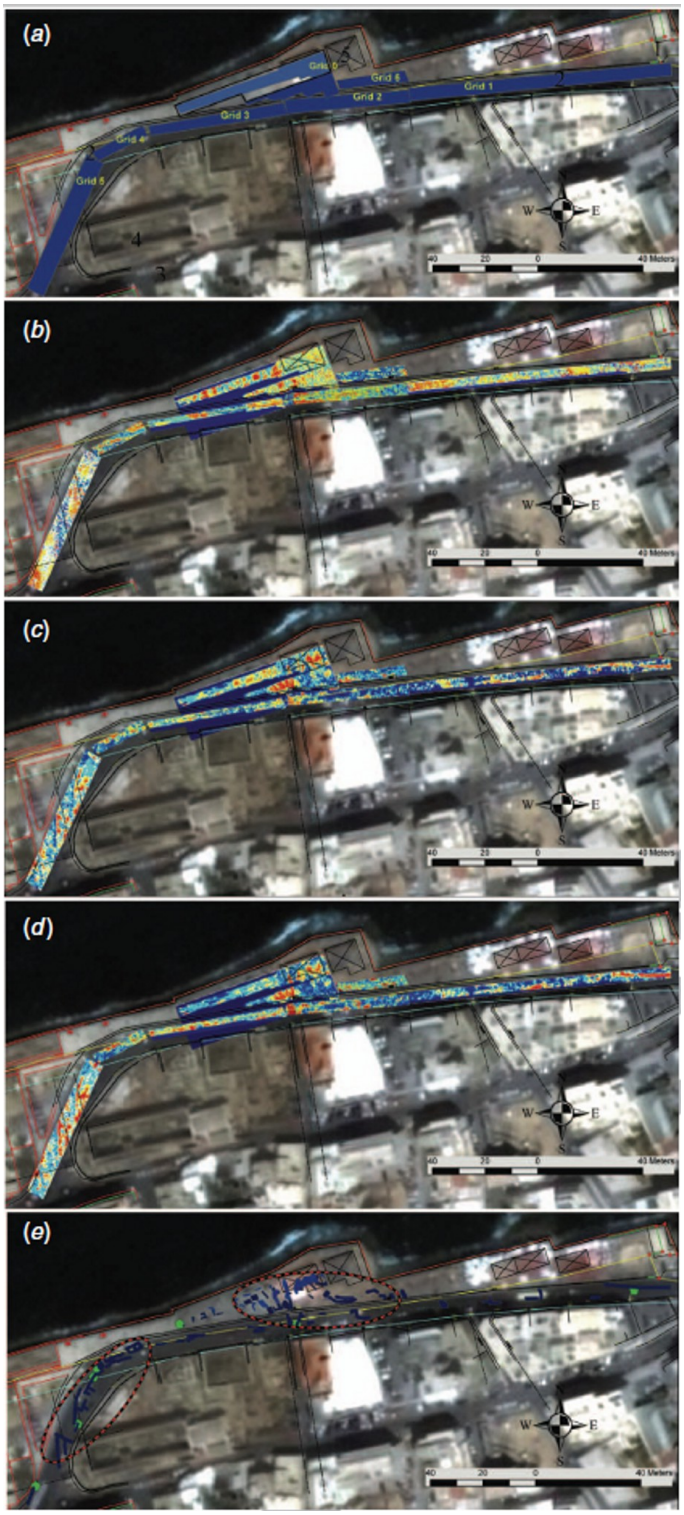

Figure 2: a) Location map for the GPR grids that were used to cover the area of interest. (1: 18th English Square, 2: Sof. Venizelou Av., 3: Mitsotaki Av., 4: Saint Petros church, 5: Palaeochristian church). b) GPR horizontal slice of the depth Z=0.4–0.6 m. c) GPR horizontal slice of the depth Z=1.2–1.4 m. d) GPR horizontal slice of the depth Z=1.4–1.6 m. e) Diagrammatic interpretation of the strong GPR reflections (warm colors). The elliptical areas indicate the regions in which there is higher probability that archaeological structures are located.

The significant number of strong GPR reflectors in the central part of the area indicated that the palaeochristian church forms part of a broader architectural complex. The subsequent excavation works in a small section of the investigated area at the south and west of the palaeochristian church revealed this architectural complex as it can be seen in figure 3.

