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The 2016–2018 Greek-Swedish archaeological project at Thessalian Vlochos, Greece

Abstract

The Vlochos Archaeological Project (2016–2018) was a Greek-Swedish archaeological investigation of the remains of the ancient urban site at Vlochos in western Thessaly, Greece. Employing a wide array of non-invasive methods, the project succeeded in completely mapping the visible remains, which had previously not been systematically investigated. The extensive remains of multi-period urban fortifications, a Classical-Hellenistic city, a Roman town, and a Late Antique fortress were identified, evidence of the long history of habitation on this site. Since comparatively little fieldwork has been conducted in the region, the results significantly increase our knowledge of the history and archaeology of Thessaly.*

Keywords: Thessaly, *polis*, non-invasive, architectural survey, fortifications, geophysical survey, aerial survey, multi-phase settlement

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Introduction

In this paper we present the work of the Vlochos Archaeological Project (henceforth VLAP) that took place at the archaeological site of Vlochos in Thessaly, Greece between 2016 and 2018. VLAP was a Greek-Swedish collaboration and included archaeologists and students from the Ephorate of Antiquities of Karditsa and the University of Gothenburg, with additional research personnel from Bournemouth University and Arkeologikonsult Ltd. Maria Vaïopoulou (director, Ephorate of Antiquities of Karditsa) directed the Greek side and Helene Whittaker (professor, Gothenburg University) the Swedish side. Fieldwork was supervised by Fotini Tsiouka (Ephorate of Antiquities of Karditsa) and Robin Rönnlund (University of Gothenburg).

One of the central aims of the project was to develop and implement a cost-effective digital methodology for investigating large complex urban sites in Greece, with a focus on rapid and non-invasive methods. Because they are important archaeological landmarks in the landscape, urban sites are often well-known. However, in many cases our knowledge about their architectural layout, extent or even function is quite limited. Remoteness, dense vegetation, poor accessibility and difficult terrain, as well as factors such as over-silting and cultivation have hindered archaeological research. Recent advances in technology, which allow for different approaches from the traditional excavation-centred methods, call for new strategies in recording ancient Greek cities.

With regard to central Thessaly and the north-eastern part of the Karditsa plain, the fortified urban sites along the banks of the Pinios and Enipeas rivers appear to belong to a complex settlement network, which is yet not fully understood. To comprehend the role and function of this network of cities requires ambitious multi-method approaches that aim to understand each city and its countryside on its own terms. Our project focuses on the archaeology of Strongilovouni hill, near the modern village of Vlochos, and adjacent areas (*Fig. 1*). We documented

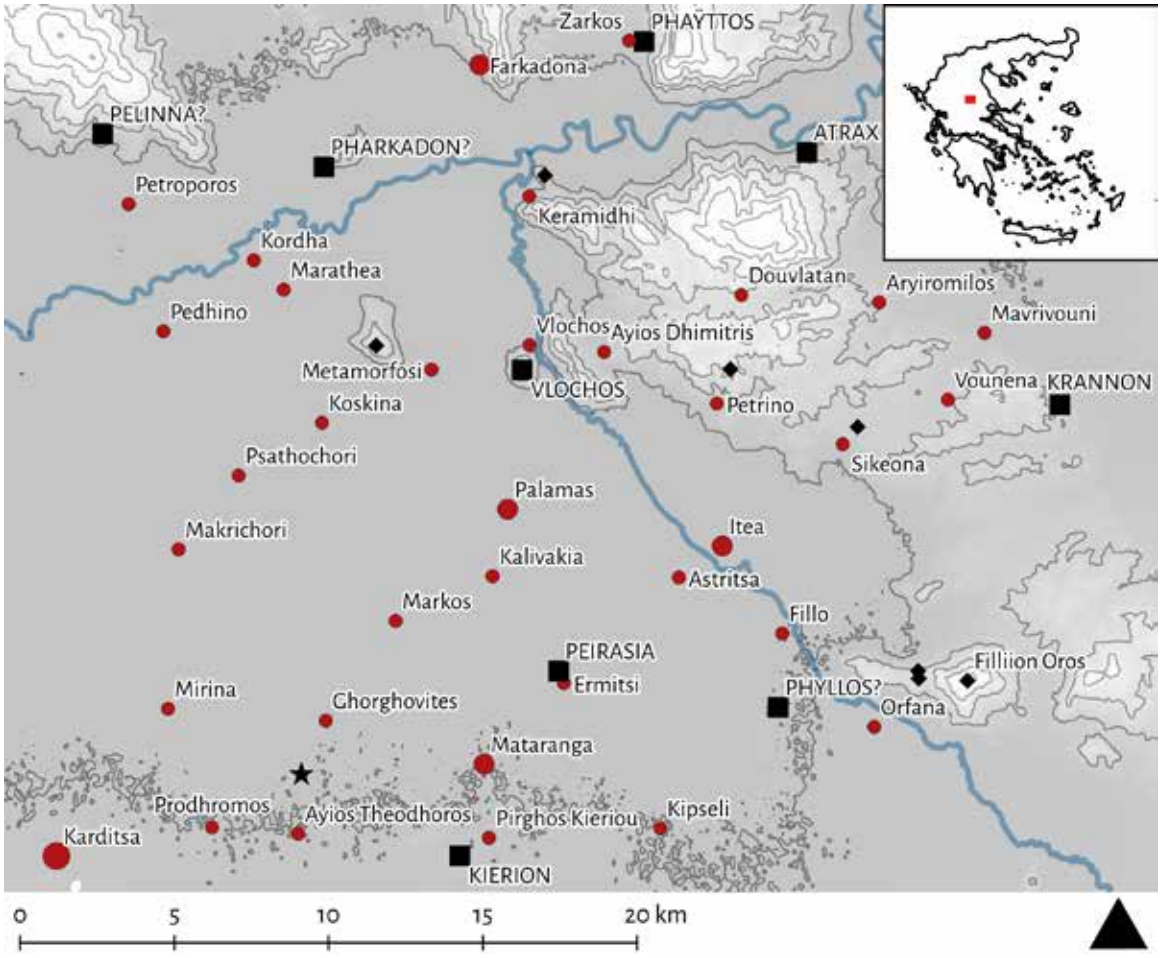

Fig. 1. The location of the site at Vlochos within central Thessaly with surrounding modern settlements (red) and notable archaeological sites (black). Map by R. Rönnlund.

and interpreted the ancient remains on the site through the development and implementation of an integrative, non-invasive digital survey programme. It is our hope that this method can be emulated at other sites within the region in order to allow for detailed regional comparison of early urbanization and social nucleation in Thessaly and beyond. The method that we used, which we describe below, has the potential to yield significant and detailed information about the structural organization of urban sites, their chronological development, and the overall character of standing *and* buried remains.

This ambitious programme necessitated a team of specialists that included Classical archaeologists, landscape archaeologists, surveyors, geophysicists, and heritage professionals. The integration of this complex and varied skill set was crucial to the method employed at Vlochos, which was centred on the mapping and characterization of the spatial articulation of human activity and the spectrum of materialized impact on the landscape.

Topography and site subdivision

The archaeological site at Vlochos[1] (Βλοχός) lies to the south of the eponymous village in the municipality of Palamas in the peripheral administrative unit of Karditsa. It consists mainly of the sizeable hill of Strongilovouni (Στρογγυλοβούνι, *Fig. 2*)[2] and the flat area of Patoma (Πάτωμα, *Figs. 3, 4*) to the south of it. Kuşaklı Dağ, the Turkish Ottoman name of the hill, means "belted mountain",[3] reflecting the appearance of the fortification walls along the brow of the hill. The toponym Vlochos itself is probably derived from Medieval

[1] The transliteration of modern Greek into Latin letters poses an interesting problem. In this article, we have strived for a more "phonetic" mode of transliterating toponyms, except in cases where the toponym is well-established in English.

[2] Meaning "round mountain", a suitable designation for this hill.

[3] Heuzey 1927, 75–76. The alternative Greek toponym is Zonaria (Ζωνάρια), meaning "the belts".

Fig. 2. Strongilovouni hill, looking towards the north, with Makrivouni hill at right at back. The area of Patoma is visible as a green linear area immediately below the hill. Photograph by R. Rönnlund.

Fig. 3. View of the area of Patoma from the southern slope of Strongilovouni, looking towards the south-east. Photograph by J. Klange.

Greek Evlochos (Εὐλοχὸς), meaning "a location suitable for ambushes."[4]

The hill is separated from the neighbouring hill of Makrivouni to the east by the river Enipeas (or Tsanarlis, ancient Enipeus), which flows from the highlands of Dhomokos far to the south into the larger river Pinios (or Salamvrias, ancient Peneios) *c*. 5 km north of the site. The area is rich in river confluences; just 1.5 km south-east of the site the Enipeas is joined by its tributary rivers Sofadhitis (ancient Kouarios) and Farsalitis (ancient Apidanos), and *c*. 3 km further downstream it meets its last tributaries the Rongozinos (ancient Onochonos) and Lipsimos (ancient Pamisos), both of which have undergone river engineering in modern times.[5]

The area around Vlochos went through a rapid transformation in the mid-20th century as a result of intensive landscaping. What had previously been an area with many seasonal and permanent marshes is now characterized by the cultivation of cotton on an industrial scale. The pre-industrial landscape can tentatively be reconstructed through a combination of World War II aerial photographs and the Greek General Staff's maps from the first decades of the 20th century (*Fig. 5*).

[4] The toponym exists in other locations in Greece, including in Aetolia, see Woodhouse 1897, 186. The narrow passage between Strongilovouni hill and Makrivouni hill at the site of the village is indeed "suitable for ambushes". The popular etymology *evlochos* (εὐλόχος, "helpful in childbirth"), an obscure epithet of Artemis, seems less likely. The early Ottoman name of the village, which at the time was divided in two, was according to a 1484 document Kisikli (Κησικλί, from Kısıklı), see Kayapınar & Spanos 2016, 286. The very similar word *kuşaklı* (see note above), could perhaps have influenced the Ottoman name of the village.

[5] Stählin 1924, fold-out map.

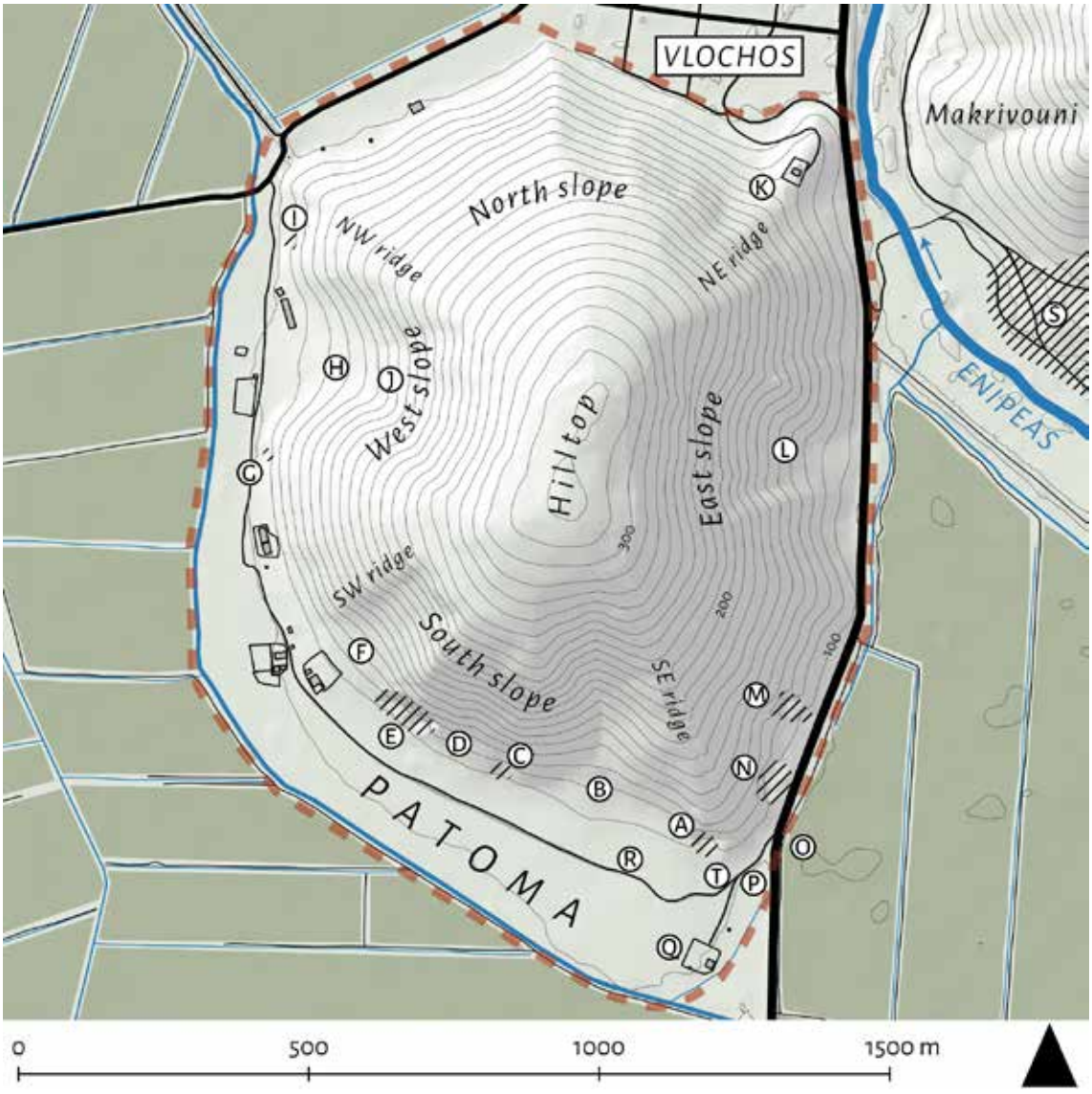

Fig. 4. Topographical sketch of the archaeological site at Vlochos and the Strongilovouni hill, with approximate extent of the site within the dashed red line. Plan by R. Rönnlund.

The area has traditionally been identified as belonging to the ancient Thessalian administrative district or tetrad of Thessaliotis,[6] according to the Aristotelian *Constitution of the Thessalians* established in the 6th century BC by the semi-mythical Aleuas the Red of Larissa.[7] As the ancient name of the settlement cannot be ascertained at present (see below) and the precise extents of the tetrads remain unknown, it is difficult to definitely determine whether the settlement at Vlochos belonged to Thessaliotis.

The archaeological site of Vlochos can be divided into separate areas based on topography (*Fig. 4*). The south, east and west slopes of the hill are mostly steep and inaccessible, whereas the north slope is less so. At several locations at the foot of the hill, in between rocky outcrops, are colluvial fans (B, D, F, H, and L in *Fig. 4*), which consist of colluvium amassed by the ongoing erosion of the hillsides. The hill-top area, which is loosely defined by the intramural areas along the brow of the hill, comprises *c.* 15 hectares of rocky ground with little vegetation. The hill-top consists of two low peaks, the southern of which is the highest (313 masl). The southern half of the hill-top is fairly easy to walk across, whereas the northern

[6] Roller 2018, 561.
[7] Arist. *fr.* 197; Helly 1995, 9–10; Graninger 2010, 307; 2011, 10.

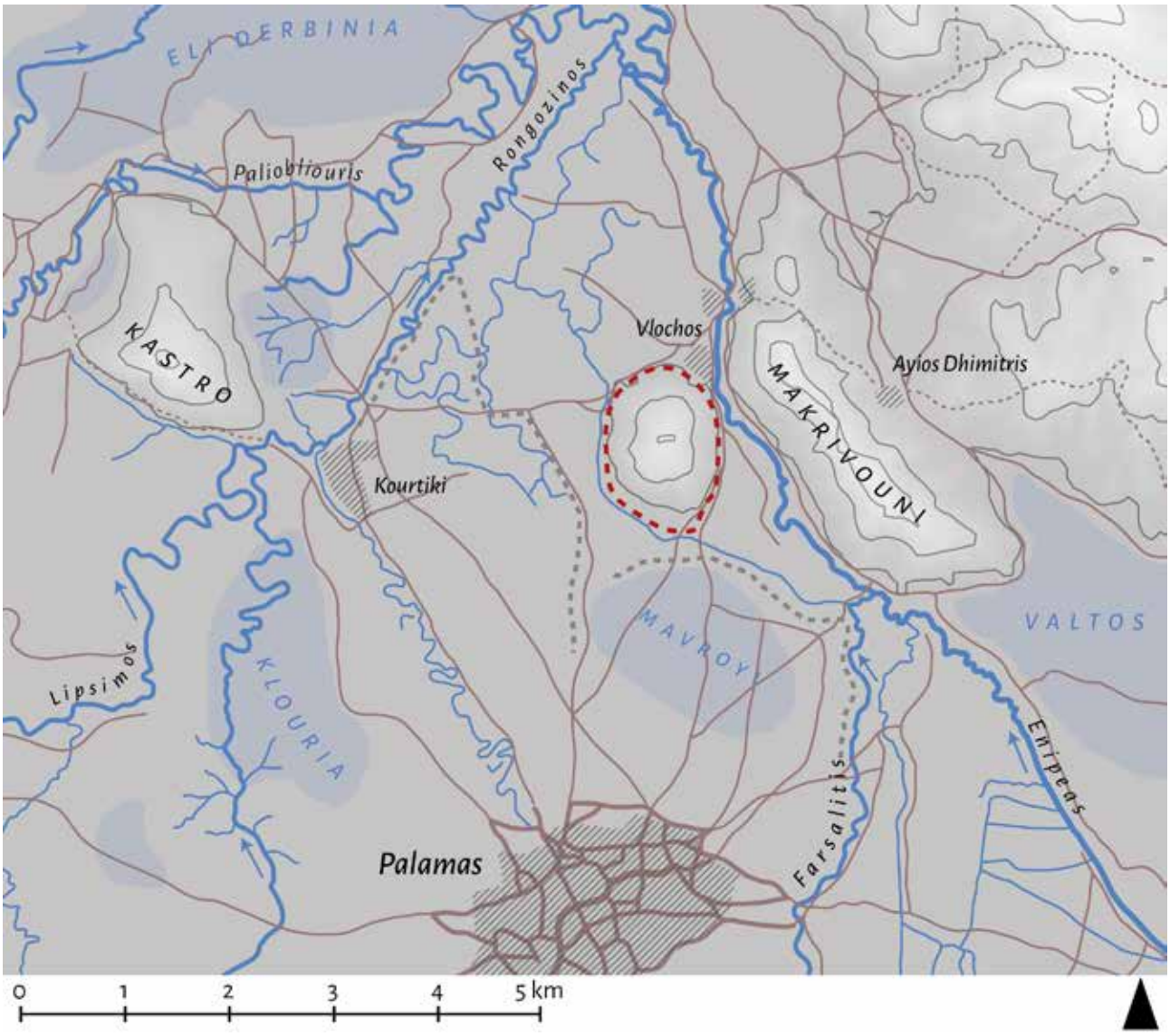

Fig. 5. Map of the pre-industrial landscape surrounding the archaeological site at Vlochos (within dashed red line), as reconstructed from World War II Allied and Axis reprints of pre-Balkan Wars Greek General Staff's maps, and of aerial photographs of 1945 and 1960. Striped grey lines indicate early embankments, light blue areas marshes. Map by R. Rönnlund.

part is extremely rugged and difficult. The hill-top area is located approximately 200 m above the plain, and, because of the curved terrain, is only visible from a distance. Four ridges protrude from the hillside, the most notable being the south-east and south-west ridges, which contain the south-east and south-west descending walls (see below).

The area of Patoma, as the name "floor" implies, is a *c*. 25-hectare flat surface at the southern foot of the hill. This area has remained uncultivated in the otherwise heavily irrigated landscape, and is today mainly covered with prickly vegetation and, apart from shepherds and beekeepers, is seldom visited by anyone.

Apart from a few sheep pens, there is no modern habitation within the area of the archaeological site, and the only substantial standing buildings are the chapels of Ayios Dhimitris (K in *Fig. 4*) on the north-east ridge of the hill[8] and Ayios Modhestos (Q in *Fig. 4*) in the area of Patoma.[9] Seven

[8] Small, single-nave chapel with apse, probably of the 16th century, with internal decorations of the 16th and 18th century, see Sdrolia 2007, 120. Protected monument, declaration ΥΠΠΟ/ΑΡΧ/Β1/Φ32/30841/561/13-8-1992; ΦΕΚ 553/Β/7-9-1992.

[9] Probably constructed in the 1960s or a little later, as it does not feature on the 1960 aerial photographs of the site.

quarries of varying sizes were opened on the hill slopes in the mid-20th century (A, C, E, G, I, M, N in *Fig. 4*) and the site was damaged by the subsequent bulldozing of truck-ways. Quarrying was later moved to the hillsides of Makrivouni (S in *Fig. 4*). A small shooting-range of unknown date with concrete foundations can be seen in the middle of the Patoma area (R in *Fig. 4*).

The area (roughly within the red dashed line in *Fig. 4*) was declared an archaeological site in 1964 by the Ministry of Culture and was at the time identified as ancient Peirasia(i) or Homeric Asterion (see below).[10] The archaeological site at Vlochos, all of which is situated on public land, has subsequently been protected by Greek legislation from any form of exploitation.

Previous archaeological work at Vlochos

Prior to the present study, the area on and around Strongilovouni had only been subject to superficial archaeological study, mainly in the form of the observations made by early travellers, an extensive survey, and limited rescue work by the local archaeological authorities.

The first published mention of the site at Vlochos is in William Leake's account of his visit to the area in 1803.[11] He describes the remains on the hill as being of a "Hellenic city", with a "triple enclosure" lacking towers, and with walls of the "earliest kinds". Two walls descend the hill almost to the plain, making the walled enclosure between two and three miles in circumference (3.2–4.8 km). Based on its position at the confluence of what he identified as ancient Apidanos and Enipeus (modern Apidanos and Enipeas), Leake identified the remains as those of the ancient city of Peirasia(i).[12] However, judging from Leake's outline of his itinerary, it is apparent that he never visited nor saw the site himself, but relied on second-hand information. This has caused some later confusion and even the invention of an additional ancient city site; having visited the village of Vlochos, Leake proceeded along the path over Makrivouni and arrived late at night at the nearby village of Petrino,[13] where he describes the extensive remains of a walled city.[14] As no remains corresponding to Leake's description of a fortification wall of several kilometres in length have been reported from Petrino, it appears probable that he at some point confused descriptions of nearby Strongilovouni with those of Petrino.

If this was the case, it would seem that the first recorded scholarly visitor to the site was Johan Louis Ussing, who climbed the hill on 12 June 1846 during his extensive travels in Thessaly.[15] Ussing came to the site in the late afternoon, but managed to record some dimensions and apparent dates of the visible remains before he got lost in the dark. He identified the walls descending the hill on the south slope as being Medieval, and those on the summit as being "Hellenic"; the latter having several strong towers and gates. The existence of a wall that descended the north slope in a zig-zag fashion was also noted by Ussing, who interpreted it as protecting a road leading up to the summit.

Apart from one short posthumously published visit by Léon Heuzey in 1857,[16] the site appears not to have attracted any scholarly visits for more than 100 years.[17] Friedrich Stählin's descriptions of the site—as Peirasiai—are mainly based on those of Ussing and his plan of the remains is a tracing of the Greek General Staff's map from the early 20th century (*Fig. 6*).[18]

Frederick Winter mentions the site in an article on ancient fortifications,[19] and his personal archive contains photographs from 1962 marked Vlochos. These depict some of the fortifications and general views of the hill (*Fig. 7*) and constitute to our knowledge the earliest known photographs of the site.[20]

Ancient remains discovered during quarrying activities at the foot of the hill in 1964 prompted the archaeological authorities in Volos to conduct limited rescue work. At the site of Gekas (Γκέκας, at E in *Fig. 4*),[21] three votive *stelai* were found.[22] In the same year a golden wreath weighing 30 g (now in the Archaeological Museum of Volos) was handed in to the authorities by a private citizen.[23] The finds from the rescue excavation established that the location of the actual settlement was at the foot of the hill and not on the hill-top, as had previously been assumed. As a result of the threat to the site from the ongoing quarrying, in 1964 the Ministry of Culture declared Strongilovouni at Vlochos a protected archaeological site.

As part of an extensive survey of the Enipeus valley in the 1980s, Jean-Claude Decourt visited the site at Vlochos and

[10] Declaration ΥΑ 1154/4-3-1964, ΦΕΚ 91/Β/19-3-1964.
[11] Leake 1835, 319.
[12] Leake 1835, 322–323.
[13] Along the path indicated by the dashed line between the villages of Vlochos and Ayios Dhimitris in *Fig. 5*.
[14] Leake 1835, 326.
[15] Ussing 1847, 258–259.
[16] Heuzey 1927, 75–76.
[17] The site is discussed by Edmonds 1899, but the author seems never to have visited Vlochos.
[18] Stählin 1937a, 103.
[19] Winter 1971a, 421.
[20] Negatives 62-7B-035 to -037 and 62-08-000 to -014. Negatives kept at the Canadian Institute in Greece.
[21] The exact location was identified by us through enquiries with one senior inhabitant of Vlochos, Mr Konstantinos Tegopoulos, who had guarded the site at night during the 1964 excavations.
[22] Liagkouras 1965.
[23] Archaeological Museum of Volos, M79/ID 1952.

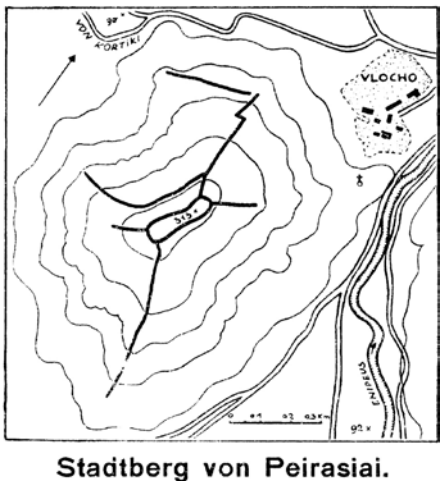

Fig. 6. Sketch-plan of the site at Vlochos (as Peirasiai), made after the Greek General Staff's map, in Stählin 1938a, 103.

Fig. 7. The hill-top and east slope of Strongilovouni in 1962. Photograph by F.E. Winter. © The Canadian Institute in Greece.

described its visible remains.[24] Decourt's account remained the most detailed and accurate until this study and included the first published photographs of the site and its fortifications. Decourt later published the twelve known inscriptions from the site, ranging in date from the Archaic to the late Hellenistic period.[25]

As a result of the installation of a telecommunications cable at the eastern extremity of the site in 1996, three trial trenches were laid out by the Ephorate in the affected area, immediately to the west of the road from Vlochos to Palamas. The remains of several buildings, which were interpreted by the excavator as workshops, were noted.[26] A later collaboration between the Ephorate and the municipality of Palamas helped expose a section of the lower fortifications in the area of Patoma, which had been covered in alluvial deposits from the nearby Enipeas.[27]

Short descriptions of the site appeared in the following years in various publications and guide-books on the antiquities of the region,[28] but no further archaeological work was published until the present study. The traditional identification with ancient Peirasia(i) was, however, shown to be false by the discovery of a Classical-Hellenistic stamped roof tile at the large multi-period site of Ermitsi (10 km south of Vlochos) with the inscription [Π]ειρασί[εων],[29] indicating that the centre of this particular *polis* was at this location (see below).

Methodology

The site at Vlochos was characterized by extensive yet relatively under-investigated archaeological remains which clearly warranted a detailed study. This was central to the aim of VLAP, which sought to understand the extent of urbanization, and the chronological development and character of the fortifications on the site. The scale of the site and the limited budget of the project required a methodology that could rapidly map and record the area on multiple scales, from a macro-scale aerial reconnaissance, through medium-scale recording of urban layouts, to the micro-scale layout of individual structures. We therefore decided on a survey approach that integrated landscape survey, aerial survey, surface survey, architectural survey, and geophysical and geochemical prospection.

In terms of Classical archaeology, this approach fits well within a recent development in a long tradition of whole-site recording. However, relatively few sites have been studied using integrated digital non-invasive surveys on this scale.[30] Until relatively recently, much of our knowledge of Classical-Hellenistic urban development and layout stemmed

[24] Decourt 1990, 160–162, figs. 58–72.
[25] Decourt 1995, 1–8, pls 1–2 (as Limnaion).
[26] Nikolaou 1997, 492.
[27] Hatziangelakis 2007, 34.
[28] Hatziangelakis 2008, 322–323; Nikolaou 2012, 82–83 (as Limnaion).
[29] *ADelt* 48 *Chron*. B1 (1993), 244; Hatziangelakis 2008, 319–320.

[30] Similar approaches have been conducted mainly in Boeotia, most notably at Plataiai, see Konecny *et al.* 2013. Other sites within that region have been similarly studied, but are at present under publication. These include ancient Haliartos, Hyettos, Koroneia, and Tanagra; all studied by the Leiden Ancient Cities of Boeotia Project. Several archaeological projects within Greece have utilized similar individual methods as VLAP, but few of them have chosen a fully non-invasive approach. Noteworthy examples are ancient Sikyon (Lolos 2011) on the Peloponnese, Olynthos at Chalcidice (Nevett *et al.* 2017), Makrakomi in Phthiotis (Papakonstantinou *et al.* 2013), and Kastro Kallithea (Tziafalias *et al.* 2006; 2009; Haagsma *et al.* 2011) and Skotoussa in Thessaly (La Torre *et al.* 2017).

Table 1. Summary of techniques used during the 2016–2018 seasons, showing their broad aims and outputs.

Method	Technique(s)	Aims	Product/output
Aerial survey	Unmanned aerial photography (drone), multi-image photogrammetry (SFM).	To produce a topographic plan of the site, to identify micro-topographic features, to supplement the architectural survey.	Orthomosaic vertical aerial photographs, oblique aerial photographs, digital elevation models, local relief models.
Surface survey	Fieldwalking (*ad hoc*).	To discern the distribution of surface remains and artefacts.	Extent of surface material.
Architectural survey	NRTK-GNSS mapping of structures. Terrestrial photogrammetric recording of visible features.	To record visible architecture and to identify any diagnostic chronological features and/or stratigraphic relationships.	Architectural plan, phase outline, digital shape files.
Geophysical prospection	Fluxgate gradiometry, ground penetrating radar.	To map and record subsurface archaeological remains.	Map of buried architectural remains, layout of the site, detailed plans of key buildings.
Geochemical prospection	Portable X-ray fluorescence analyser (pXRF).	Identify contrast in chemical soil enrichment.	Heat map of elemental soil concentrations.

from extensive early 20th-century excavations of sites mainly in Asia Minor and Magna Graecia, with additional information from fieldwork at the very large ancient cities of Athens and Corinth. "Lesser" cities received less attention and their origin and development were assumed to be similar to that of the "major" cities. The advantage of our approach is that it can reveal significant structural detail of a site in a short time and at a very low expense. With a small team and only a total of seven weeks in the field, we were able to map out the layout of an ancient city, identify multiple chronological phases of construction, record the full extent of standing archaeology, and identify numerous additional structures. In comparison, with the same time frame and budget, a project focused on excavation alone would likely only have been able to reveal a single building. This is not to diminish the value of excavation, but rather to highlight the importance of integrating multiple methods when exploring complex and extensive sites.

In our approach, each technique contributes a different but complementary dataset that together can give us a clearer understanding of the site. *Table 1* shows a summary of the methods, the principal techniques, aims, and outputs. The results of each approach were collated in a geospatial database using a Geographic Information System (in ArcGIS and QGIS). This is an important methodological component, as the database does not simply curate the data, but allows the outputs of the methods to be analysed in detail and integrated to produce a holistic characterization of the site. This acts as the basis for interpretation and the cross-technique comparison.

It is important to acknowledge that while this approach has the potential to yield significant information about ancient urban sites, it is not exhaustive. Without excavation, interpretations remain broad. However, the comparison of data obtained by the use of different techniques means that confidence in our interpretations is higher than if we had only relied on a single method. We consequently argue that the results represent a good approximation of the function, history, and character of the site.

AERIAL SURVEY

Aerial survey with a small Unmanned Aerial System (UAS, i.e. a drone) with a 12-megapixel camera attached via a mechanical gimbal was used extensively at Vlochos.[31] Aerial photographs were collected for publication shots of specific features or contexts, vertical images of key structures, and images for multi-image photogrammetry (sometimes called Structure From Motion, SFM).

Photogrammetry uses multiple overlapping photographs to produce a three-dimensional point cloud which can act as the basis for spatially accurate, mosaicked orthographical photographs (a true vertical overhead image) and digital elevation models. These are produced by pixel-matching software that identifies comparable points in the images and produces a series of stereographical pairs that, when collated, produce the 3D model. Several areas were photographed. These can broadly be split into three scales: large scale, recorded at an altitude of *c.* 120 m covering an area of over 1 km^2, medium scale, captured at between 30 and 100 m covering areas such as the Patoma area and the hilltop, and small scale, capturing at below 30 m and targeting specific features.[32] This approach has significant potential in that it allows for rapid capture of high resolution imagery over relatively large areas and, additionally, flights can be launched with very little preparation, allowing condition-

[31] DJI Phantom 3, Mavic Pro, and Mavic Pro 2.

[32] All these images were recorded prior to the recent implementation of stricter legislation concerning UAVs.

specific images to be captured (of, for example, crop-marks and snow-marks).

At Vlochos, flights conducted at different times of the year allowed for the capture of specific features and phenomena, including indications of buried archaeology just below the surface. Most notably, the unexpected weather conditions in January 2019 gave an unprecedented view of the differential thawing patterns in the winter's snowfall.

Most of the data was captured using predefined flight paths (using the DroneDeploy software). This approach worked well for flat areas, but was problematic in areas of extreme topography (such as the hill slopes). Therefore, a mixed method was adopted that combined predetermined flight paths and *ad hoc* manual capture (*Fig. 8*). In order to geo-rectify some of the survey areas, visible tie points were recorded using NRTK-GNSS on either custom-made marker plates or visible architecture. Additional data were extracted from video orbits of the hill.

Photographs were taken with a significant overlap (*c.* 60–70%) and in total over 16,000 aerial images were captured of the site between 2016 and 2018. These were grouped by area and/or target and filtered before being processed in Agisoft Photoscan (now Metashape). Specific workflows varied depending on requirements but broadly followed the standard processing procedure of aligning photographs, building a dense cloud and mesh, and finally producing a texture. Orthophotographs and digital elevation models (DEMs) were exported as geoTIFs and added to the spatial database. Secondary processing of DEMs was carried out in the GIS software (ArcGIS and QGIS).

PRELIMINARY SURFACE SURVEY

A small surface survey unit surveyed—where accessible—the terrain within and immediately around the archaeological site, identifying concentrations of surface finds and structures and recording them with a hand-held GPS unit (*c.* 3-metre accuracy). This was done partly to assist the architectural survey, but mainly to locate the boundaries of the archaeological site. As the archaeological site at Vlochos comprises a large area with a great variety in terrain and vegetation, different surface conditions (ploughed fields, eroded hill-slope, etc.) have naturally generated different grades of artefact exposure. The aim of the survey was not to collect individual finds and plot their distribution, but rather to acquire a first overview of the archaeological situation at the site.

We would like to point out that this cannot be compared to a systematic surface survey or "fieldwalk", which in all probability would have resulted in more surface finds. Fieldwalking would have required the collection of finds, which we did not want to do as the project strove to be non-invasive. However, we plan to incorporate fieldwalking in future work at the site (see below).

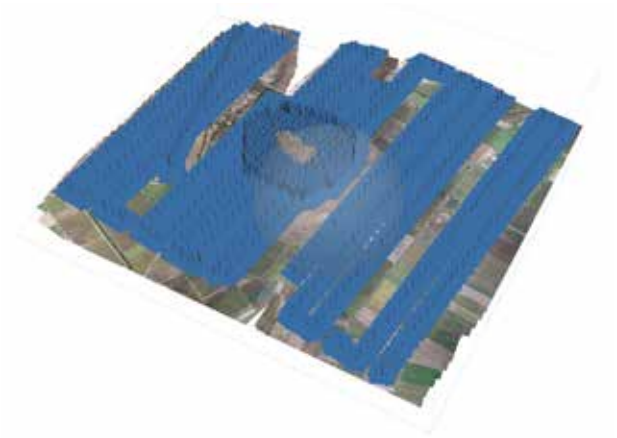

Fig. 8. Photogrammetric reconstruction of physical terrain in Agisoft Metashape. Modelling by R. Potter.

ARCHITECTURAL SURVEY

The aim of the survey of fortifications and visible architectural remains was to record all of the remains on the hill-top, the slopes, and the area of Patoma. In order to achieve this within the project's three-year time frame, a documentation method was developed that allowed the rapid characterization of features. In order to locate potential features, aerial photograph interpretation and GIS analyses (including slope and local relief modelling) were used to identify walls and areas of interest, which were then systematically surveyed in the field.

After the initial survey, a more in-depth documentation of structures with a high archaeological potential was carried out. A feature was essentially considered to be a discrete line of more than two stones, or solitary stones that clearly were *in situ*. Each feature was given a context number indicating their zonal position and relative chronological phasing. For the areas outside the Patoma area, features were described, photographed, and recorded with an NRTK-GNSS receiver (Network Real-Time Kinematic Global Navigation Satellite System, 0.03 m accuracy).

The initial work was conducted using digital vector line measurements, which recorded securely identified architectural features. These lines consist of a series of 3D points recorded at the base of the architectural remains, tracing the outer faces of the features. In a second stage, vector polygon measurements, similarly executed as the vector lines, were added to record individual stones of particular architectural significance. Within the Patoma area, features were only recorded as individual stones using polygon measurements, as the architectural survey in this area had a secondary role to the geophysical survey. Larger features, such as fortification walls or features that together with other features formed structures (including building foundations), were recorded using terrestrial and/or aerial photogrammetry (SFM).

In order to process the data, we employed SiteWorks,[33] a software that combines raw measurement data from fieldwork with a relational database, allowing for the processed data to be exported as GIS shape-files or other database formats. In the post-processing part of the project, features were grouped to form structure-contexts such as buildings or fortifications. To further interpret the structures, data from the aerial and geophysical surveys were at this stage also used in conjunction with the data from the architectural survey.

The surface survey of visible architectural remains can of course provide neither the same accuracy of dating as an excavation nor the broader evidence for human activity in the landscape produced by a fieldwalk survey. The documentation of visible architecture generally provides only the broader indications for the dating of construction phases. The presence of visible stratigraphy within the constructed features above ground, however, provides further evidence for the chronological sequence of the architectural remains on the site. In order to illustrate and analyse the stratigraphic evidence, Harris matrices have been created for all features using the software yED. In order to further interpret the visible architectural remains, the aerial mapping of the site has been used for the investigation of the micro-topography.

GEOPHYSICAL PROSPECTION

Geophysical prospection and characterization formed a significant component of the project methodology. Because of the open topography of the Patoma area and the extent of the ancient intramural area, it was decided to incorporate techniques that allowed for both rapid-extensive coverage and intensive-detailed analysis. A combination of large-scale magnetometry (using fluxgate gradiometers) and Ground Penetrating Radar (GPR) was selected. Magnetometry allows large areas to be surveyed quickly in order to produce a comprehensive overall plan, while GPR allows smaller areas to be investigated in detail, at multiple depths. The techniques also complement each other well in terms of the physical remains they record.

Most of the survey work was focused on the Patoma area where magnetometry was used on the total extent of accessible terrain (*Fig. 9*). GPR was used to target areas of interest within the wider magnetometry survey. Other areas were surveyed with magnetometry to answer specific questions. A test area was chosen to the south of the Patoma area on land that is now used for farming, in order to confirm the extent of urban remains. Other smaller grids were located on the west colluvial fan (H in *Fig. 4*), and on the hill-top in order to identify any subsurface structures.

Magnetometry is a passive technique which identifies subtle variations in the Earth's magnetic field caused by near-surface magnetic changes. This can include areas of burning, soil disturbance, or areas that have a different magnetic fraction in the soil matrix. Additionally, magnetometry can reveal the contrast between iron-rich soils and magnetically inert building materials (such as limestone or marble). On Greek urban sites, this combination of observable magnetic phenomena is valuable, as foundation materials are typically stone and buildings are roofed with tiles made from fired, iron-rich clay which, upon collapse can create a clear contrast between foundation and surrounding areas.

GPR uses electromagnetic radiation emitted vertically into the ground to identify changes in subsurface density. Changes cause a signal reflection that is received by the unit and the travel time can be equated to relative depth. In contrast to magnetometry, this technique allows subsurface features to be identified at multiple depths. GPR is consequently useful in relation to multi-phased remains that in magnetometry would appear as a single, two-dimensional plot. However, compared to magnetometry the technique is significantly slower and requires much more data processing and analysis. This issue is mitigated by using the two along with extensive horizontal survey of magnetic characteristics and more detailed, intensive study of changes in subsurface density at varying depths.

Survey was conducted in four areas of the site of Vlochos with magnetometry carried out in the Patoma area, the west slope, the hill-top, and in the adjacent fields to the south, while GPR was limited to selected parts of the Patoma area. The data-capturing methods, survey techniques and processing conform to the guidelines of the Europae Archaeologiae Consilium (EAC).[34]

Magnetometry

The magnetometry survey used a dual-probe Bartington 601-2 fluxgate gradiometer, following a grid system measured at 20 m by 20 m established with a GNSS-NRTK unit. Each grid was surveyed using the zig-zag method at 1-m intervals with data recorded every 12.5 cm. This method was selected as it gives a good compromise between survey speed and precision. Data were recorded in Nanotesla (nT) with a sensitivity range of 0.1 nT. The instrument collects two lines of data on every transect and readings are logged on a consecutive timer along each transect. The instrument will typically detect features to a depth of up to 1 m, but sensitivity can vary depending on the strength and character of the magnetic anomalies and the background geology. Data were downloaded to a por-

[33] Developed by Arkeologikonsult Ldt.

[34] Schmidt *et al.* 2015.

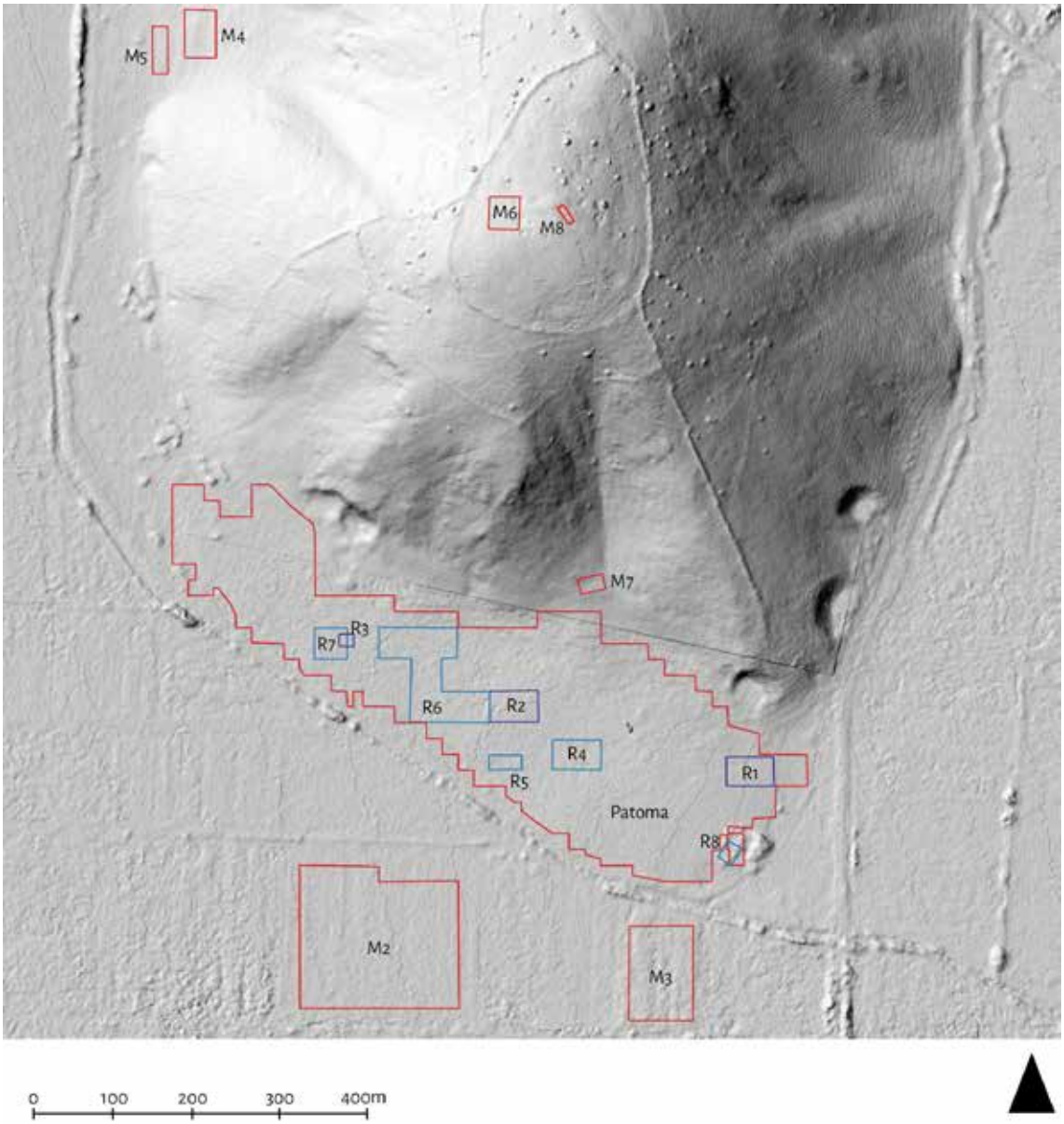

Fig. 9. Geophysical survey areas marked on hill slope model, with magnetometry shown in red and GPR in blue. Plot by D. Pitman.

table computer and processed using specialist software (Terrasurveyor).