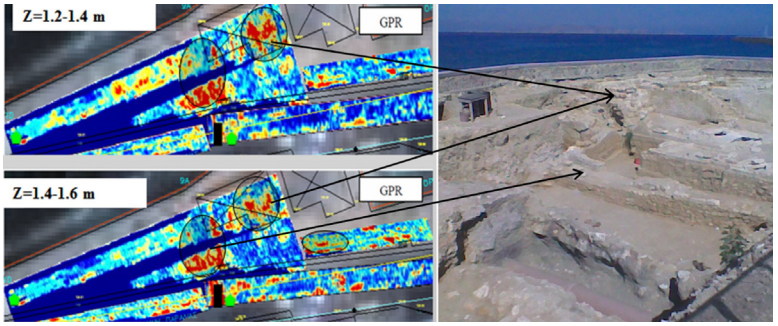

Figure 3: Correlation of the excavated archaeological structures (right photo) with the GPR results (left photo) SW of the palaeochristian church.

This case study signifies the efficiency of GPR technique in the archaeological exploration of urban areas. The use of this method seems to be adequate to reconstruct the complex subsurface material properties encountered in the urban settings and to guide the archaeological excavation in selected places. In general, urban geophysics provides a valuable tool at the stages of designing and constructing modern infrastructure, by assisting with the protection and preservation of the cultural heritage of an urbanised area.

Conference, Seminar and Course Announcements

EAC Symposium: Remote Sensing for Archaeological Heritage Management in the 21st century

Reykjavik, Iceland, 25–27 March 2010

This symposium will examine Remote Sensing for Archaeological Heritage Management at the start of the 21st century. The key themes to be explored will be: the registration of monuments; the creation of reliable monuments records; approaches to large-scale mapping; monitoring and management of monument condition; and applications of historic imagery. Well-established approaches and techniques will be set alongside new technologies and data-sources, with discussion covering relative merits and applicability. Approaches to be considered will include aerial photography, both modern and historic, LiDAR, satellite imagery, multi-and hyper-spectral data, sonar and geophysical survey. Both terrestrial and maritime contexts will be addressed.

See: http://www.e-a-c.org/index.php?article_id=14

National Park Service's 2010 Archaeological Prospection Workshop

Knife River Indian Villages National Historic Site, North Dakota, USA, 24-28 May 2010

The National Park Service's 2010 workshop on archaeological prospection techniques entitled *Current Archaeological Prospection Advances for Non-Destructive Investigations in the 21st Century* will be held May 24-28, 2010, at the Knife River Indian Villages National Historic Site near Stanton, North Dakota. Lodging will be in the in the communities of Beulah, Hazen, and Riverdale, North Dakota. The field exercises will take place at the Knife River Indian Villages National Historic Site. The park preserves the historic and archeological remnants of the culture and agricultural lifestyle of the Northern Plains Indians during the 18th and 19th centuries. Co-sponsors for the workshop include the National Park Service and the State Historical Society of North Dakota. This will be the twentieth year of the workshop dedicated to the use of geophysical, aerial photography, and other remote sensing methods as they apply to the identification, evaluation, conservation, and protection of archaeological resources across this Nation. The workshop will present lectures on the theory of operation, methodology, processing, and interpretation with on-hands use of the equipment in the field. There is a registration charge of $475.00. Application forms are available on the Midwest Archeological Center's web page at http://www.nps.gov/history/mwac/. For further information, please contact Steven L. DeVore, Archeologist, National Park Service, Midwest Archeological Center, Federal Building, Room 474, 100 Centennial Mall North, Lincoln, Nebraska 68508-3873: tel: (402) 437-5392, ext. 141; fax: (402) 437-5098; email: steve_de_vore@nps.gov

AARG 2010

Bucharest, Romania, 16-18 September 2010

* FIRST CALL FOR PAPERS *
International aerial archaeology conference

AARG 2010 Bucuresti

16 - 18 September 2010

Organised by the
Institutul de Memorie Culturala (CIMEC)

and the Aerial Archaeology Research Group

** Proposals for sessions, papers and posters are invited**

16 – 17 September: Conference Papers

18 September: Field Trip
Neolithic sites south of Bucharest, towards the Danube

Closing date for proposals of papers, posters and sessions is **31st May 2010**

Conference Organising Committee

Professor Dr hab. Wlodek Rączkowski (AARG, University of Poznań)
Dr Irina Oberlander-Tarnoveanu (CIMEC), Dave Cowley (AARG, RCAHMS)
Carmen Bem (CIMEC), Lidka Żuk (AARG, University of Poznań)