All data were processed using the same primary workflow with additional secondary processing applied when necessary. The following summarizes the key processing steps:

1. De-stripe (determines the mean reading for each transect and subtracts that value from each data point in the layer). This produces a normalized plot, but maintains the total nT range of the original survey. Typically, this is too broad to see the full range of archaeological features and requires clipping.
2. Clip (removes data points beyond a set range, typically one or two standard deviations). This is used to varying degrees, depending on the strength and range of magnetic variation. In this instance data were clipped to ±12nT.
3. Interpolate (increases the number of data points to match the X and Y resolution) used for the final presentation images as presented in this article. This provides a more even image.

Plots for each survey area were exported from Terrasurveyor using the standard process outlined above. Each plot was then geo-rectified in ArcGIS and exported as geoTIFs (GGRS87). Initial appraisal of potential structures was carried out visually before being assessed in Terrasurveyor using the XYZ visualization and magnetic profiles.

Ground Penetrating Radar

The GPR survey was conducted using a Malå Mira 3D imaging radar array. The system includes eight 400 MHz antennae separated at 8 cm. This gives a maximum effective depth of 4 m and a swathe width of 1 m. Data were spatially recorded using a robotic total station attached to the system. Spatial points (x,y,z) were continuously streamed allowing accurate geolocation of 3D points, including topographic offset. GPR was targeted on key areas of interest, and interpolation between swathes was therefore kept to a minimum. The array was towed using a small tractor and total coverage was ensured using guide points along parallel baselines.

In total, nine areas were recorded covering a total of 2.1 hectares. The radargrams were processed first using R-slicer before more detailed processing in GPR-Slice 7. Data was processed along the following broad workflow:

1. Time Zero Adjustment on raw data.
2. Amplitude correction and Antenna Ringdown removal.
3. Data interpolated.
4. The velocity of the subsurface matrix was estimated using hyperbola migration. Best fit hyperbola matching calculated the average site velocity to be 0.07 m/ns.
5. Gain was adjusted using a curve in order to minimize background noise and static interference.

Time-slices showing prominent archaeology were exported as geoTIFs (GGRS87) and added to the geographic database.

GEOCHEMICAL PROSPECTION

In order to characterize the soil conditions and to investigate the potential for spatial chemical enrichment by anthropogenic activity, a small-scale prospection of *in situ* chemical analysis was conducted on the topsoil in the Patoma area. A range of human activities leave a geochemical trace. Some, such as industrial activity, can alter the soil's geochemistry over time, while others, such as midden deposits, leave relatively low levels of enrichment. The extent of visible chemical change depends on the background soil conditions, geomorphological constituents, and taphonomic processes.[35]

Analyses were conducted on-site using a portable X-ray fluorescence analyser (pXRF) with built-in GPS (Niton XI3t Gold). Analyses were run for 25 seconds with the instruments "soil mode" which uses fundamental parameter calibration and Compton scatter normalization to give elemental composition values that are internally consistent for a detailed methodological discussion.[36] Points were taken on a "systematic random" basis by walking in broad transects with readings taken every 20–30 m. The instrument's built-in GPS was used to record the location of each reading with an accuracy of ±4 m. This form of survey is used to identify any specialized chemical enrichment. In total, 18 elements were analysed simultaneously, resulting in a broad-spectrum analysis of soil geochemistry.

Results of the 2016–2018 seasons

The results of the project's field seasons are presented below, according to survey method. The nature of the integrated survey approach means that it is necessary to present the data in steps in order to maintain clarity. The first step is to present the detailed outputs from each survey type, before integrating the technical results into a more interpretative discussion. In practice, this is an iterative process that does not necessarily follow a linear workflow. During the course of the fieldwork, a new result from one technique could lead to the implementation of a different technique.

AERIAL SURVEY

Aerial survey contributed to every part of the project. The illustrative potential alone of aerial images means that important areas of the site not observable from the ground can be seen in detail. The dataset and first phase of processed orthographical photomosaics have consequently contributed significantly to our understanding of the site as a tool for both the recording of features to prospection and identification of previously unidentified structures.

One of the most significant results of the aerial survey was the total orthographical photomosaic of the hill-top areas (*Fig. 10*). This photomosaic was used to identify features such as the **Bastion**, which is nearly inaccessible to traditional survey methods (*Fig. 11*), and the building cluster in the north-west corner of the *akropolis*. In addition to identifying new structures, this survey also helped to exclude large areas from the surface survey. In being able to show that no identifiable structures were present, the aerial survey allowed us to make informed decisions regarding the best use of terrestrial approaches.

[35] Eberl *et al.* 2012.

[36] Welham *et al.* forthcoming.

Fig. 10. Orthographic photomosaic of the archaeological site at Vlochos (GGRS87). Referencing by D. Pitman and R. Potter.

The aerial survey was used to produce a large-scale Digital Elevations Model (DEM) of the whole site and immediate surroundings. This was an important component of our survey work, as it acted as a base-map for many of the more detailed surface surveys. Aerial photography was also used for more *ad hoc* prospection. Throughout the duration of the project, the drone, which was always on site, was an integral part of on-going prospection and recording processes. When potential structures were identified on the ground, the drone could quickly be deployed to help guide subsequent NRTK-GNSS measurements and geophysical work.

In the period since the conclusion of the project, aerial reconnaissance has continued at the site through the work of the Ephorate of Antiquities of Karditsa. In January 2019, it was used to great effect after a snowfall in the Patoma area. The images show a series of snow-marks on the

Fig. 11. Aerial view of the ***Bastion****, looking towards the south-west. Photograph by J. Klange and H. Manley.*

ground. The differential thawing of the snow, caused by residual heat in buried architecture, highlighted a range of archaeological remains that include the fortification walls and structures in the centre of the eastern section of the site. The snow-marks show clear linear structures, indicative of both domestic structures and public architecture. This includes structures that were previously unidentified by the geophysical and aerial surveys (*Fig. 12*). This was perhaps the first time in Greek archaeology that a drone was used to record snow-marks.

PRELIMINARY SURFACE SURVEY

The surface survey of the hill and its immediate vicinity resulted in surprisingly few concentrations of artefacts. The hill-top area contained next to no ceramic material; only a few fragments of eroded tile and non-diagnostic sherds were found in the south part of the area. As this part of the site is exposed to strong erosive forces, it is probable that any ceramic material exposed to the elements would have disintegrated or been washed away downhill.

The Patoma area is rich in surface material, especially at the base of the slope where erosive forces and modern quarrying have exposed buried soils. The area has not been ploughed within living memory. Most of the visible ceramics are, however, heavily eroded, indicating a long exposure to the elements. To ascertain if the distribution of ceramic material reflects any functional internal differences within the settlement would require systematic fieldwalking.

Careful examination of all the fields surrounding the hill revealed no ceramic material, and the surface soil must therefore be regarded as near-sterile. We find it remarkable that in spite of being located next to the densely built-up ancient settlement, the fields south of the area of Patoma contained only five ceramic fragments, all non-diagnostic, very small, and none of which was found close to the ancient settlement. No slabs from the tombs reportedly found here by local inhabitants were identified. It is probable, however, that silting from the nearby river Enipeas has covered most of this area, and that any ceramic material lies buried deep in the ground.

The only exception was a zone of slightly elevated soil in the field immediately east of the Patoma area (O in *Fig. 4*), just outside the archaeological site, where numerous sherds and tile fragments of Classical-Hellenistic and Roman date were noted. The proximity to the urban settlement suggests that this may have been a suburban area, the existence of which has already been established by the nearby rescue excavations (see above). However, as the modern road immediately next to the area is built up on an artificial bank, it could also be that the material had been moved here during the construction of the road in the 1930s.

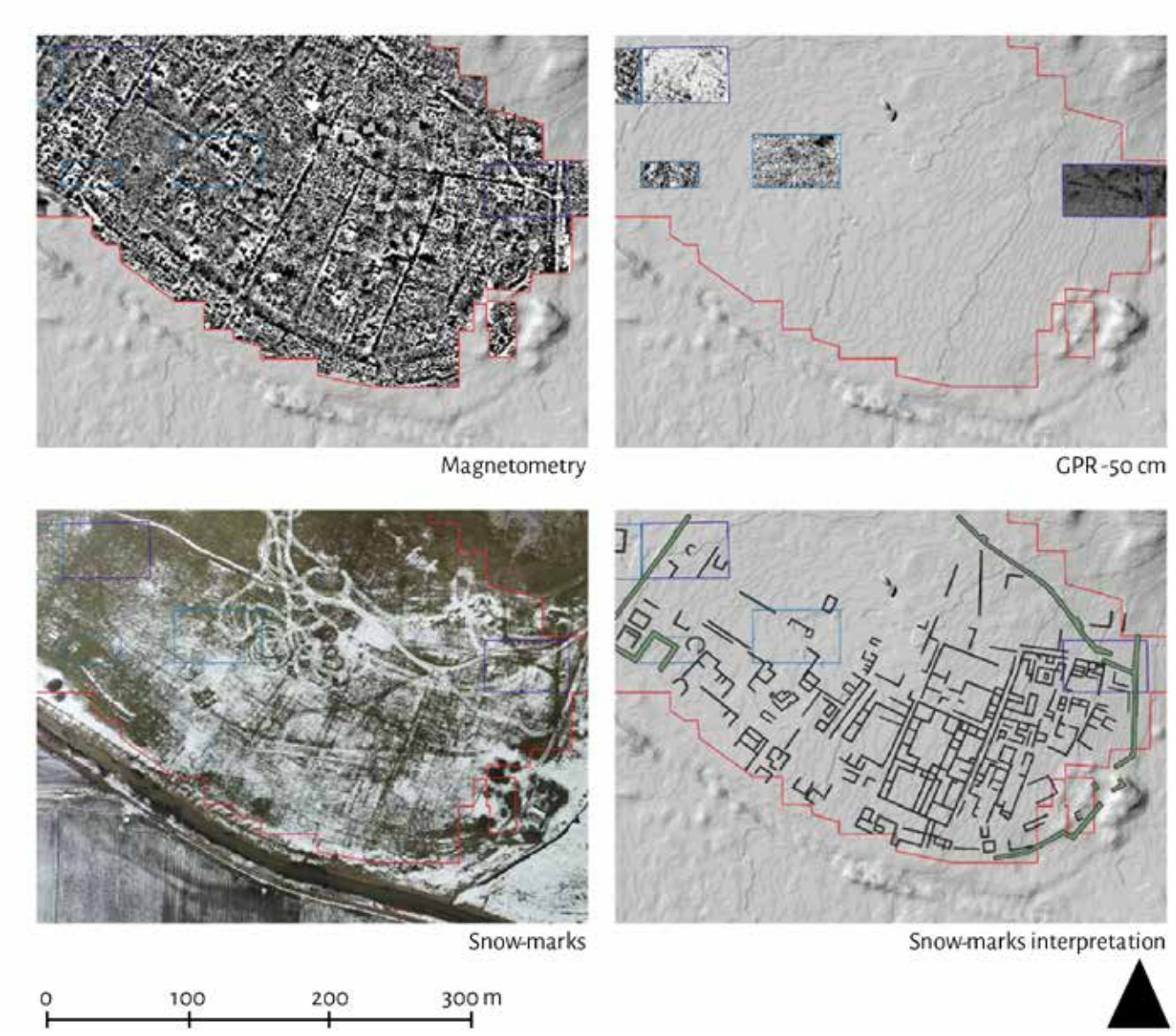

Fig. 12. Comparison between magnetometry, GPR, and snow-marks, showing the clear presence of buried linear walls and their partial correlation with magnetic and radar anomalies. Geophysics by R. Potter and D. Pitman, aerial photomosaic by L. Shaw, and interpretations by R. Rönnlund.

ARCHITECTURAL SURVEY

Fortifications

The survey of visible architectural remains at the site of Vlochos confirmed and added to preliminary observations made by the team. Most of the architectural remains below the hill slopes have been nearly completely stripped of stones, most probably for the production of lime in the large kiln visible at the east end of the Patoma area (T in *Fig. 4*). Several local informants confirmed that the site had been frequented during the construction of houses in the surrounding villages and the *spolia* visible in the churches of nearby Palamas probably originate from the remains at Vlochos.[37]

The hill-top and slopes, however, contain extensive remains of several fortification programmes, a comparably small number of building foundations, and some features of unknown function. The hill-top fortifications—consisting of walls, towers, and gates—are in places preserved up to 2.5 m

[37] Spoliated fragments have also been noted in the church of nearby Metamorfosi (previously Kourtiki) and in the one at Petrino. Whether these originate from the site at Vlochos cannot be ascertained.

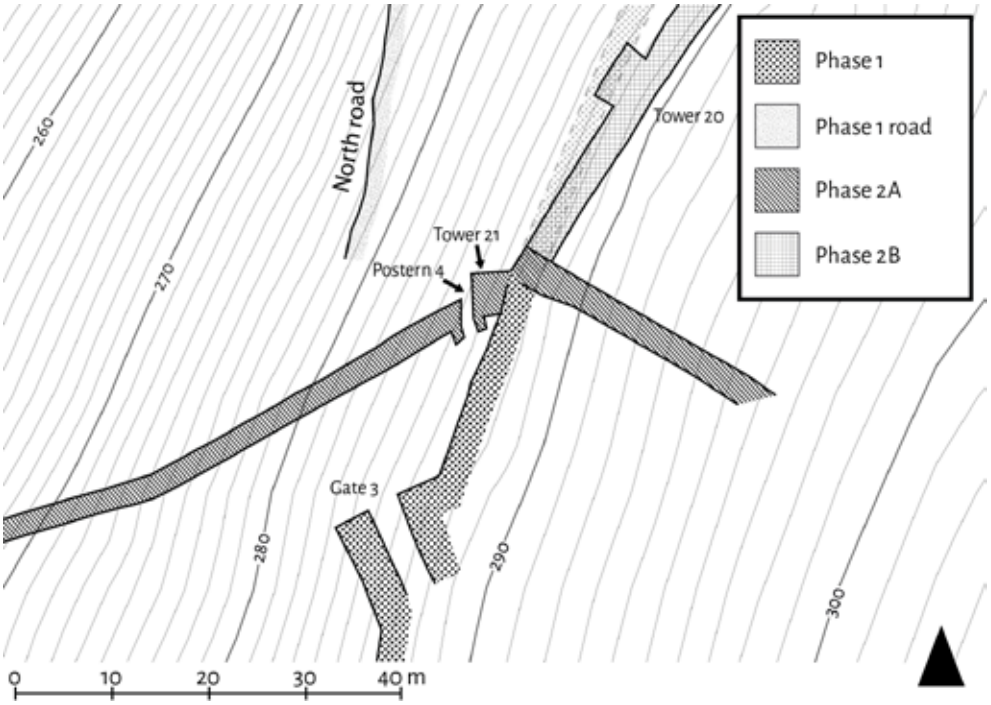

Fig. 13. Fortification construction phases at the ***Gate 3*** *complex, west side of hill-top. Plan by R. Rönnlund.*

in height, and appear not to have been stripped for building material.

The existence of several discrete construction phases of the fortifications was quickly confirmed. This was first discerned as differences in execution, layout, and material, ranging from rubble walls, through polygonal masonry to mortared walls. Further work allowed for the identification of the stratigraphic relationship between these phases, as sections of fortification walls clearly overlapped one another at two areas on the hill-top.

In all, five separate chronological building phases could be identified: one pre-Classical (Phase 1), two Classical-Hellenistic (Phases 2A and 2B), one Roman (Phase 3), and one Late Antique or Early Byzantine (Phase 4). It has to be noted, however, that the remains of one of the phases (Phase 3) could only partially be traced at the surface; most of the evidence for this phase is derived from the results of the gradiometric survey (see below).

The chronological relationship between the better-preserved phases (1 and 2A/2B) can clearly be observed around **Gate 3** on the west brow of the hill-top (*Fig. 13*). Here, the tower-less fortification wall in uncut rubble masonry of Phase 1 is clearly cut by the very differently executed curtain wall of Phase 2A, immediately east of **Tower 21**. Part of the outer-face masonry of the Phase 1 wall was kept *in situ* inside the fill of the later Phase 2 wall, whereas the immediate continuation of the former towards the north-east was largely removed. That the large terraced road on the north and west slopes of the hill was related to Phase 1 could further be ascertained, as its course clearly points towards the Phase 1 large **Gate 3** rather than the small **Postern 4** of Phase 2A.

With a distinct difference in masonry style and quality of execution, the second phase of fortification can with confidence be divided into two sub-phases. Again, this is most clearly discernible at **Tower 21** (*Fig. 13*), where the Phase 2A south-west descending wall (in neatly cut semi-coursed polygonal masonry, *Fig. 14*) ends and is replaced in the next curtain wall by the roughly cut and poorly preserved masonry of Phase 2B (*Fig. 15*). The original course of the fortified enceinte of Phase 2A continues in a sharp angle at this point towards the south-east, and is only partially preserved in the area closest to **Tower 21**.

A similar situation, although less easily discernible, can be noted at the corresponding deviation of Phases 1 and 2A/2B at the south-east corner of the hill-top (*Fig. 16*). The existence of another road, similar to the previously mentioned one, on the south and east slopes of the hill leading towards the hill-top indicates the existence of another gate here, similar to **Gate 3**. Later building activities have, however, eradicated any evidence, and its position can only be determined by the course of the **South road** and a very large square block marking its possible outer corner.

The south-east descending wall of Phase 2A originates in the large **Tower 4** immediately on top of the reconstructed trace of Phase 1 and the continuation uphill of the latter can only be discerned with confidence *c.* 40 m further to the

Fig. 14. Outer face of south-west descending wall, below ***Postern 4****, looking towards the east. Photograph by S. Chandrasekaran.*

Fig. 15. Outer face of wall between ***Tower 7*** *and* ***Tower 8****, looking towards the west. Photograph by S. Chandrasekaran.*

north–north-east. Similarly to the corresponding intersection of Phases 1 and 2A/2B at **Tower 21** (see above), the Phase 2B wall continues along the natural topography in a distinctly different style of masonry and level of preservation. The existence of the foundations of a probable Late Antique church built immediately upon the remains of the Phase 1 gate (**Gate 2**) gives little additional stratigraphic evidence.

Below this area, the south-east descending wall contains extensive remains of the last reconfigurations on site (*Fig. 17*). The Phase 2A fortification wall, which is very well preserved at the upper section of the *c.* 450-m-long south-east descending wall, shows clear indications of extensive repairs and reconstruction in mortared masonry. This is most obvious at the lower section, where comparably little of the original outer face of the Phase 2A wall is preserved, with sections of original masonry becoming more predominant further up the slope. Two towers and four stairs appear to have been added to the wall, which in turn was made narrower than in Phase 2A. All traces of repairs cease abruptly just above **Jog 3**, where it is even possible to discern the end of the mortared fill as a line of lime on top of the wall.

Internal structures

Apart from the large fortifications, the site contains few visible preserved architectural features. These are mainly located in the southern part of the hill-top as well as on the south-east ridge along the inner side of the south-east descending wall. Scattered foundations can be noted elsewhere, including in the Patoma area, but most of the site is devoid of

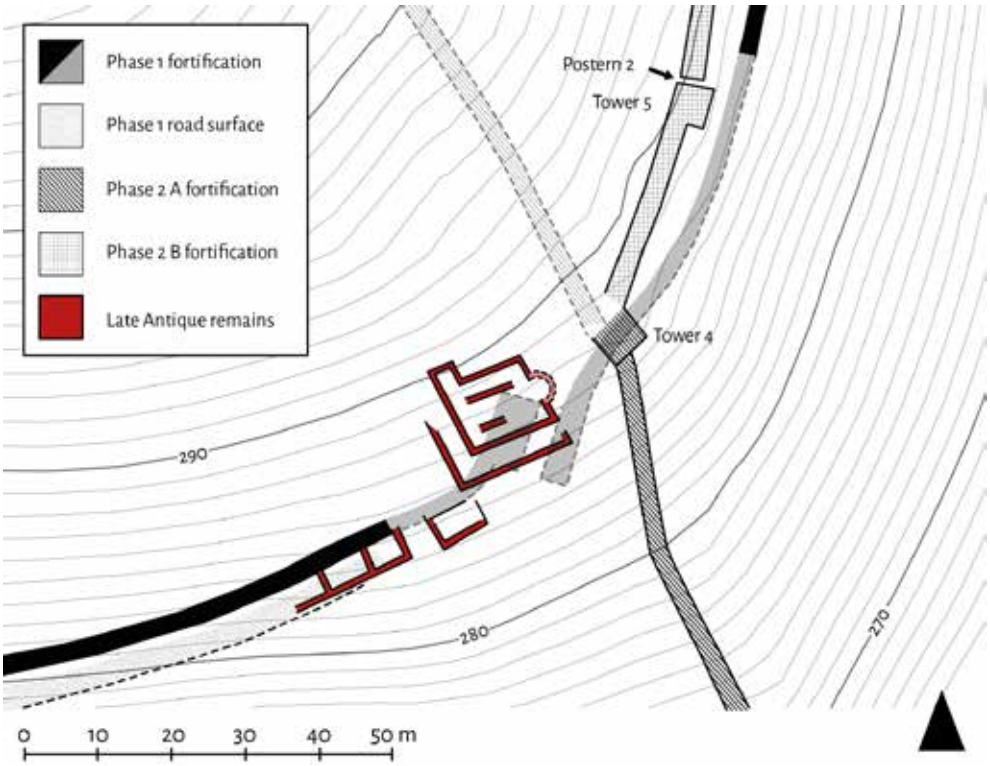

Fig. 16. Multi-period remains at the south-east area of the hill-top. Paler colouring of Phase 1 remains indicates reconstructed trace. Plan by R. Rönnlund.

building remains. The steep slopes are not suitable for the construction of houses but why the vast flattish hill-top only contains the building foundations of a few structures is difficult to explain.

The methods we employed proved effective, especially in the case of the area of the **church** in the south-east part of the hill-top. The large amounts of rubble covering the architectural remains would have made identification impossible without the painstakingly collected NRTK-GNSS measurements. These allowed us to discern the outline of the building and to identify it as a three-aisled church (*Fig. 16*).

GEOPHYSICAL PROSPECTION

In all 20 hectares of the site were surveyed in 2016–2018 during a period of seven weeks using geophysical prospection methods over four areas. The largest survey, that of the Patoma area, included 14.5 hectares surveyed with magnetometry and 2 hectares with ground-penetrating radar (GPR). This area included the majority of the intramural area as indicated by visible architecture and geophysical results. Other areas included the hill-top, its western slopes, and the fields south of the Patoma area. Both techniques proved exceptionally productive: the magnetometry data provided an extensive plan of the ancient city and the GPR data revealed clear outlines of buildings. The following sections summarize the results from the surveys.

The Patoma area

The magnetic characteristics and flat topography of the Patoma area turned out to be ideal for this kind of survey. In contrast, the dense vegetation made some sections of it seasonally inaccessible. During the first season (2016), survey was conducted only in accessible areas. After extensive mowing further areas became accessible during the second larger season (2017). During the third season, gaps in the survey were filled in. A full plot can be seen in *Fig. 18*. It is clear that there is significant structured variation in the results. There are a clear series of subsurface features that have recognizable magnetic signatures.

The survey in the Patoma area is dominated by linear anomalies which are indicative of a complex, multiphase series of walls, roads, and avenues. Both the character of ancient urbanism and the soil conditions have contributed to walls being discernible as low-magnetism linear anomalies, which are shadowed by magnetically rich areas, most likely caused by accumulations of anthropogenic material including magnetically active roof tiles. Streets appear as magnetically rich, linear anomalies. They form a clear grid-like layout that dominates the site. The main thoroughfare runs in a broadly north-east–south-west direction and connects to smaller, perpendicular streets (*Figs. 19, 20*).

The wall anomalies fall into two main types; fortification and domestic/structural. Fortification walls are visible along the outer limits of the survey area where surface traces of the

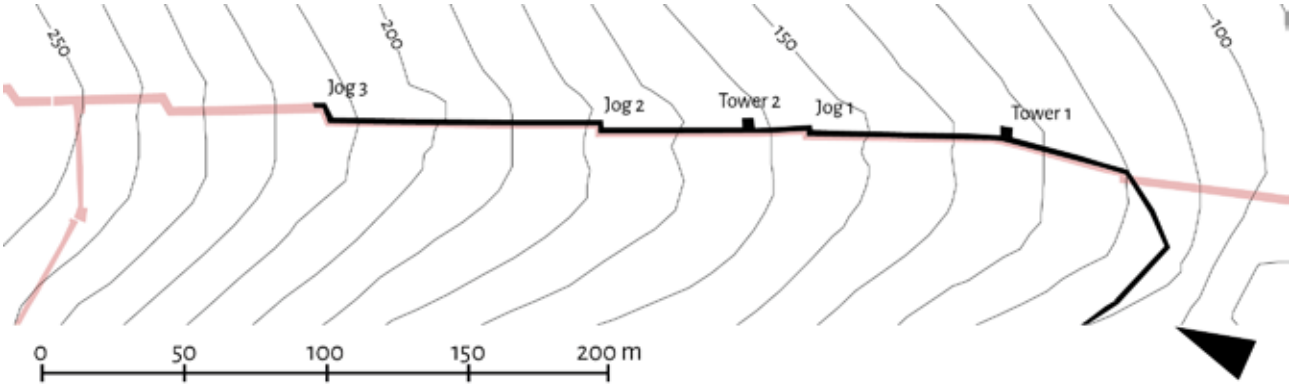

Fig. 17. South-east descending wall. Phase 4 repairs, additions, and extensions (black) upon Phase 2A fortification wall (pink). Plan by R. Rönnlund.

Fig. 18. Magnetic plot of the Patoma area. Plot by D. Pitman.

main city wall are still present. In the geophysical image, it can most clearly be seen in the west, where the line of the fortifications connects with the south-west descending wall further up the hill. This section includes between four and six tower-like structures and what appears to be a large entranceway, as also discernible in aerial photographs. Another fortification wall, dominating the eastern half of the surveyed area, appears to truncate multiple linear features, suggesting it belongs to a later phase of the site (see above). Areas immediately outside (north-west of) this wall seem to have been cleared of earlier structures. The line of the wall can be clearly seen in the magnetic data as a low magnetic anomaly.

Structural and domestic walls are far subtler in the magnetometry and are in some areas obscured by the magnetic

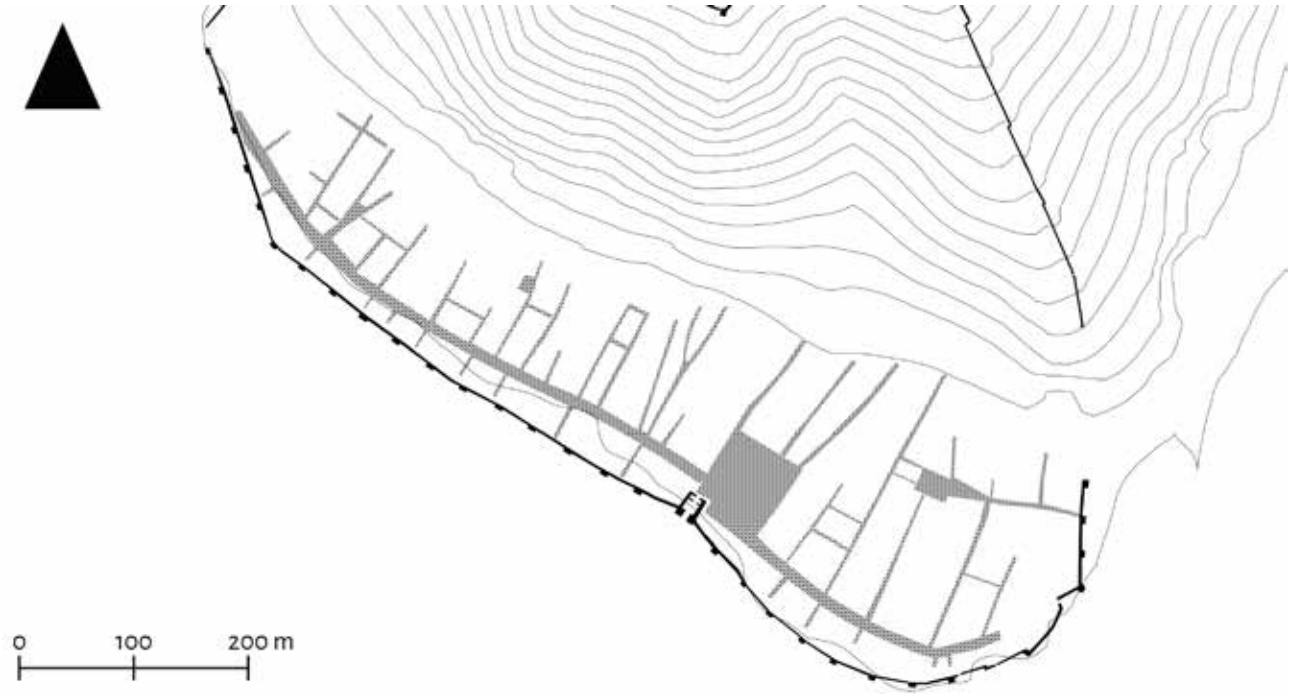

Fig. 20. Outline of street surfaces based on their magnetic signature (grey). Reconstructed trace of Phase 2A and 2B fortifications in black. Plan by R. Rönnlund and D. Pitman.

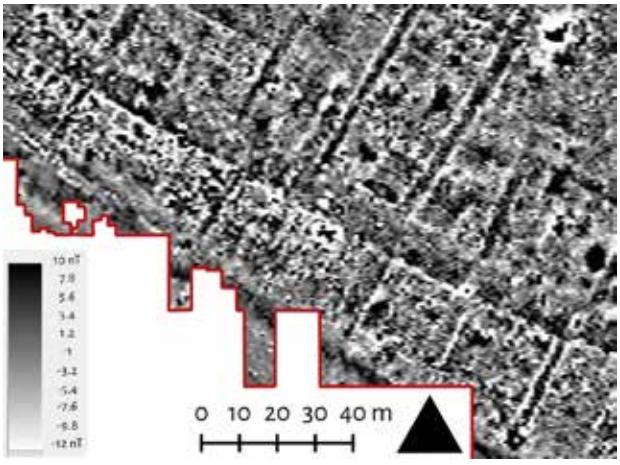

Fig. 19. Magnetic plot in the south-west of the Patoma area showing clear walls, roads, and the main west avenue. Plot by D. Pitman.

intensity of the surrounding areas. However, there are some anomalies (*Fig. 19*) where building structures and outlines are clearly visible alongside possible streets. These conform well with the grid-like layout of the bulk of the internal features.

Results of the targeted GPR surveys in the Patoma area complemented the magnetic results well in some key sectors. However, there are significant magnetic anomalies that are not identifiable through the radar survey; this is problematic as many of these missing features are likely to be buried architecture or foundations which should be within the visible range of the GPR. That said, some structures are clearly visible in both, such as the fortification wall in the east and some of the structures within the later enclosure (*Fig. 21*). But in other instances, structures that have been identified by radar are not clearly visible in the magnetics, most notably a structure in the western part of the site (*Fig. 22*). The structure has foundations that extend to a depth of *c.* 0.60 m and appears with much more clarity in the GPR data than the magnetic data.

Extensive tests of GPR on site suggest that either much of the archaeology is too shallow for the 400 MHz antennae to identify, with only deeper structural remains visible, or, that the majority of structures, which had probably been built with local stone, do not create enough contrast in the packed sand of the Patoma area. The latter scenario, although unusual, seems more likely as there are areas that clearly contain deep structural remains (fortification walls, monumental architecture, etc.) that remain invisible. This would suggest that, rather than those clear GPR structures being simply deeper, they are built in a style, or from a material, that causes a higher contrast with the surrounding strata.

The other areas surveyed on site produced little by way of urban remains. Sample grids in the west colluvial fan (H in *Fig. 4*) aimed at identifying terracing. While the survey indicated the presence of linear structures perpendicular to the

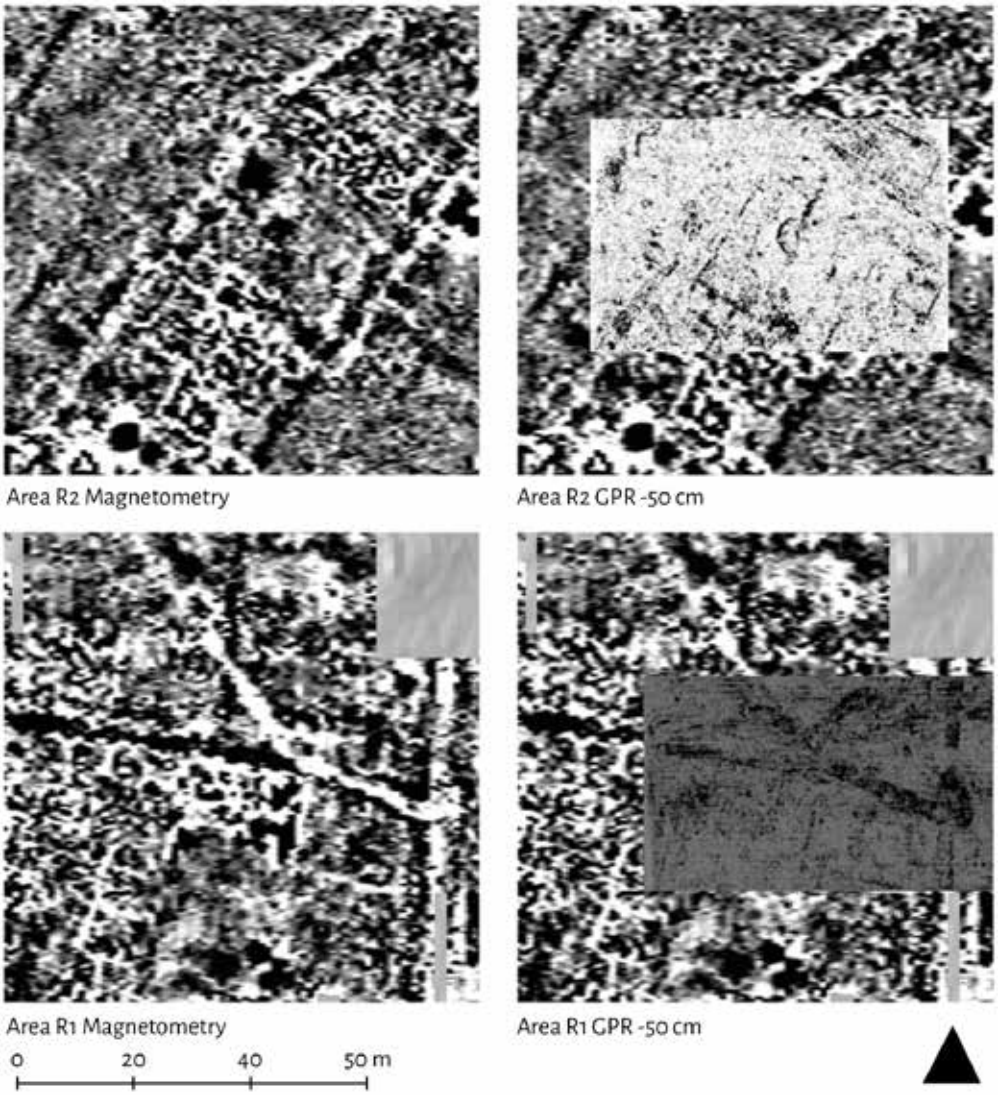

Fig. 21. Comparison between magnetometry and GPR in areas in areas R1 and R2. Plots by R. Potter and D. Pitman.

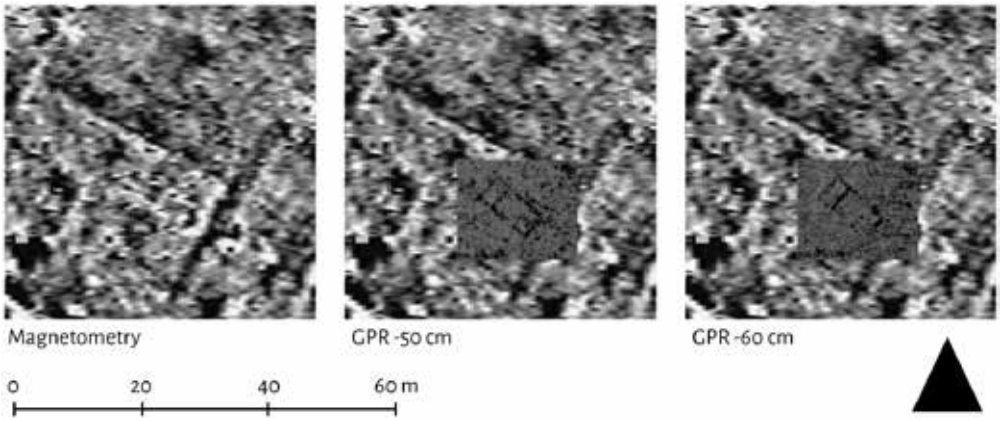

Fig. 22. Comparison between magnetometry and GPR data (superimposed). Plots by D. Pitman and R. Potter.

slope, the indications were very weak. It is likely that if terracing is present, it is buried under a significant depth of colluvium. Similarly, the sample on the south-east colluvial fan (B in *Fig. 4*) did not identify clear structural variation.

An additional four hectares of magnetometric surveying was carried out in the area to the south of the Patoma area on the other side of the modern irrigation canal that runs immediately south of the area. The survey blocks were placed within an agricultural field that probably contains silt accumulation from seasonal flooding of the nearby river Enipeas. Some geological variation and possible (un-datable) canals were identified, but no urban remains. Given the strength of the magnetic signature of the urban remains within the Patoma area, it is likely that if urban remains are to be found in the adjacent fields, they would have been revealed by the survey. The magnetometry suggests that urban activity was mainly limited to the intramural area of the Patoma.[38]

GEOCHEMICAL PROSPECTION

The results of the geochemical prospection show very low chemical enrichment on the site. There is also very little in the way of structured variation in the chemical mapping. Summative statistics for anthropogenic elements can be seen in *Table 2.* The data show a relatively inert soil stratum with low levels of chemical enrichment and comparatively little variation. The variation that is present seems to be the result of colluvium depositions rather than anthropogenic activity.

The lack of structured variation and general chemical enrichment over the site is most likely due to the properties of the soil matrix and its origin. It is likely, based on the hydrology of the plain, that flooding events have taken place on the site (in the Patoma area) with colluvial build-up closer to the foot of the hill. This has likely led to a relatively clean topsoil to the south, and a non-anthropogenic soil in the north. It is possible, however, that upon excavation there could be significant chemical enrichment within buried soil horizons.

Table 2. Summary of geochemical soil analysis (PPM) and percentage variance across the site.

Element	Mn	Ni	Cu	Zn	Pb
Mean	851	105	40	123	23
Standard deviation	143	29	7	16	7
% Variance	17	28	18	13	32

Discussion: Fortifications and means of access

As outlined above, the fortifications of Strongilovouni present strong indications of several clearly discernible phases of construction, probably the results of individual building programmes. Combining the results of the architectural survey and the geophysical prospection, it is possible to arrange these in a chronological scheme, including a pre-Classical, two Classical-Hellenistic, a Late Roman, and a Late Antique/Early Byzantine phase.

PHASE 1 (PRE-CLASSICAL)

The first fortification programme that can be discerned at Strongilovouni is a hill-top enceinte encompassing the whole summit, and two terraced roads leading up to two gates in the walls (*Fig. 23*). The isolated **Bastion** on the east slope of the hill is stylistically similar to the other remains from this phase and has therefore been interpreted as part of the same complex. There are no non-fortification structures on or around the hill that can be associated with this phase with any confidence, and the intramural area of the hill-top enceinte is nearly devoid of visible ceramics.

Fortification walls

The Phase 1 fortification walls followed a figure-of-eight course around the summit of the hill, running for 1.3 km and encompassing *c.* 11 hectares of rocky, barren ground (*Fig. 23*). The degree of preservation of the remains varies considerably, ranging from foundations to 2.5-m-high walls. In a few places no remains of the wall are preserved, but this is a result of later building activities.

The overall construction of the fortification walls indicates that they were built as part of a single building programme, but the internal differences in masonry indicate that separate teams of workmen must have been involved in the work.

The main difference in masonry within the Phase 1 enceinte is the extent to which large blocks have been used. At the northernmost end of the enceinte (F in *Fig. 23*), the outer face of the fortification consists mainly of very large uncut stones, ranging between 0.5–1.2 m in size, supporting a 3.2-m-wide wall preserved to more than 2 m in height. The masonry (*Fig. 24*) shows that the wall was built in sections, with courses aligned in a slanting manner.

This contrasts with the masonry found on the opposite side of the enceinte (G in *Fig. 23*), which has a more uniform outer face with many small stones employed. The frag-

[38] The excavations conducted by the Ephorate of Antiquities in Volos (see above) took place immediately outside the fortified area to the east of the site (at P in *Fig. 1*), showing that there at least at this location were extramural structures in the Classical-Hellenistic period.

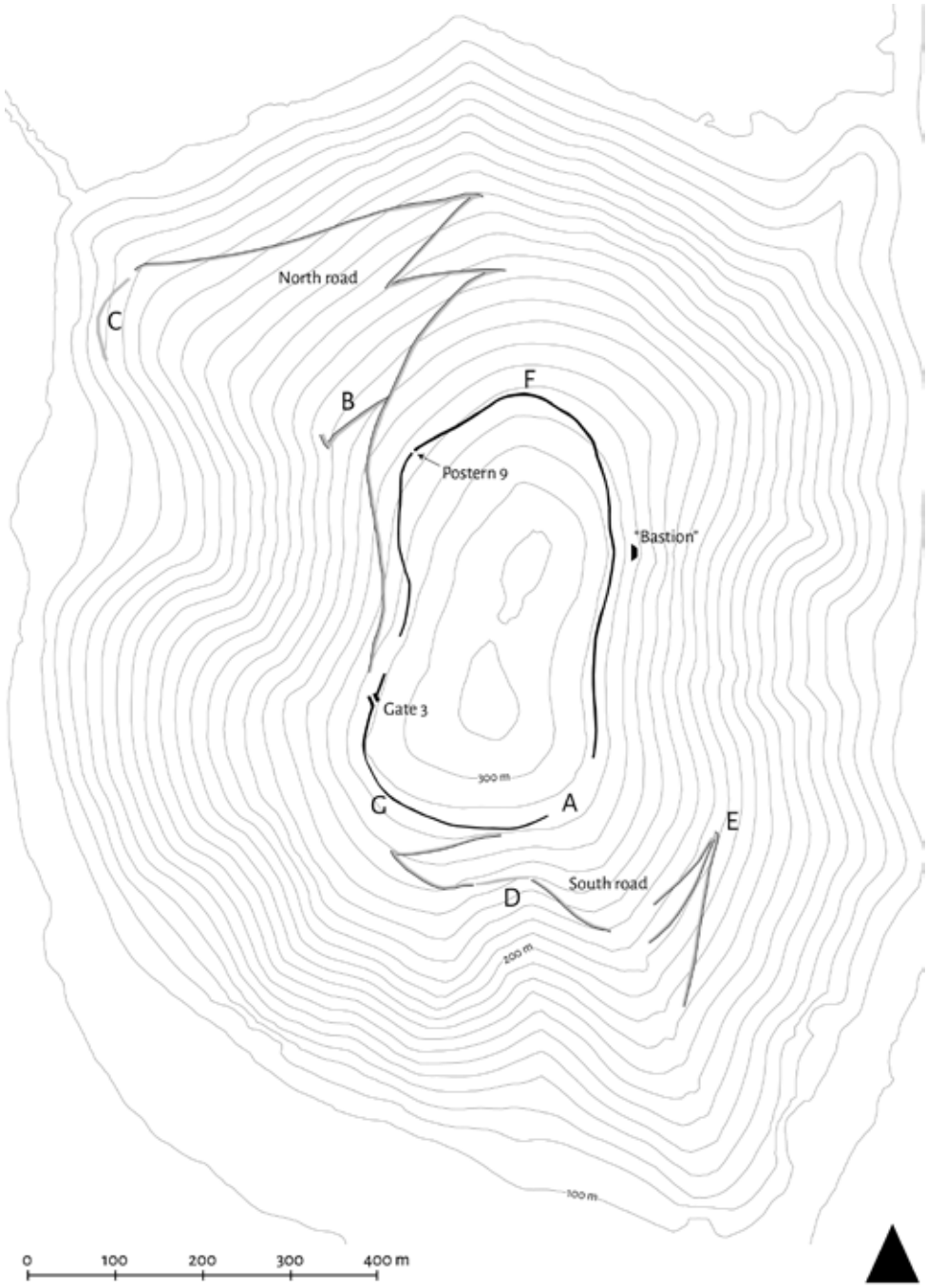

Fig. 23. Phase 1 fortifications and terraced roads. Plan by J. Klange and R. Rönnlund.