Address for conference correspondence:

Dave Cowley, RCAHMS, 16 Bernard Terrace, Edinburgh, EH8 9NX, Scotland
Email dave.cowley@rcahms.gov.uk

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Student/Young Researchers Bursaries For Aarg 2010

These are to support bona fide students and young researchers who are interested in aerial archaeology and wish to attend the conference. Applications to Dave Cowley at the above address, by letter or email. There is no formal application form but please provide the following information:
Your interests in archaeology and aerial archaeology; place of study; the name and contact details of a supervisor or employer who can provide a reference; an estimate of travel costs to attend.
Closing date for applications is 31st May 2010

Aerial Archaeology Research Group website: http://aarg.univie.ac.at/

Pre-conference workshop

Remote-sensing mapping programmes in archaeology: planning, organisation, results
15th of September - Ministry of Culture, Bucuresti, Romania
Further details to be announced.

Recent Work in Archaeological Geophysics

Burlington House, Piccadilly, London, UK, 15 December 2010

NSGG
Near-Surface Geophysics Group

The Near Surface Geophysics Group of the Geological Society of London (formerly the Engineering and Industrial Geophysics Group) is pleased to announce the ninth in a succession of biennial day meetings devoted to archaeological geophysics. Near surface geophysical techniques have become increasingly established in archaeological research and evaluation over the past decade and are now routinely applied in archaeological investigations. This meeting offers a forum where contributors from the UK and further afield can present and debate the results of recent research and case studies. Suppliers of equipment and software also attend and the meeting therefore represents an invaluable opportunity for both archaeological and geophysical practitioners to exchange information about recent developments.

Call for papers
Those interested in contributing either a talk or poster are warmly encouraged to contact the convenor and to submit abstracts of up to 1000 words in length, accompanied by suitable greyscale illustrative material, no later than the 31st August 2010. These will be collated and made available to all those attending.

Convenor: Paul Linford, English Heritage, Fort Cumberland, Eastney, Portsmouth, PO4 9LD, UK; Tel.: +44 (0)23 9285 6749 email: Paul.Linford@english-heritage.org.uk

NB: It is intended that, as in past years, the Forensic Geosciences Group will hold their meeting on Geoscientific Techniques at Crime Scenes on the following day (Thursday 16th December) and further details will be publicised in due course.

Journal Notification

Archaeological Prospection 17:1

The first issue of the year of Archaeological Prospection is headed for the printers. One of the subsequent issues will be selected papers from the ISAP Paris 2009 conference. The papers are a representative sample of the many excellent papers from the meeting and will be edited by Christophe Benech and Alain Tabbagh. Articles in Issue 1 cover a huge geographic and academic area:

Geophysical study of a pre-Hispanic lakeshore settlement (Chiconahuapan Lake, Mexico). Rene Efrain Chavez, Andres Tejero, Denisse Lorenia Argote and Maria Encarnacion Camara

Magnetic Survey in the Investigation of Sociopolitical Change at a Late Bronze age fortress settlement in Northwestern Armenia. Ian Lindsay, Adam T. Smith and Ruben Badalyan

Exploring the location and function of a Late Neolithic house at Crossiecrown, Orkney by geophysical, geochemical and soil micromorphological methods. Richard Jones, Adrian Challands, Charles French, Nick Card, Jane Downes and Colin Richards

Decorrugation, edge detection, and modeling of total field magnetic observations from a historic town site, Yellowstone National Park, USA. Steven D. Sheriff, Douglas MacDonald and David Dick

There are reviews of the following two books: '*Satellite Remote Sensing for Archaeology*' written by Sarah H Parcak and '*A field guide to geophysics in archaeology*' by John Oswin.

Naturally this is the time of year to take advantage of the great deal offered to ISAP members by Wiley-Blackwell for this journal (http://www.bradford.ac.uk/archsci/archprospection/menu.php?2)

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