Fig. 24. Outer masonry of Phase 1 fortifications, at F in Fig. 23. *Elevation drawing by R. Rönnlund and R. Potter.*

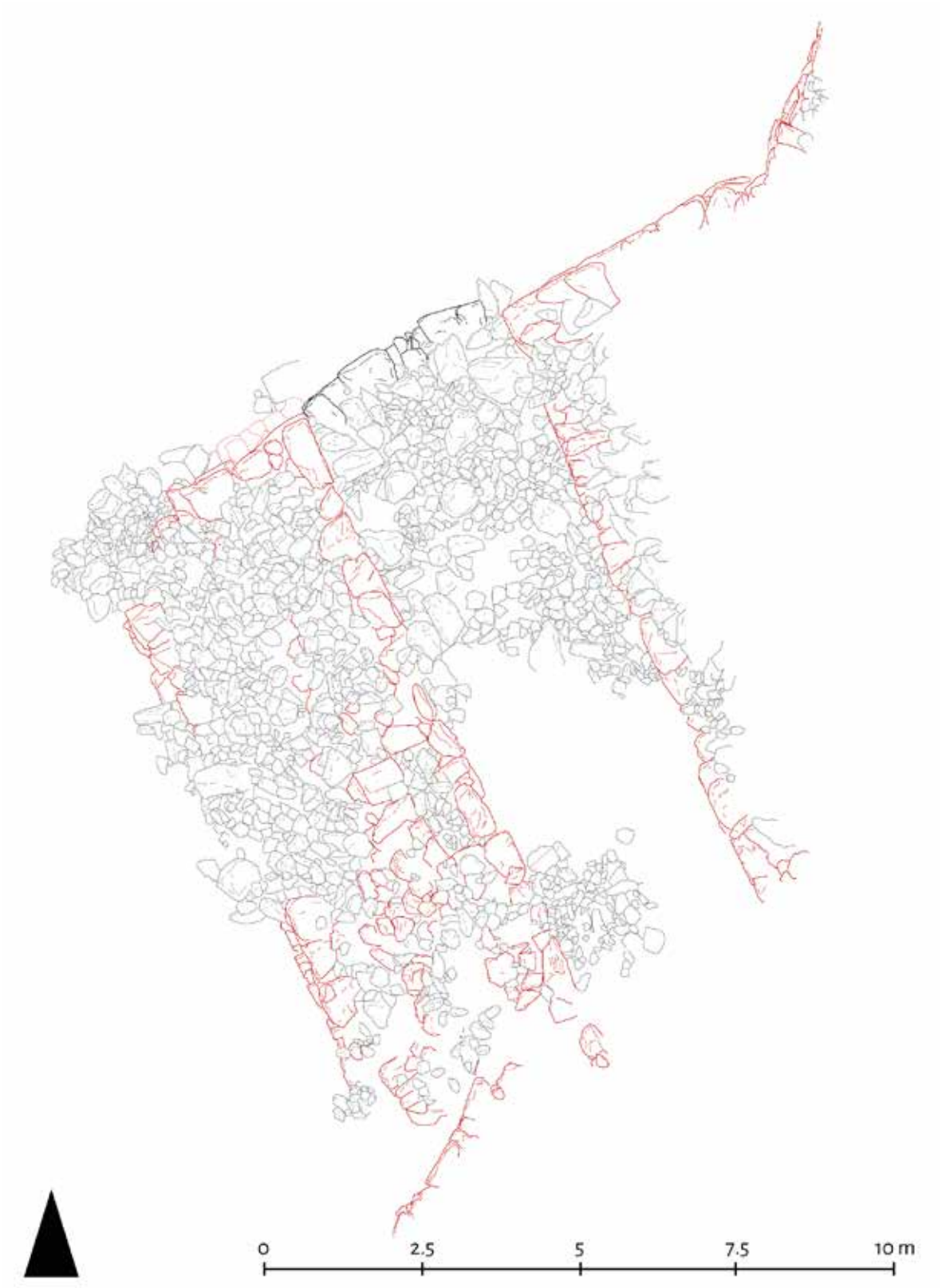

Fig. 25. Plan of ***Gate 3****. Red: Phase 1 stones* in situ*. Black: later additions. Grey: rubble collapse. Plan by R. Rönnlund and R. Potter.*

Fig. 26. Aerial view of ***Gate 3****, looking towards the north-east. Photograph by J. Klange and H. Manley.*

mentary back face of the wall indicates that it was slightly narrower than on the north side, being 2.7 m wide at this location.

Gates

The intramural area of the enceinte was accessible through two large gates, of which only **Gate 3** is preserved (*Fig. 25*). The corresponding gate (**Gate 2**) at the south-eastern bend of the enceinte (at A in *Fig. 23*) has been nearly completely removed in a later period, but a large remaining square block and the course of the **South road** (see below) presents sufficient evidence of its position. A small postern (**Postern 9**) is vaguely discernible in the north-western corner of the enceinte, constituting the sole example of this kind of feature in this phase.

Gate 3 (*Figs. 25, 26*) is situated above the west slope, immediately inside the fortification wall of the later Phase 2A. It is of a tangential type, protruding 135° for 11.9 m from the face of the fortification wall. Most of the outermost sections have collapsed down the steep slope below. The amount of rubble and large unworked stones below the structure suggests a considerable original height for the gate.

The opening of the gate is 3.5 m wide at the outside and 3.2 m at the inside, with a 10.1-m-long inner corridor. A secondary slightly bulging stack of stones had been piled up at the outer end of the corridor, possibly to fill in the opening. It is at present not possible to discern the floor surface material of the gate corridor.

Flanking the gate on the west side is a wall-like feature, 3.8 m wide and 11.9 m long along the outside. This appears to have been constructed separately from the adjoining fortification wall, as a section of the latter continues within the fill of the former (see *Fig. 25*). Internal arrangements of stones within this wall on the inside of the corridor are suggestive of compartments stabilizing the rubble fill in the slope, a necessary arrangement as the bedrock under the west corner is nearly 3.5 m lower than at the south corner. The masonry of the feature can only partially be discerned due to rubble collapse, but it appears to be similar to that of the adjoining fortification wall of Phase 1. Large unworked as well as semi-worked stones up to 0.9 m in size form the front at the gate opening.

Fig. 27. Aerial view of the ***North road****, looking towards the south. Photograph by D. Pitman.*

Fig. 28. Detail of masonry in retaining wall of the ***North road****, looking towards the south-south-east. Photograph by R. Rönnlund.*

The inner, eastern flank of the gate consists of a bastion-like feature, preserved to a considerable height (2.35 m above the rubble surface). The width of the feature is 4.6 m along the outside, but it cannot be further discerned as the inner sections are covered in turf and rubble.

In all, the whole **Gate 3** complex forms a perfect square cut diagonally, 11.9 by 11.9 m in size. Assuming that the outer face of the gate was on a level with the adjoining fortification wall, the original height of the gate front must have originally been between 4 and 6 metres, depending on the height of the fortification wall. Whether the whole foundation was built up in stone or partially in mudbrick cannot at present be ascertained.

Roads

Two terraced roads are preserved on the north and south slopes of the hill. The road on the south slope is unevenly preserved. The road on the north slope is preserved almost to its original extent. The high level of preservation of the roads and their exposed position on the slopes make them visible from afar, and as a result they were noted by the earliest visitors to the site (see above). They are clearly related to the gates in the Phase 1 wall and, can consequently be regarded as part of the Phase 1 fortified complex.

The **North road** (*Fig. 27*) appears to have begun at the west foot of the hill in an area dominated by the large west

Fig. 29. Aerial view of the ***South road****, looking towards the north-west. Photograph by D. Pitman.*

Fig. 30. Aerial view of section of the ***South road****, looking towards the north. Photograph by D. Pitman.*

alluvial fan. Being close to the level of the plain, all remains here have been stripped probably for building material, and the lowest stretch of the road can only be discerned in rock cuttings (C in *Fig. 23*). This section appears to have made a bend along the natural topography of the hill, and at *c.* 130 masl the first preserved area of terracing can be observed. From here, the road ascends the hill in an eastward direction, completing a 50 m vertical ascent in 403 m. At this point, the road makes a sharp turn towards the south-west for 147 m, to then return to the original eastward direction for another 130 m. Here, the road makes a final turn again towards the south-west, forming a "Σ" or zigzag shape on the slope.[39] The road continues uphill in a gentle curve gradually turning towards the south as it follows the topography. After 250 m, at *c.* 240 masl, there is a 92-m-long deviation of the road (B in *Fig. 23*) leading down the

[39] This highly visible feature in the surrounding landscape has prompted several local legends, including that it corresponds to a "M", with the South road being an "A". This—we are often told—represents the initials of Μέγας Αλέξανδρος, Alexander the Great. This understanding of the ancient remains, even if interesting, must be understood as the result of popular imagination and the appropriation of a glorious past. It is our aim to further explore issues like this in future work.

slope to a dead end with what appears to be an unfinished bend. The main route of the road continues uphill after the deviation for another 324 m until it can no longer be discerned at *c*. 280 masl among the rubble collapse from later building activities. It is obvious from the orientation of the road that it originally led to **Gate 3**, which is found only 25 m south of the last discernible section of the road terracing.

The preserved length of the **North road** (excluding the deviation) is 1,221 m, completing a 150 m ascent. The gradient of this road is constant, being *c*. 12.3%, meaning that it is necessary to walk 8 metres horizontally in order to ascend 1 metre, except at the unpreserved lowest section, where the gradient of the slope is less steep. The terraced outer sides of the road are preserved to a maximum of 1.5 m and are built up with uncut stones of varying sizes (*Fig. 28*) ranging from 2 m in diameter to mere rubble. The road, the width of which varies from 4 to 6 m, has no preserved paving and the surface consists of the rubble filling of the terracing and bedrock. Some of the bedrock has clearly been cut away to create a more even surface; this is most evident in the upper parts of the road.

The **South road** (*Fig. 29*) shares many of the characteristics of the **North road**, but is only fragmentarily preserved due to later building activities. Like the **North road**, the **South road** follows a zig-zag course, being first discernible at *c*. 180 masl close to the later fortifications of the south-east descending wall (see below). It ascends the hill at the same angle as the **North road**, running north for 200 m where it ends in a semi-circular platform (E in *Fig. 23*). From this point, two terraces deviate towards the south-west, one lower and one upper, of which the lower seems to constitute the actual road while the upper is possibly a retaining wall since it appears disconnected from the surfaces of the other two stretches of roads. The masonry surface of the lower road terrace is very even, and stands out from the rest of the walls of the roads in its execution. The blocks (of varying sizes) are not worked, but the alignment of the individual blocks creates an aesthetically pleasing surface. Both terraces end shortly before the south-east descending wall, the construction of which probably caused the removal of the road terraces.

East of the south-east descending wall, there are fragmentary remains of the continuation of the road (*Fig. 30*). Whether the continuation belongs to the lower or the upper terracing cannot be discerned, as the extremely steep slope has here caused the nearly total collapse of the road. However fragmentary sections of the road, as well as rock cuttings, show the continuous course of the road as it turns gradually towards the north-west along the curvature of the hill. To be able to support a 4- to 6-m-wide road surface, the outer terracing at this location must have originally exceeded 4.5 m in height, of which only 0.5 m (one to two courses) remain today.

The construction of the Classical-Hellenistic *diateichisma* (or cross-wall) resulted in the removal of a large section of the road (D in *Fig. 23*) and the reuse of the building material (see below). The road is again discernible immediately west of this area, where it turns gently up the slope for 90 m before it makes a sharp turn towards the east. As the road approaches the poorly preserved southern point of the Phase 1 hill-top fortification, it ceases its ascending route, and follows the outside of the wall towards the east until it is no longer discernible. It is highly probable that it ended at the now-destroyed **Gate 2** (A in *Fig. 23*) at the south-eastern part of the Phase 1 enceinte (see above), but later building activities and large amounts of rubble have caused too much disturbance in this area to allow for any certainty.

It is evident that the roads relate explicitly to the Phase 1 hill-top fortification, as both lead to the two principal openings in the latter. The width of the road surfaces further indicates that they were constructed to allow for transport with carts or animals, with ample turning space at each bend. Compared with Ottoman period *kalderimia*—paved horse tracks which are seldom wider than 2–2.5 m[40]—the terraced roads on Strongilovouni appear monumental and almost excessive in size.

There are plenty of examples of terraced roads from all over Greece, but few that can be seen as parallels to the examples on Strongilovouni with regard to their relationship with a hill-top fortification. The Late Bronze Age (henceforth LBA) fortified site at Krissa near Delphi has a terraced road leading up to the ridge-top enceinte, but it is merely 250 m in preserved length, and appears not to follow a zig-zag course. It is, however, of a similar construction to the road on Strongilovouni, being 3.5–4.5 m wide with a terrace wall still rising to two metres.[41] The hill-top site of Bazaraki at former Lake Kopaïs in Boeotia, which was summarily published by Siegfried Lauffer and has been identified as a Mycenaean *Burg*, has a similar construction: a 650-m-long and 4.5-m-wide road leads in a zig-zag fashion from the foot of the hill to the fortified enceinte on the top. The masonry of the road terrace is similar to the examples at Vlochos, being "*kyklopische [...] mit über 2 m langen Blöcken gestütz*".[42] The LBA date of this site, cannot, however, be ascertained, as no surface material has been reported.

A promontory known as Prosilio immediately east of the village of Keramidhi (5 km north of Vlochos) contains the well-preserved remains of a road of a similar construction, but of lesser width. This can first be traceable at the saddle of the promontory to the south-east, and ends at a Classical-Hellenistic fortification on the north-western summit. Whether the road and the fortification are contemporary cannot be ascertained at present.[43]

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[40] Pritchett 1965, 84; Kase *et al*. 1991, 24; Forsén & Forsén 2003, 71–74.
[41] Van Effenterre & Jannoray 1937, fig. 1; Kase 1973, 75; Kase *et al.* 1991, 42; Phialon 2018, 423.
[42] Lauffer 1986, 204–206.
[43] Pers. comm. E. Dafi, Ephorate of Antiquities of Trikala. The site is yet unpublished.

Fig. 31. North-east face and fill of ***Bastion****, looking towards the west. Photograph by R. Rönnlund.*

The Bastion

An isolated feature on the east slope of the hill, *c*. 20 m below the wall of the Phase 1 enceinte, which had previously not been reported, was identified from aerial photographs and subsequently visited. The extremely steep slope at this location with consequent strong erosive forces has caused the nearly complete collapse of this feature, and it is therefore hard to observe it from the fortification wall above it.

The feature, here called the **Bastion**, consists of a semi-hexagonal terrace, with the sides built up in well-executed polygonal masonry (*Figs. 11, 31*). It has a diameter of *c*. 10 m with a fill of rubble, creating a poorly preserved platform. The sides are 9.7 m (north-east), 9.7 m (east), and 7.0 m (south-east), the east and south-east faces are very poorly preserved. The masonry in the north-east face (*Fig. 31*) is fairly well-preserved to a height of 1.7 m with individual blocks up to 1.6 m by 0.35 m in size. The angle of the slope and the preserved internal rubble filling suggests that the original height of the feature at its east side must have been between 4 and 6 m, and it must have been a stunning sight from the river valley 190 m below. Due to the similarities in execution to some of the better-preserved sections of the Phase 1 fortification wall, as well as the location immediately below the latter, it is probable that these features belong to the same building programme.

A parallel to this feature can be seen at Phocian Krissa (see above), where an extramural semi-circular "*bastion*" is found in the slope 50 m below the main LBA fortified enceinte. It is smaller than the example at Strongilovouni, having a diameter of 6.2 m, and is built up in rubble masonry to a preserved height of 2 m.[44]

Dating of the Phase 1 complex

Since we do not have any surface material or non-fortification architecture that can be securely associated with this phase, it is difficult to suggest a date of construction for the fortifications and roads. With clearly Classical-Hellenistic and Late Antique fortifications preserved on top of the remains of

[44] Van Effenterre & Jannoray 1937, 325–326; Phialon 2018, 422–423.

this first phase, it is however safe to assume that the Phase 1 remains pre-date the 4th-century BC date of Phase 2A (see below). This is further supported by the general layout of the complex, which—lacking towers and other distinct features of the Classical-Hellenistic period—gives an overall impression of an earlier date. The only pre-Classical datable material found at Vlochos is late Archaic (late 6th century BC, see Appendix), which could possibly indicate an Archaic date for the Phase 1 complex. However, as this find was found *ex situ* we cannot at present relate it to the fortifications with any certainty.

Comparable walls with regards to masonry and size at other sites in Thessaly have been dated mainly to the LBA or Archaic period, on stylistic grounds or because of the dates of associated material. The large hill-top enclosure of Ktouri near Farsala, where the masonry is very similar, has produced some Mycenaean to Classical finds. The confused stratigraphy at this location, however, makes it difficult to confidently connect pottery of any specific period with the structural remains.[45] The "Kastro 1" atop Filliion Oros/Doganca Dağ just east of modern Fillo appears to be yet another parallel in the vicinity.[46] It is, however, poorly published.

It should be noted, however, that the closest comparanda displaying all of the characteristic features of this phase (the gates, roads, and the **Bastion**) have been dated to the LBA. These are located in other regions of Greece; there are no securely identified fortified LBA hill-top sites in the area of the Western Thessalian plain[47] and the only fortification wall from this period in the proximity of Vlochos is at Palamas, 5 km south of Strongilovouni. Here, the foundations of a wall, 1.6 m wide and traceable for 6.3 m, has been excavated; it is possible that these are the remains of a wall that surrounded the double *maghoula* Papoutsi-Chandakli. Associated pottery dates the wall to LHIIB–LHIII.[48] The masonry which consists of small uncut stones, 0.3–0.4 m in size, supporting a rubble fill is quite different from the Phase 1 fortifications at Vlochos. This, together with the difference in wall width, does not allow for a positive identification of an LBA phase at Vlochos.

The construction of a vast complex with gates, 1.3 km of hill-top fortification walls, and well over 2.5 km of monumental-size terraced roads, indicates a centralized society capable of mustering a considerable labour force. If we can assume that the situation was similar to that in Boeotia or the Argolid, where securely dated fortification complexes have been identified, this would support a LBA date of construction. However, there is no specific evidence for a Bronze Age date and in view of the fact that the Archaic period in western Thessaly is poorly understood, it could equally well be later in date. It is, however, quite probable that Phase 1 predates the Classical period.

PHASE 2A AND 2B (CLASSICAL-HELLENISTIC)

Judging from the layout and stylistic elements, it appears that a new fortification complex was built on and below the hill around the middle of the 4th century BC. It seems not have followed the course of the Phase 1 fortifications or to have utilized it as a source of building material. The remains of both fortifications remain nearly intact on the hilltop.

This new and most extensive phase of fortification construction at Vlochos can be divided into two sub-phases, 2A and 2B, the latter being a reconfiguration and expansion of the former (*Fig. 32*). Whereas the Phase 2A defensive walls on the hill-top appear to have cut across the southern of the two summits of the hill, the Phase 2B fortified enceinte was extended almost 200 m further north, enclosing both summits. Only fragmentary remains of the Phase 2A fortification wall can be noted on the very top, and this section of the wall seems to have been dismantled at the time of the extension of the fortified area. Clearly discernible differences in masonry constitute further evidence for the two sub-phases, which can, however, be identified with some confidence only where remains are visible above ground.

Most of the Phase 2A and 2B fortifications in the lower settlement area have been severely stripped for building material over the centuries, leaving little but their foundations below ground. Similarly, sections of the Phase 2A fortification wall from the area of **Jog 4** and down to the foot of the hill were repaired and reconfigured in Phase 4 (see below); later in the 20th century they were completely destroyed in their lower sections by quarrying activities.

The existence of an "*akropolis*" in a narrow sense can only be discerned at this stage, as the fortification layout comprises two distinctly separated enclosures within the same system,[49] defined by the outer fortification wall and the south slope *diateichisma*. The 11-hectare Phase 2B *akropolis* at Vlochos is one of the largest examples of *akropoleis* on the Greek Mainland,[50] and one of the few that is of a comparably similar size to the actual settlement area.

[45] Béquignon 1932, 122–137.
[46] Decourt 1990, figs. 80, 81.
[47] "Cyclopean" walls have been noted at Ktouri at Farsala and at nearby Pirghos Kieriou, but their LBA dates remain disputed, see Kalogeroudis 2008, 244–245; Lang 1996, 278.
[48] Hatziangelakis 2008, 321–322.
[49] Lawrence 1979, 126; Rönnlund 2018, 57–58.
[50] The *akropolis* at Vlochos is to our knowledge only surpassed by the extremely large examples of Sikyon (*c.* 60 ha) and Corinth (*c.* 25 ha) in the Peloponnese.

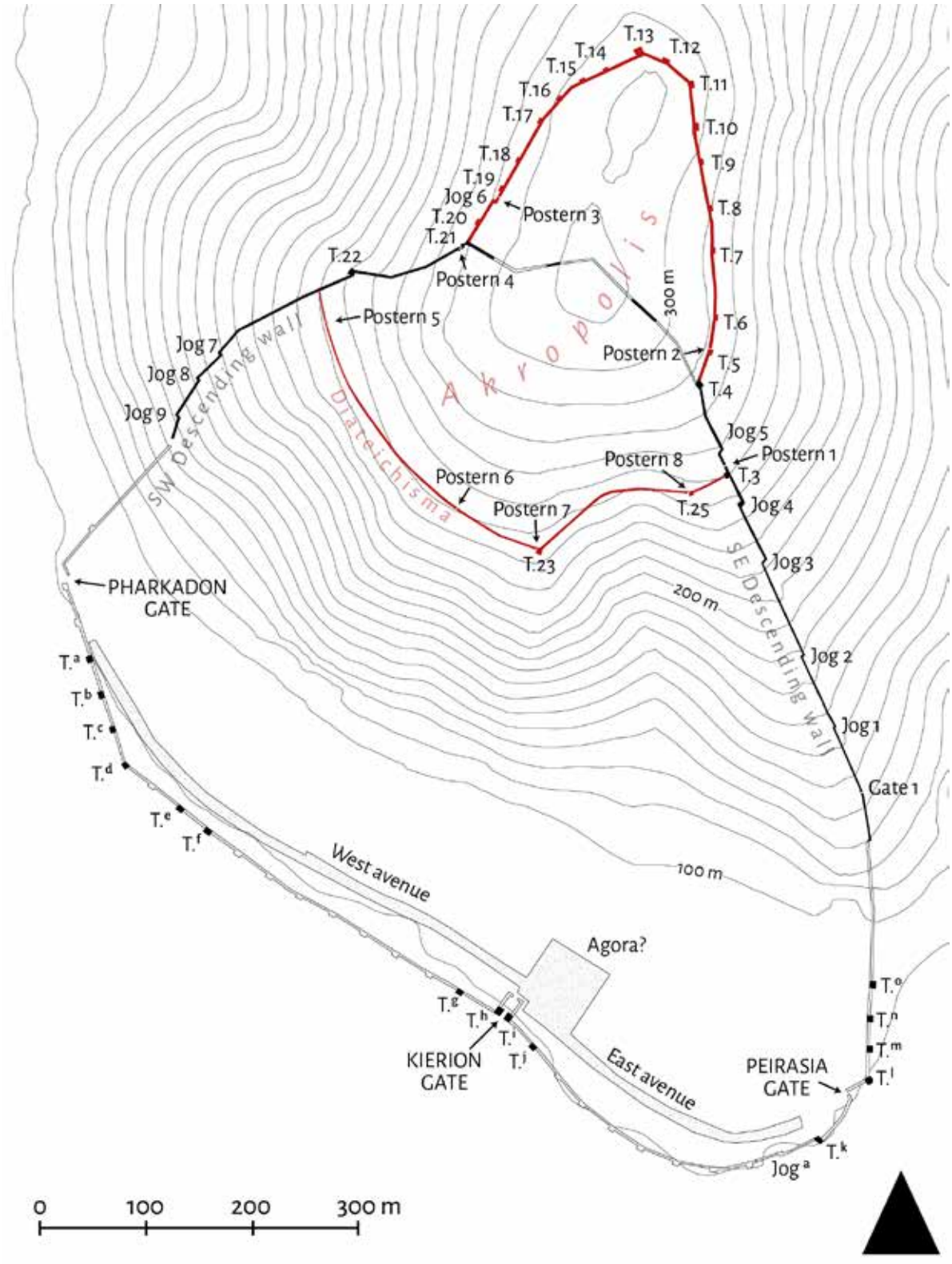

Fig. 32. Phase 2A (black) and 2B (red) fortifications (Classical-Hellenistic). Preserved features in full colour, reconstructed features as unfilled. Confidently identified towers (T) in lower fortifications marked with letters. Plan by J. Klange, D. Pitman and R. Rönnlund.

Fig. 33. Nearly obliterated section of Phase 2B fortification wall, as seen from ***Tower 21****, looking towards the south-west. Photograph by S. Chandrasekaran.*

Fig. 34. Outer face of Phase 2B wall between ***Tower 4*** *and* ***Tower 5****, looking towards the south-west. Photograph by S. Chandrasekaran.*

Walls

The most well-preserved part of the outer face of the fortification walls of Phase 2A is in two stretches at the brow of the hill, between **Jog 5** and **Tower 4**, and between **Postern 4** and **Tower 22**. The reason for the high degree of preservation here is probably a combination of high-quality workmanship and the distance from the foot of the hill, where most cut stones have been removed for re-use elsewhere. The building technique is representative of most of the fortifications that can be identified as belonging to Phase 2A, consisting of an outer face in polygonal un-coursed and semi-coursed hammer-dressed masonry with stones of varying sizes (*Fig. 14*). The back face, which has with few exceptions collapsed, is built up with small, uncut stones, leaving large amounts of rubble on the inside of the wall. The area between the inner and outer faces, which is 2.4–2.5 m wide, has a rubble fill of small, uncut stones and gravel. Possible compartments in the rubble fill can be made out in the section of the wall below **Tower 4** down to **Jog 4**, but whether these are *in situ* cannot be ascertained due to the instability of the fill material.

The masonry of Phase 2B varies significantly in quality of execution and is consequently often poorly preserved compared to that of Phase 2A. This is evident between **Tower 5** and **Tower 11** and between **Tower 19** and **Tower 21**, where most of both the inner and outer faces of the wall have almost totally collapsed (*Figs. 15, 33*). The masonry consists of a mix of rubble and polygonal and irregular trapezoidal stones, and contrasts starkly with the more well-built sections of the fortifications.

Fig. 35. West end of diateichisma*, looking towards the east. Photograph by R. Rönnlund.*

Fig. 36. Outer face of diateichisma *between* ***Tower 23*** *and* ***Postern 8****, looking towards the north-east. Photograph by R. Rönnlund.*

It is only in the stretch of the wall between the large well-built **Tower 12** and the smaller **Tower 19** where the height is better preserved that the masonry is again of good quality. Here the masonry is mainly regular trapezoidal,[51] constructed of lightly worked stones of considerable size. The extent of collapse does not allow for any helpful photography of the masonry, except at the south part of the section between **Tower 4** and **Tower 5**, where the stone socle of the wall (here in irregular trapezoidal masonry) is preserved to its original height (*Fig. 34*). The back face of the wall has collapsed to near obliteration at most locations, but it appears to have been built of smaller, uncut stones, which are often hard to distinguish from the rubble fill of the wall. The existence of stabilizing compartments within the rubble fill can be noted especially in the section between **Tower 5** and **Tower 10**. Whether these are *in situ* cannot, however, be ascertained as the fill here is quite loose.

The 545-m-long cross wall or *diateichisma* that divides the *akropolis* area from the south slope below it has been identified as belonging to Phase 2B as the masonry resembles the characteristics of this sub-phase.[52] Also, there is little to suggest that the *diateichisma* and the south-west and south-east descending walls were constructed at the same time, even if

[51] Winter 1971b, 80.

[52] For the term *diateichisma*, see Sokolicek 2009, 13–17.

Fig. 37. South side of ***Tower 3****, showing the irregular trapezoidal masonry. Photograph by R. Rönnlund.*

Fig. 38. ***Tower 13****, looking towards the south. Photograph by S. Chandrasekaran.*

this cannot be fully ruled out. Much rubble covers the areas where the walls meet, and the construction sequence can only be better understood after extensive cleaning.

The style of masonry in the *diateichisma* varies and includes un-coursed and coursed polygonal and irregular trapezoidal and trapezoidal (*Fig. 35*). The greatest variation is in the size of the stones, which ranges from relatively modest at the points where the wall joins with the south-east and south-west descending walls, to very large along the centre of the extent of the wall. At the hollow on the south slope *c.* 100 m from the beginning of the wall to the east (*Fig. 36*), it appears that the masonry was built up from re-used uncut blocks from the Phase 1 **South road** which must have previously traversed the area but is very poorly preserved. In some cases they exceed 2 m in diameter, and are similar to the ones used for the **North road**. Due to the steepness of the slope, the wall is poorly preserved, which impedes classification of the masonry in spite of the size of the stones.

It should be observed that the middle part of the *diateichisma* (around **Tower 23**) is the only section of the hill-top and slope fortification walls that is clearly visible from the central area of the urban settlement at the foot of the hill. It seems possible that the exact course of this part of the *akropolis* defences was laid out to maximize its visibility; had it been put higher up the slope (closer to the Phase 1 enceinte), it would not have been visible from the inhabited area below.

Only a short section of the fortification wall of the lower settlement in the Patoma area, which had previously been revealed during rescue work by the Ephorate and the municipality of Palamas, could be studied.[53] It is 13.5 m long, and is situated just south-east of the **Kierion gate** (see below). Only the foundations of the wall are discernible, indicating an original width for the stone socle of 2.7 m.

[53] Hatziangelakis 2007, 34.

Table 3. List of preserved towers.

	Width	Depth (from back of wall)	Discernible height	Phase
Tower 3	6 m	Not discernible	1.5 m	Phase 2B
Tower 4	4.9 m	6 m	0.47 m	Phase 2B
Tower 5	5.7 m	5 m	1.74 m	Phase 2B
Tower 6	6.1 m	4.6 m	1.5 m	Phase 2B
Tower 7	5.7 m	4.7 m	1.52 m	Phase 2B
Tower 8	6.0 m	5.2 m	0.4 m	Phase 2B
Tower 9	5.8 m	5.2 m	1.65 m	Phase 2B
Tower 10	7.6 m	6.0 m	1.2 m	Phase 2B
Tower 11	7.3 m	5.7 m	1.35 m	Phase 2B
Tower 12	7.6 m	5.9 m	1.75 m	Phase 2B
Tower 13	7.9 m	8.8 m	2.05 m	Phase 2B
Tower 14	5.6 m	5.0 m	2.4 m	Phase 2B
Tower 15	5.9 m	5.1 m	1.33 m	Phase 2B
Tower 16	6.0 m	5.2 m	1.12 m	Phase 2B
Tower 17	5.6 m	5.1 m	1.5 m	Phase 2B
Tower 18	5.6 m	4.7 m	1.1 m	Phase 2B
Tower 19	5.7 m	Not discernible	2.3 m	Phase 2B
Tower 20	6.4 m	5.4 m	0.6 m	Phase 2B
Tower 21	4.2 m	4.6 m	1.0 m	Phase 2A
Tower 22	6.2 m	5.3 m	1.4 m	Phase 2A
Tower 23	5.8 m	6.4 m	1.5 m	Phase 2B
Tower 24	Not applicable	Not applicable	1.35 m	Phase 2B
Tower 25	4.7 m	4.0 m	1.8 m	Phase 2B

*Fig. 39. "*Randschlag*" at south-west corner of* ***Tower 3****. Photograph by R. Rönnlund.*

Towers

Only three preserved towers can with confidence be identified as belonging to the original (Phase 2A) layout of the Classical-Hellenistic building programme, to be compared with the 19 of the subsequent Phase 2B (*Table 3*). Adding to this are the 15 securely identified towers in the lower part of the enceinte, which are known only from the geophysical prospection. The regular intervals (*c.* 30–32 m, or *c.* one Doric *plethron*) between each discernible tower would suggest an original number of 35–40 towers in the wall surrounding the urban settlement (see *Fig. 32*). Adding the aforementioned 22 towers, this would indicate close to 60 towers in the fortification of Phase 2B. This number is comparable to what we see at other sites in Thessaly, including at Paleoghardhiki/Pelinna 15 km north-west of Vlochos.[54]

The towers are of varying sizes and shapes. Most are between 5 and 6 m wide and deep, and are rarely of a perfect square shape. Whether this is also the case in the lower settlement area cannot be discerned, as no tower remains are visible above ground. The towers of Phase 2B are often of a remarkably poor quality compared with Phase 2A, and with the exception of **Tower 3** (*Fig. 37*) are consequently less well-preserved. **Tower 3** is well-integrated into the Phase 2A south-east descending wall, but its south face is in a distinctly different masonry style (irregular trapezoidal),[55] contrasting with the polygonal south-east descending wall.

Tower 21 differs in shape from the others in that it is not square. It is located at the junction of the south-west descending wall, the Phase 2B outer *akropolis* wall, and the fragmentary remains of the Phase 2A wall. It resembles Tower 13 at Ghoritsa in position and design, but is smaller.[56]

The most substantial towers are all found at the north end of the enceinte, with the largest example being **Tower 13**, which constitutes the northernmost point of the Phase 2B enclosure (*Fig. 38*). Protruding almost 3 metres further out than

[54] Stählin 1924, 116–118; 1937b; Tziafalias 1992.

[55] Winter 1971b, 83–84.

[56] Bakhuizen 1992, 102, fig. 36. This tower is 6 m wide and projects 2 m from the fortification wall.

*Fig. 40. Outer (lower) face of **Jog 3**, looking towards the north. Photograph by R. Rönnlund.*

the neighbouring **Towers 12** and **14** and built in the same well-executed (coursed trapezoidal) masonry as its adjoining walls, it must have been a remarkable sight.

In spite of being smaller, **Tower 23** on the opposite side of the *akropolis* forms its counterpart above the settlement area, as it is the only large tower in the *diateichisma*.

Because rubble collapse covers most of them, the internal construction of the towers is hard to understand. The masonry of the towers is always similar to the adjoining curtain walls, with which it seems that the towers of both sub-phases are bonded, indicating that they were constructed at the same time. There are no discernible differences in preserved height between towers and curtain walls, suggesting that the stone part of the structures was of equal height. **Tower 10**, **11** and **12** display fragmentary indications of a square inner compartment, the walls of which are *c*. 0.8 m in thickness. The rubble packing of **Tower 3** and **17** appears to have been divided by a cross-like feature,[57] comparable to what has been described at other Classical-Hellenistic sites in Thessaly and other regions of Greece.[58] Only **Tower 3** has a drafted corner (or "*Randschlag*", a groove cut in the stones along the corner), and this only at its south-west corner (*Fig. 39*).

Where the actual height above ground can be estimated, it appears that the stone foundations of the towers were up to 2.4 m high, which corresponds to the curtain walls (see above). The amount of rubble collapse around the towers is not more substantial than along the curtain walls, indicating that the higher parts of the fortification structures of Phase 2A and 2B were constructed in mudbrick. As fragments of roof tiles have been found at nearly all towers (but not at their adjoining curtain walls), it appears plausible that the original tower structures had sloping tiled roofs.

Jogs

One of the more distinguishable characteristics found on Strongilovouni is the "jogged" or "indented" trace of the fortifications. Eight such "jogs", with a possible ninth example, have been noted in the Phase 2A fortification wall, all in the two descending walls. Jogs have been interpreted as a technique of fortification pre-dating the use of towers, which in later periods only occur in steep terrains.[59] This is the case at Vlochos, where the preserved jogs are only to be found in the two descending walls.

The best preserved examples of this feature, **Jogs 3** (*Fig. 40*), **4**, **5**, are found in the south-east descending wall (*Fig. 41*) and constitute impressive structures preserved to well over two metres, giving the impression of tower-like features on the steep hill slope.[60] The later (Phase 4) repairs

[57] Lawrence 1979, 223.
[58] Lawrence 1979, 322 (ancient Proerna); Bakhuizen 1992, 142 (Ghoritsa).
[59] Scranton 1941, 154.
[60] Winter 1971a, 421. Winter's claim that the "jogs and towers are closely integrated" does not apply in this south-eastern sector of our site, as the

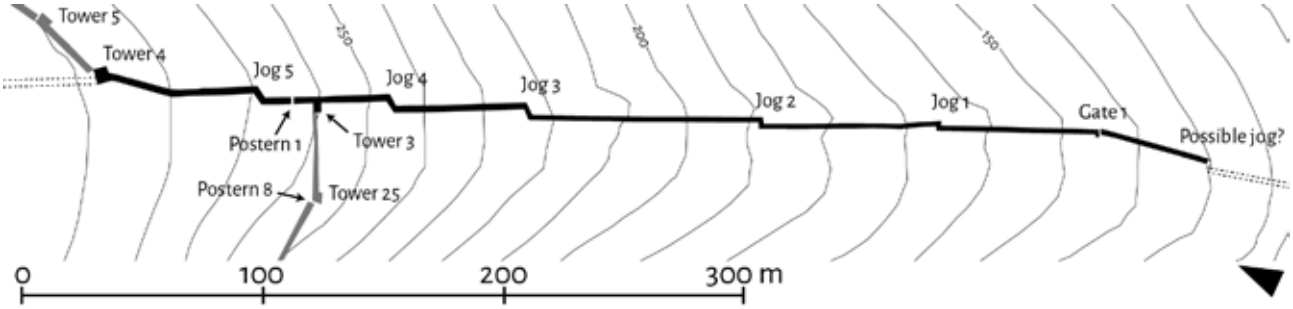

Fig. 41. Phase 2A (black) and 2B (grey) features in the south-east descending wall. Reconstructed trace of Phase 2A as dashed line. Plan by R. Rönnlund.

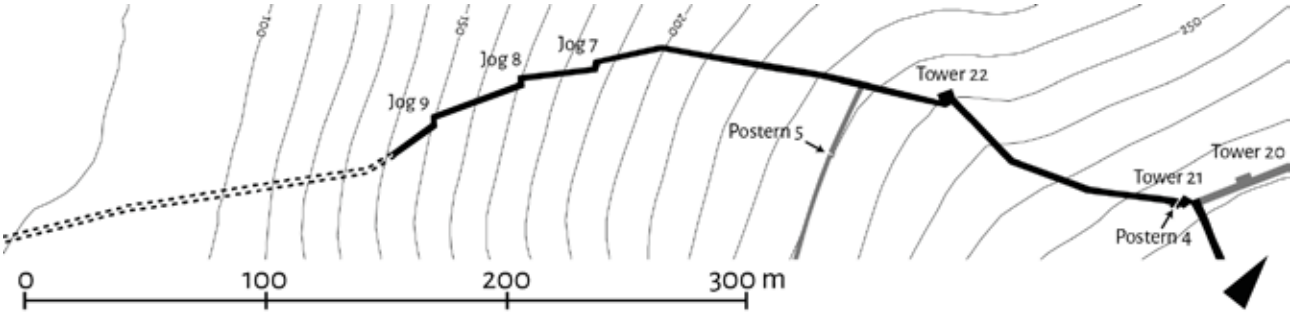

Fig. 42. Phase 2A (black) and 2B (grey) features in the south-west descending wall. Reconstructed trace as dashed line. Plan by R. Rönnlund.

of the lower section of the south-east descending wall (from **Jog 3** downwards) have mostly preserved the outer face of the fortification, but made the wall considerably narrower than it originally was.

A possible reconfiguration of the jogged system can be noted at **Jog 4**, which preserves, although poorly, remains of an internal near-square feature. Some roof tiles found here could possibly indicate the existence of a tower-like feature, but the masses of rubble covering the area do not allow for any closer identification.

The corresponding south-west descending wall on the other side of the enclosed area is similarly serrated in its layout, but only in the middle of the slope (*Fig. 42*). Because of the steepness of the terrain and the inward curving of the wall trace, comparatively little is preserved of the masonry at this location.

At the south-east corner of the lower settlement area, the geophysical prospection revealed a possible jog in the fortification wall but the disturbed soils in this area make any closer identification impossible.

only towers found here are clearly of a later date (Phase 4).

Gates and posterns

None of the three Phase 2A and 2B gates of the lower settlement area can at present be discerned on the surface, but they have been identified through the geophysical survey and aerial photography. The gates have been conventionally named after the neighbouring ancient cities found in their general direction, the **Peirasia gate**, the **Kierion gate**, and the **Pharkadon gate** (*Figs. 1, 32*).[61] The last can only partly be recognized in historical aerial photographs, as its location is currently underneath one of the modern sheep pens found at the west end of the Patoma area. Its outline and the orientation of the large avenue-like street that leads up to it, however, suggest that the **Pharkadon gate** was originally of an overlap or lateral gate type,[62] and was located at the sharp westernmost corner of the enceinte.

The largest gate in the whole enceinte, the **Kierion gate** (see *Fig. 32*), is located in the centre of the south-western fortification line. It is a conventional courtyard gate (*Fig. 43*), very similar in layout and size to the west gate of Ghoritsa,[63] and the south-east gate of New Halos,[64] also in Thessaly. Two large square towers (**Towers h** and **i**), *c.* 6 by 6 m, flank a *c.* 5-m-wide

[61] Ancient Peirasia at modern Ermitsi, Kierion at modern Pirghos Kieriou, and Pharkadon possibly at modern Klokotos.
[62] Lawrence 1979, 332–335; Maher 2017, 52.
[63] Bakhuizen 1992, 118–122.
[64] Reinders 2014, 61–95.

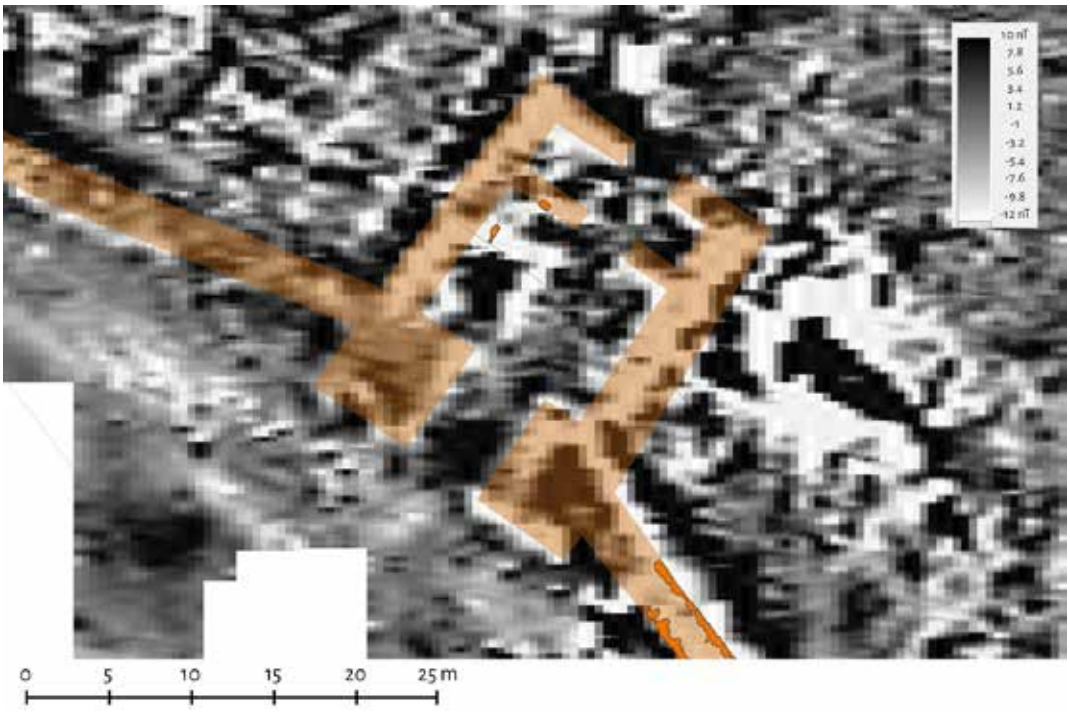

*Fig. 43. Magnetic plot with interpretation (orange) of courtyard gate (**Kierion gate**). Plot by D. Pitman and R. Rönnlund.*

opening into the courtyard. The courtyard, which is *c.* 10 m wide and 11 m deep, is surrounded by walls and the backs of the towers. The magnetic plot shows further inner divisions, similar to the double gateways noted at New Halos. These appear to have been *c.* 3 m wide, and placed *c.* 4 m apart. Other magnetic anomalies within the gate complex can probably be explained as the remains of secondary use of the gate, which has also been noted at New Halos.

This gate appears to lead into what has been identified in the magnetometric survey as the *agora* area in the east sector of the settlement, and constitutes the terminus of a 160-m-long street leading towards the possible monumental complex in the south-east colluvial fan (B in *Fig. 4*). It is probable that this gate constituted the most important entrance to the settlement at the time of Phase 2B.

The **Peirasia gate** was located at the south-east corner of the settlement and is presently underneath the modern chapel of Ayios Modhestos and its yard. The modern structures (the chapel, concrete slabs, fences) at this location hampered the gradiometric survey, and we could only survey parts of the ancient feature. However, the outlines of the gate complex are more discernible in the snow-marks, showing that it most probably was of an overlap type with one or two circular towers flanking the entranceway.

There are no gates in the fortifications on the hill-top belonging to Phase 2A and 2B, except for a small one in the south-east descending wall. This, **Gate 1**, has been severely damaged by later (Phase 4) building activities and the construction of **Tower 1**, which completely blocked it. It was 1.8 m wide throughout the 2.9-m-long passage, with a poorly preserved foundation of an inner face, indicating a possible additional door at the back.

A total of eight posterns can be noted in the Phase 2A and 2B fortification walls, all of a relatively uniform width (1.2; 1.1; 1; 1.1; 0.9; 1.1; 1 m).[65] Two (**Posterns 2**, **6**) have their lintels preserved *ex situ*, collapsed into the passage, indicating an original passage roof built up by slanted slabs supporting one another and forming a triangular arch. Four of the posterns (**Posterns 2**, **4**, **7**, **8**) directly adjoin a tower, two are close to towers (**Posterns 1**, **3**) and another two are located in the unbroken line of the *diateichisma* (**Posterns 5**, **6**).

As narrow posterns constitute the only openings into the *akropolis* area of Phase 2A and 2B, and are often situated in quite inaccessible locations, it is probable that the main routes of access into this area were along the south-east and south-west descending walls. This would suggest that the *akropolis* at this point did not primarily serve as an area of refuge for the population of the lower settlement, as access to the hill-top area would have been extremely difficult.[66] If the area was meant to function as a refuge, there would arguably have been

[65] Relatively narrow compared to the examples in Lawrence 1979, 335–342.
[66] Cf. Winter 1971b, 234.

entrances to the *akropolis* facilitating the passage of larger groups of people and possibly even livestock.

Date of Phases 2A and 2B

Both of the two sub-phases of Phase 2 contain some of the typical features of the fortification schemes of the late Classical and Hellenistic periods as can be seen in all Greek areas, including Thessaly.[67] Phase 2A appears to have been constructed as a complete, planned unit, the purpose of which was to fortify the settlement at the foot of the hill as well as the southern half of the hill-top area. The relatively few towers identified as belonging to this phase, and the "serrated trace" of the two descending walls conform to a layout that has traditionally been interpreted as belonging to the early to mid-4th century BC.[68] At present, it is not possible to confirm this date, but in combination with the prevalent use of polygonal masonry and the lack of ashlar masonry, we find it plausible that Phase 2A should be dated to the 4th century BC. The construction could therefore possibly be related to the changes in the political landscape brought on by the incorporation of Thessaly into the Macedonian sphere of influence.

Polygonal masonry has traditionally been regarded as mainly Archaic or Classical in date,[69] as a result of which several Thessalian fortifications have been dated to the Archaic period.[70] Whether this dating is correct for Thessaly is doubtful, as the fortifications display much variation, and recent studies have suggested that polygonal masonry was in use well into the Hellenistic period.[71]

The reconfiguration of the *akropolis* area that occurred in Phase 2B must have been prompted by a change in the function of the fortified hill-top area. The reason why it was extended employing a different type of masonry cannot, however, be explained from a purely utilitarian perspective. It is possible that the intention was to enhance the visual impact of the *akropolis* as it appeared from the important routes to the north, from where it must have appeared formidable. Whether this reconfiguration took place soon after the end of Phase 2A or later is at present impossible to ascertain, but the difference in execution and layout give the impression that some time had passed.

PHASE 3 (LATE ROMAN)

The existence of a Late Roman phase of fortifications at Vlochos was not known before the geophysical survey in the Patoma area. The magnetometric survey of the eastern half of this flat area revealed the outline of a curved stretch of fortification wall with 16 towers, clearly traversing the previous Classical-Hellenistic street grid (*Fig. 44*). A large robber's trench, probably evidence of stones being removed from this wall, can be traced in the area closest to the hill slope (cf. *Figs. 45, 46*). A broad section of the latter also appears to have been cleared immediately outside (north-west) of this new enceinte (*Fig. 18*).

It is probable that the pre-existing fortifications of the preceding phase were utilized in this rearrangement of the site, as the wall appears to connect with the Phase 2A and 2B wall to the east and west. As the southernmost part of the west wall has been severely damaged by the construction of an artificial canal and the construction of the modern chapel of Ayios Modhestos, it is impossible to ascertain the extent of this re-use.

The towers appear to be square in shape, protruding from the face of the fortification wall, and had been built *c.* 22 m from each other along the 480-m-long wall. A large gate, flanked by towers, can be observed close to the west corner of the Phase 3 enceinte. It is located where the west avenue-like street of the Classical-Hellenistic city traverses the fortification line, indicating that it was used as a road into the city at that time. Judging from the results of the magnetometric survey and the aerial photographs of the 2019 snow-marks, it also appears that a second gate can be identified at the north-eastern corner of the enceinte at the point where a street seems to traverse the fortification wall.

Date of the Phase 3 fortification

Apart from three large stones that remained in the robber's trench, nothing is preserved above ground. It is difficult to date the remains of this phase of the fortifications solely on stylistic grounds. However, the outline of the fortification as well as the "shrinking" of the settled area has many parallels within Greece and is indicative of a Late Roman date. Similar situations have been noted at Macedonian Dion,[72] Boeotian Plataiai,[73] Tanagra,[74] and Thespiai,[75] as well as in Corinth,[76] and Nikopolis in Epirus.[77] In contrast to these examples, however, the Phase 3 fortifications at Vlochos are not aligned with the older Classical-Hellenistic street grid.

[67] For an overview of Thessalian fortified cities of the Classical-Hellenistic period, see Marzolff 1994.
[68] Winter 1971a, 424.
[69] Scranton 1941, 137–139; Winter 1971b, 97.
[70] Lang 1996, 275–280 includes Atrax, Argissa/Ghremnos Magoula, Dhranista, Gonnokondylon, Gonnos, Gyrton, Kallithea, Kierion (as Kirion [sic.], mistakenly identified as at Gremon [sic.] Magoula), Koutsoplatanos, Mopsion, Pharsalos, Phthiotic Thebes, and Phylake.
[71] Maher 2017, 74.
[72] Stefanidou-Tiveriou 1998, 157–215.
[73] Konecny *et al.* 2013, 112–118.
[74] Bintliff & Slapšak 2006, 15–17.
[75] Bintliff *et al.* 2017, 165–173.
[76] Warner Slane & Sanders 2005, fig. 1, 293.
[77] Kefallonitou 2007.

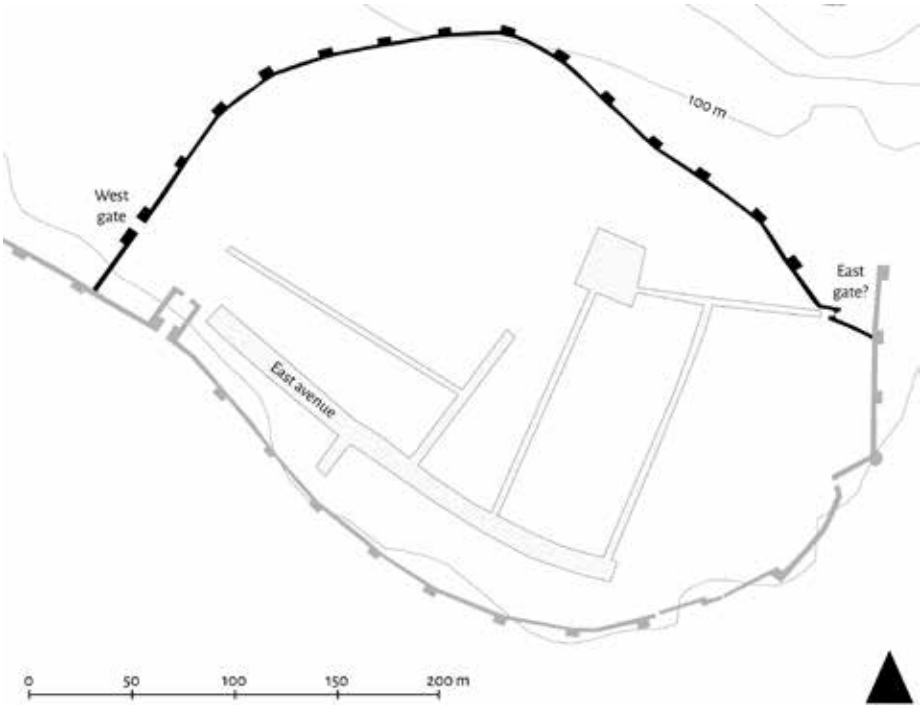

Fig. 44. Phase 3 fortifications (Late Roman) in black as identified by the geophysical prospection and snow-marks, with reconstructed Phase 2A and 2B fortifications in grey. Plan by D. Pitman and R. Rönnlund.

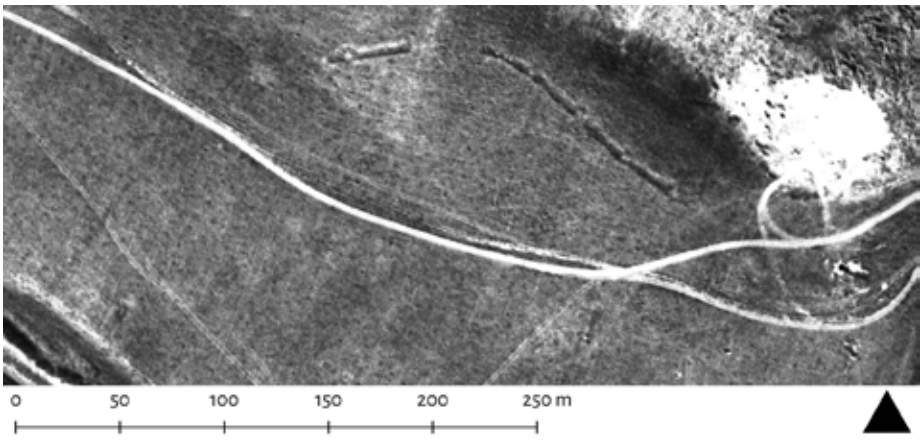

Fig. 45. Detail of 1960 aerial photograph of the Patoma area. Crop-mark (left) and robber's trench (top) are clearly visible. At right top, a 20th-century quarry and below it an Early Modern (?) lime kiln. © The Hellenic Military Geographical Service. Rectification by R. Rönnlund.

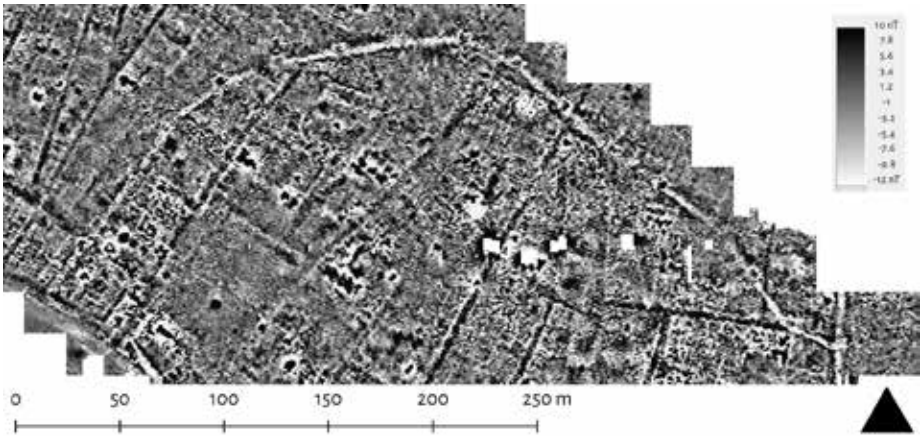

Fig. 46. Detail of magnetic plot of the west sector of the Patoma area, same extent as Fig. 45. *Plot by D. Pitman.*

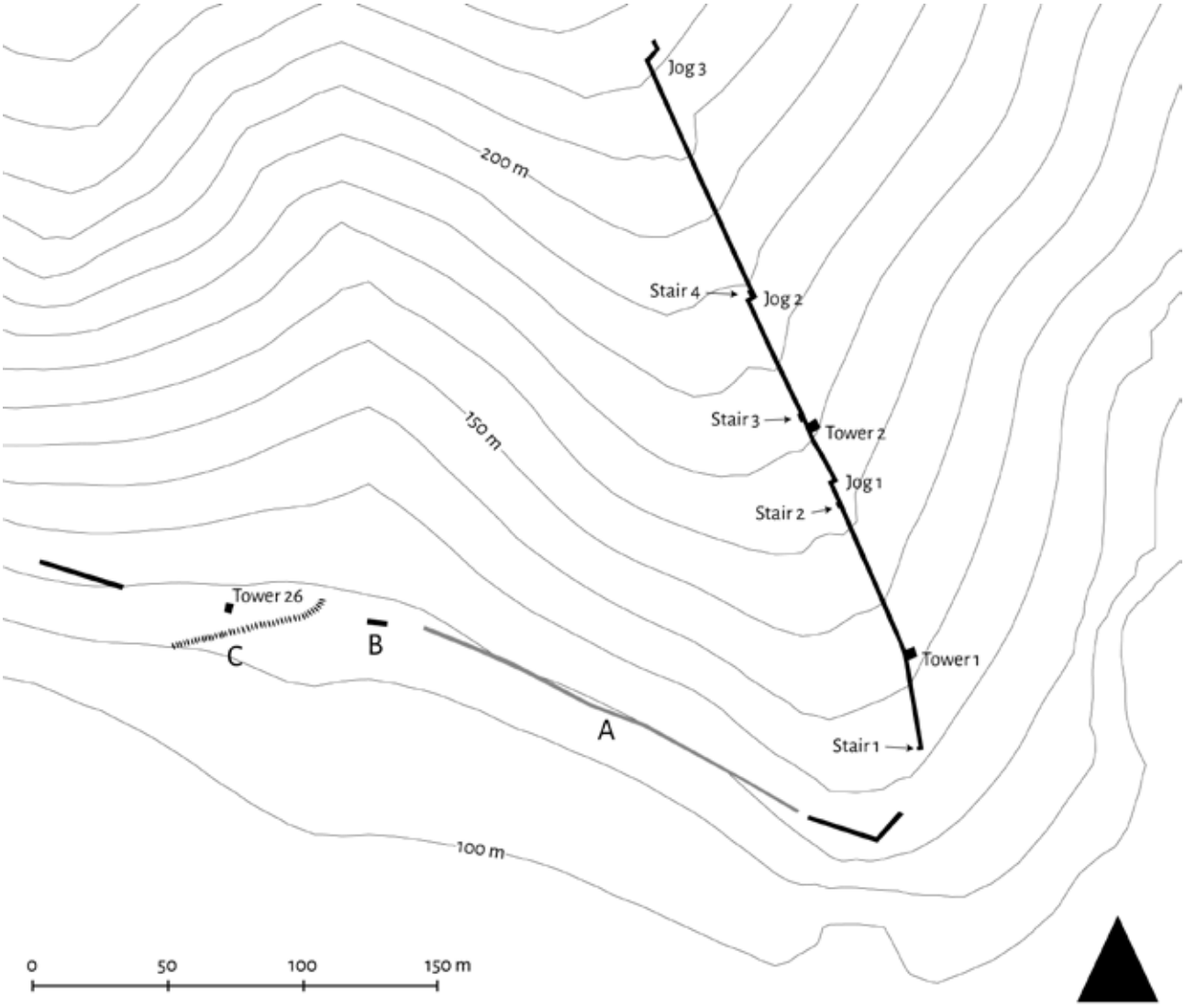

Fig. 47. Phase 4 fortifications (Late Antique). Plan by J. Klange and R. Rönnlund.

However, as will be discussed below, the internal layout of the Phase 3 settlement appears to follow the previous street pattern, which is not aligned with the fortifications of the same period.

PHASE 4 (LATE ANTIQUE/EARLY BYZANTINE)

A final fortification programme, around the south slope of the hill, immediately above the Patoma area, appears to have taken place in the Late Antique or Early Byzantine period (*Fig. 47*). This is most visible as an extensive repair to the lower section of the Classical-Hellenistic south-east descending wall (*Fig. 48*), which judging from the appearance of the remains must have been in a poor state of preservation at this time.

The lower sections of this fortification have been severely stripped for building material after its final abandonment and the remains are mainly discernible above ground from *c.* 133 masl and further up the slope. Here, the fortifications are seemingly constructed directly on the foundations of the Phase 2 wall, using mainly smaller stones of varying size joined with mortar, with the larger blocks mainly on the outside and rubble sized stones on the inside. The fill consists of rubble and gravel mixed with yellowish white mortar. The wall is 1.65 m wide—in comparison with the 2.45 m width of the Classical-Hellenistic walls—and is preserved to a varying height ranging from a few centimetres to 2.65 m on the outer face. The ground on the inside of the wall is considerably higher than on the outside. As the walls ascend the slope, the increasing grade of preservation of the

Fig. 48. Aerial view of section of Phase 4 (Late Antique) fortification wall, south-eastern slope. From bottom left to top right, ***Jog 1****,* ***Tower 1****, and* ***Jog 2****. Photograph by D. Pitman.*

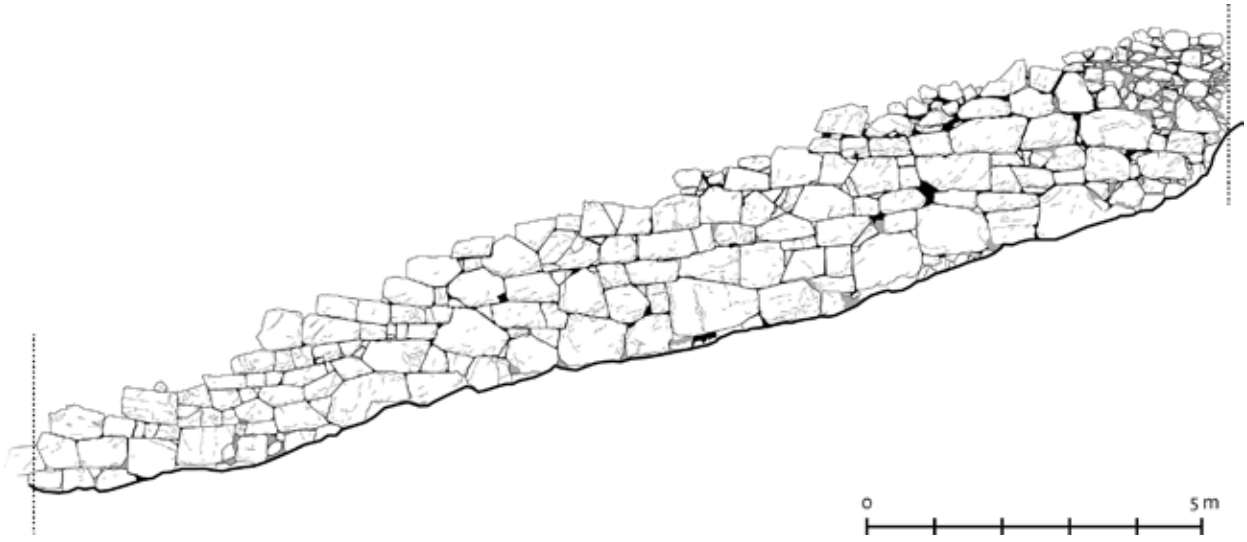

Fig. 49. Outer (east) face of Phase 2A fortification wall with Phase 4 repairs, immediately above ***Tower 1****. Elevation drawing by R. Rönnlund and R. Potter.*

Fig. 50. Inner masonry of Phase 4 wall in the south-east descending wall, looking towards the east-north-east. Photograph by R. Rönnlund.

*Fig. 51. Aerial view of **Tower 1** and **Gate 1**, looking north-west. Photograph by D. Pitman.*

Classical-Hellenistic (Phase 2) polygonal masonry becomes more and more apparent on the outer face (*Fig. 49*). At the uppermost part of the repaired section, the Classical-Hellenistic masonry is preserved nearly in its entirety, with the later modification mostly visible as the addition of mortar at the joints and in the filling. The inner face was, however, constructed entirely in Late Antiquity, and consists of small stones joined with mortar (*Fig. 50*).

At approximately 225 masl, immediately above **Jog 3**, the repairs suddenly halt. The end of the mortar and rubble fill of the wall can be observed as a sharp line where the rubble fill of Phase 2A resumes, possibly indicating a sudden end to the construction of the wall. The Classical-Hellenistic fortifications in their original 2.45 m width are exceedingly well-preserved above this position, but there is nothing apparent to explain this sudden change.

Two towers (**Tower 1** and **2**) were added at this time to the outer face of the wall. In contrast to the large re-used cut blocks of the adjoining wall, they are built mainly of small stones joined with mortar. The towers are slightly rhombic

Fig. 52. South-east face of ***Tower 2****, looking north-west. Photograph by R. Rönnlund.*

Fig. 53. ***Stair 2****, looking towards the north-east. Photograph by R. Rönnlund.*

in shape, and give the impression of having being built after the construction of the wall behind them as the masonry appears to be butted rather than bonded. At the back of the poorly preserved **Tower 1** (*Fig. 51*, 4 m wide, protruding 3.5 m from the face of the wall), are the remains of **Gate 1** (see above), which appears to have been blocked by the construction of the tower. **Tower 2** (*Fig. 52*) is identical in size, but is preserved only to a height of *c*. 2.5 m. It is constructed in a different masonry technique from the outer faces of the curtain wall, with alternating courses of larger and smaller stones joined with mortar. Larger cut blocks from the earlier Phase 2A were reused as corner-stones. As this structure was a new addition to the wall and not a repair, it is probable that the masonry style is more representative of Phase 4 than most of the other features.

Four stairs are preserved to a varying degree along the inside of the wall, the lowest of which (**Stair 1**) is only discernible as a protrusion. **Stair 4** is located immediately inside **Jog 2**, **Stair 3** just north of **Tower 2**; **Stairs 1** and **2** (*Fig. 53*) appear not to relate to any particular feature in the fortification. They are *c*. 0.75–0.9 m wide, with the longest (**Stair 3**) preserved to 3.2 m in length. None of the stairs have their steps preserved *in situ*. A possible, fifth stair can be discerned inside **Jog 3**, but the poor state prevents any positive identification.

Fragmentary remains of wall foundations and substantial traces of mortar on the bedrock indicate that the fortifications of this phase deviated from the course of the Phase 2 wall and made a turn towards the west, following the south slope of the hill (A in *Fig. 47*). This area is very steep (*c*. 47%) which has led to a substantial accumulation of erosion debris further down the slope.

The extent of this accumulation was revealed by chance on 7 September 2016, when the erosional forces of torrential rain tore open a small ravine in a terrace-like feature (B in *Figs. 6, 54, 55*) in the south-east colluvial fan. The inner walls of the ravine showed a natural stratigraphy of stones, pebbles, and soil extending 2.5 m above a cultural layer consisting of mixed tile and pottery.

A small section of the fortification wall, which had retained this great accumulation of soils, was also revealed. The wall, which is 1.65 m wide and could only be followed for 3.5 m, had been built in large, uncut stones joined with white mortar. It is aligned with the other visible remains of the Phase 4 fortifications in this area, and appears to have been connected to them. A gutter or channel penetrated this part of the wall (*Fig. 56*), probably to allow water to flow out of the intramural area above. After the exposure, continual rain brought even more soil down from the hillside, and the rain-washed debris soon started to cover this section of the wall (*Fig. 57*). Very little of the wall remained visible in 2018.

Fifty-five m west of this breach in the slope are the fragmentary remains of a tower (**Tower 26**) or possibly a gate, 3.6 by 2.3 m. Indications of a ramp-like feature leading diagonally up the slope towards the line of the fortification wall (C in *Fig. 47*) can be seen immediately below it to the south. Whether this is to be identified as a road leading up to the fortified area or a buried wall cannot be ascertained.

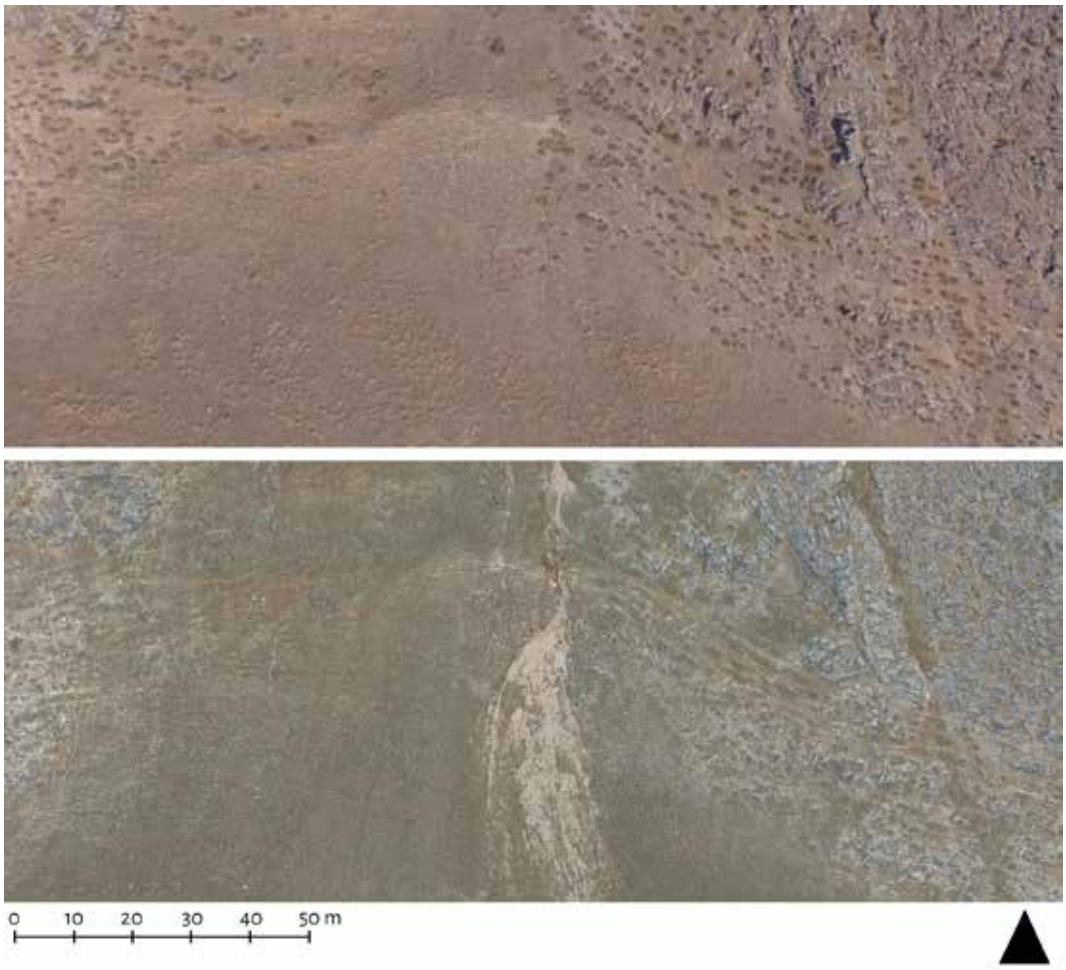

Fig. 54. Rectified aerial views of the erosion ravine within the south-east colluvial fan the day before the storm of 7 September 2016 (above) and the week after (below). Photographs by D. Pitman and R. Rönnlund.

Fig. 55. Aerial view of the erosion ravine in the south-east colluvial fan, looking towards the south-west. Photograph by J. Klange and H. Manley.

Fig. 56. Gutter in fragmentary section of Phase 4 fortification wall. Photograph taken immediately after heavy rains had revealed the section. Photograph by R. Rönnlund.

Fig. 57. Fragmentary section of lower fortification wall of Phase 4, looking towards the south. Photograph taken a week after Fig. 56. *Photograph by E. Siljedahl.*

Date of Phase 4 fortifications

The fragmentary course of the Phase 4 fortifications indicates that only the south slope of the hill was walled, and apparently only in its central and eastern parts. There is at present little to suggest that the fortifications connected the south-east and south-west descending walls, and only the former appears to have been repaired to any extent during this phase.

The reuse of blocks and rubble joined with mortar from earlier structures for the repairs and modifications suggests a Late Antique or Early Byzantine date. This is further supported by surface finds of Justinianic coins immediately below the fortified enceinte. The building technique is similar to what is found at other sites of this date in the area of western Thessaly (*Fig. 58*). The closest parallel is the hill-top site at Metamorfosi/Kourtiki, located 5 km to the west and clearly visible from Strongilovouni. Partially constructed on top of an earlier fortification, this Late Antique fortress is shaped like a crescent, with six rectangular towers (*c.* 4 m by 5 m). The masonry of this complex is quite similar to that of Phase 4 at Vlochos, and consists of smaller uncut stones joined with mortar.[78]

The most well-published of the nearby Byzantine or medieval fortified sites is the large castle at Ghrizano, 14 km north of Strongilovouni.[79] Medieval fortifications can also be seen at Klokotos,[80] Ichalia,[81] Paleoghardhiki,[82] Paleokastro Kokkonas,[83] and Pirghos Kieriou.[84]

It seems likely that the Phase 4 fortifications at Vlochos were part of the defensive system of early Medieval Thessaly, or Great Wallachia, as the area was to become known. That the fortifications on the hill do not seem to have been completed indicates that the building programme was interrupted or halted; this may reflect the political instability in the region at this time.

Discussion: Visible architectural remains

Apart from the extensive fortifications, there are comparatively few visible remains of architectural features on and below the hill (*Table 4*). These mainly occur in clusters on the hill-top (within the area of the Phase 2B *akropolis*), in some sections of the slope and to a certain extent in the area of Patoma. In some cases, the structures can arguably be connected with the construction of the fortifications, but some remain too isolated and fragmentary to allow for any dating.

AKROPOLIS

Summit enclosure

On the summit of the southern peak of Strongilovouni there is an irregularly shaped drywall enclosure (A in *Fig. 59*). Only parts of the **summit enclosure** are visible as the rest

[78] Decourt 1990, 159–160.
[79] Stählin 1924, 116; Darmezin 1992, 143–144; Gialouri 2015.
[80] Kirsten 1938; Theoyianni & Athanasiou forthcoming.
[81] Darmezin 1992, 144–146.
[82] Stählin 1937b, 331–332; Tziafalias 1992, 131; Theoyianni & Athanasiou forthcoming.
[83] Nisas 1988, 264–265.
[84] Decourt 1990, 75.

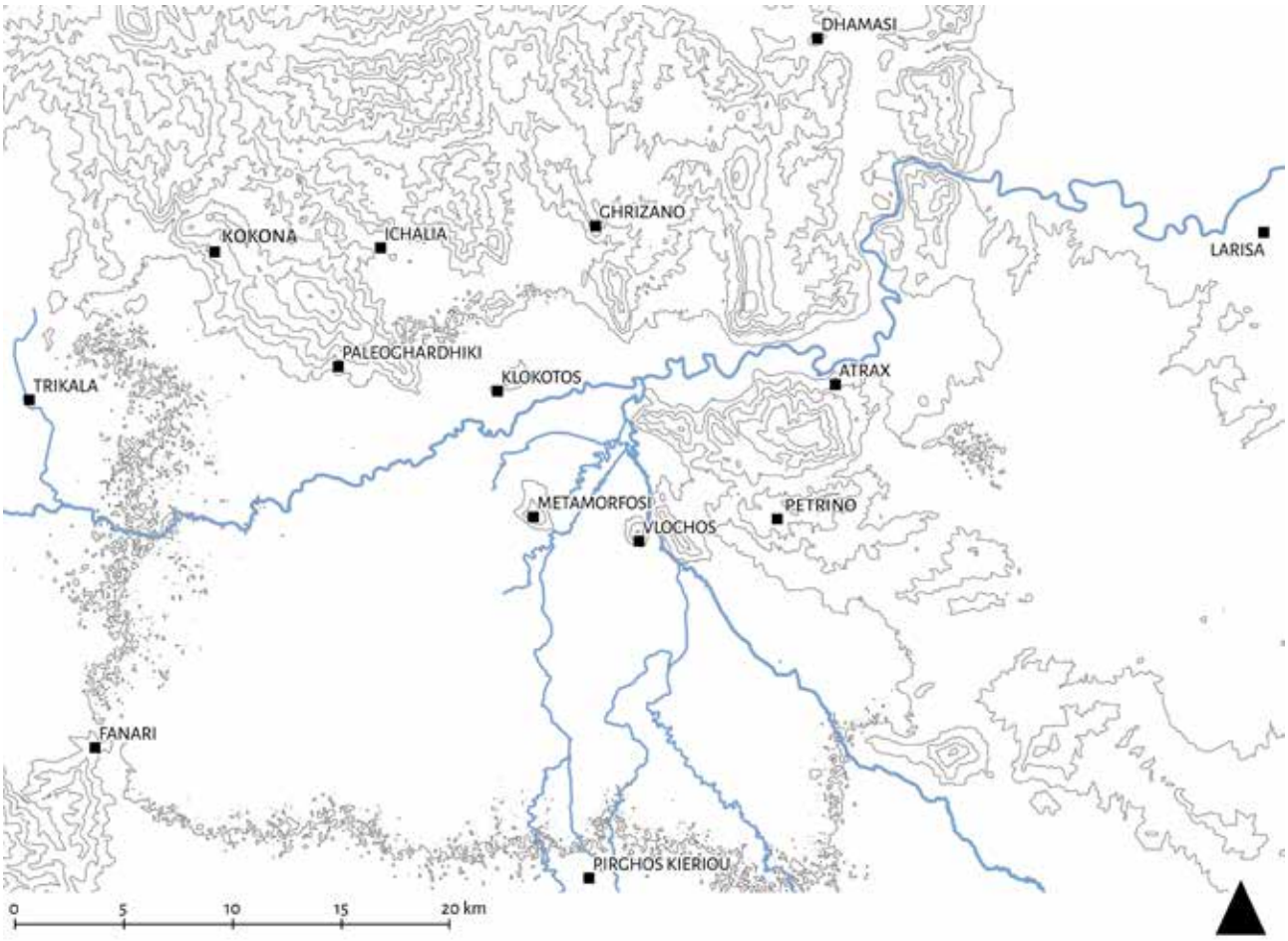

Fig. 58. Late Antique and Medieval fortified sites in central Thessaly. Map by R. Rönnlund.

is covered with rubble. It consists of unworked stones and is preserved up to three courses. Small amounts of eroded tile of uncertain date were noted on top of the rubble. The small number of preserved tiles does not allow for the conclusion that the tops of the enclosure walls were protected by tiles. Three large cut blocks can be seen protruding from the rubble surface 3 m to the north of the enclosure (at B in *Fig. 59*), indicating the existence of a now-invisible or lost substructure. It is possible that these three blocks originally belonged to a section of the Phase 2A fortification (see above), but further cleaning of the area would be necessary to confirm this.

The relative date of the **summit enclosure** can be inferred from its tentative stratigraphical relation with the Phase 2A defensive wall (C, D, and E in *Fig. 59*) and the cluster of cisterns (H in *Fig. 59*, see below), built upon the former and partially removed by the construction of the latter. We therefore find it probable that the **summit enclosure** relates to the building activities of Phase 2B, and that it had probably fallen out of use when it was partially removed in order to construct the V-shaped group of cisterns.

Hill-top courtyard building

On the south-west side of the southern peak are the remains of a 22.5 m by 18 m rectangular structure, which we identified as a **courtyard building** (F in *Fig. 59*). The foundations of the building are Classical-Hellenistic, consisting of a single or a double row of tightly set stones without any bonding material.[85] The most striking feature of the building is a large rectangular cistern, 4.7 m by 4.2 m, which had been cut into the bedrock and lined with stones. The masonry is a finely executed ashlar, but no remains of waterproof plaster have been preserved.[86]

[85] Parallel at Makrakomi, Phthiotis, see Papakonstantinou *et al.* 2013, 248.
[86] Similar to the cistern found on top of Meghalo Vouno close to Chalkis, see Bakhuizen 1970, 62–65, and on the Eretrian *akropolis*, see Du-

Table 4. Non-defensive structures within the akropolis *and on slopes of hill.*

Structure	Interpreted length and width	Width of wall foundations	Preserved height	Phase
Summit enclosure	39 m x 21 m	1.45 m–2.42 m	0.11 m–0.4 m	Phase 2B
V-shaped group of cisterns	7.5 m x 7 m	Not applicable	0.45 m–1.0 m (depth)	Phase 4 (?)
Building 1: Courtyard house	22 m x 18 m	0.58 m–0.66 m	0.1 m–0.38 m	Phase 2B
Building 2: Garrison house	14 m x 8.5 m	0.66 m	0.1 m–0.31 m	Phase 2B
Building 3: Garrison house	11 m x 8 m	0.58 m	0.1 m–0.56 m	Phase 2B
Building 4: Garrison house	8.5 m x 5 m	0.65 m	0.49 m	Phase 2B
Building 5: House 25 m N of Phase 1 wall	15 m x 11 m	0.54 m–0.57 m	0.1 m–0.35 m	Phase 2A/2B
Building 6: Building above Postern 8	12 m x 6.5 m	0.65 m–0.72 m	0.35 m–1.4 m	Phase 2A/2B
Building 7: The church	14.5 m x 10 m	0.64 m–0.79 m	0.15 m–0.6 m	Phase 4
Square platform for the church	16 m x 14 m	0.79 m	0.4 m–0.78 m	Phase 4
Building 8: Auxiliary building	12.5 m x 4.5 m	0.69 m–0.75 m	0.3 m–0.43 m	Phase 4
Building 9: Auxiliary building	6.8 m x 5 m	0.64 m–0.68 m	0.27 m–0.55 m	Phase 4
Building 10: Auxiliary building	13.6 m x 6 m	Not discernible	0.74 m	Phase 4
Building 11: Auxiliary building	8.9 m x 6.7 m	0.66 m–0.79 m	0.27 m–0.36 m	Phase 4
Building 12: Auxiliary building	6.7 m x 5.7 m	0.86 m	0.12 m–0.2 m	Phase 4
Building 13: Round structure	6.9 m (diam.)	0.8 m–0.82 m	0.15 m–0.7 m	Phase 4 (?)
Built-up pathway	9.5 m x 1.45 m	Not applicable	0.55 m–0.97 m	Phase 4 (?)
Building 14: Auxiliary building	14 m x 5.5 m	0.85 m	0.15 m–0.3 m	Phase 4
Building 15: Round structure	4.7 m (approx. diam.)	0.7 m	0.38 m	Phase 4
Rock-cut cist tomb	1.80 m x 0.41 m (dimensions of built-up cist)	Not discernible	0.55 m (depth)	Phase 4
Building 16: Building on top of rectangular platform	6.8 m x 6.7 m	0.57 m–0.67 m	0.1 m–0.27 m	Phase 2A/2B
Rectangular platform	21.5 m x 9.85 m	0.61 m–0.65 m	0.1 m–0.35 m	Phase 2A/2B
Building 17:	9 m x 6 m	Not discernible	0.08 m–0.48 m	Phase 4 (?)
Building 18:	8.7 m x 5.8 m	0.62 m	0.15 m–0.36 m	Phase 4 (?)
Building 19:	3.3 m x 2.2 m	Not discernible	0.2 m	Phase 4 (?)
Building 20:	6.4 m x 4.1 m	0.62 m	0.27 m	Phase 4 (?)
Building 21:	6 m x 4 m	Not discernible	0.21 m–0.22 m	Phase 4 (?)
Building 22: Round structure	7 m (approx. diam.)	0.55 m–0.62 m	0.21 m	Phase 4 (?)
Pen 1	19.5 m x 15.8 m	1.2 m–1.8 m	0.85 m–1.15 m	Early Modern (?)
Pen 2	8.6 m x 7.6 m	0.97 m–1.4 m	0.7 m–0.85 m	Early Modern (?)
Building 23	6.5 m x 6 m	0.60 m	0.1 m–0.2 m	
Building 24: Building or small platform	2.7 m x 2.4 m	0.54 m	0.1 m–0.25 m	Phase 2A/2B
Platform in west slope	8.83 m x 4.69 m	Not discernible	0.3 m–0.65 m	Phase 1 or 2A/2B

The cistern is surrounded by an 8 m by 8 m platform, which probably supported wooden columns carrying the weight of the upper floor. There are indications of a porch surrounding the courtyard. On the west and south sides of the courtyard are additional foundation walls giving the building a rectangular layout. Evidence of an outer porch has been recognized along the southern façade. Only a few scattered roof tiles, possibly from the roof of the building, were noted in the area, probably as a result of the strong erosion at this exposed location. The lack of rubble covering the building further suggests that it was mainly constructed in mud-brick.

crey *et al.* 2004, 274–275 and Klingborg 2017, no. 275.

Possible garrison installations

Foundation remains of three small and rectangular buildings (G in *Fig. 59*) can be seen in the north-western part of the Akropolis. The buildings are not oriented along a grid but

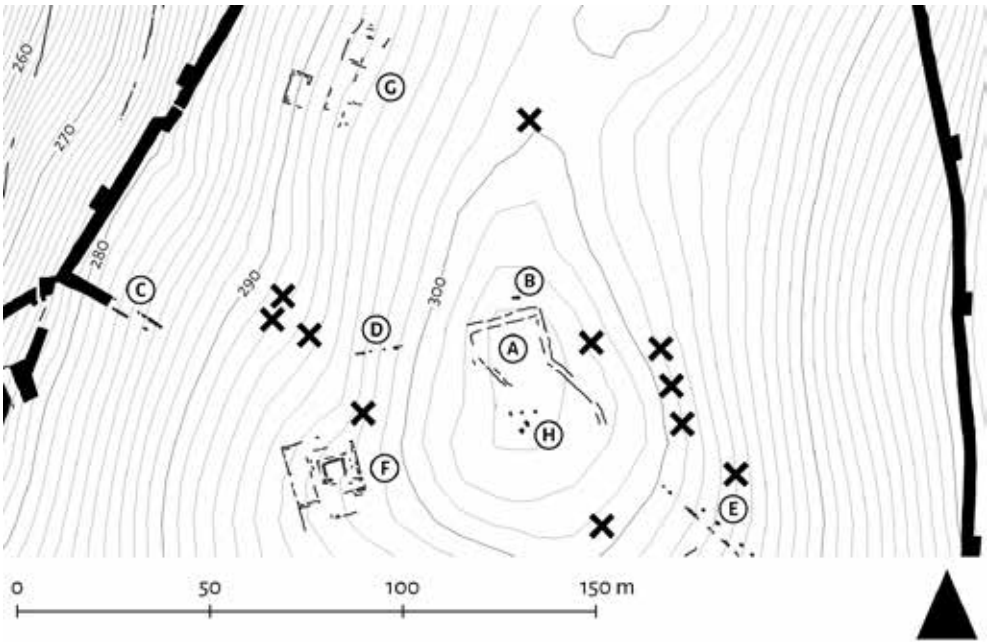

Fig. 59. Plan of structures in the central area of the akropolis. *An X marks a possible ancient quarry. Plan by J. Klange and R. Rönnlund.*

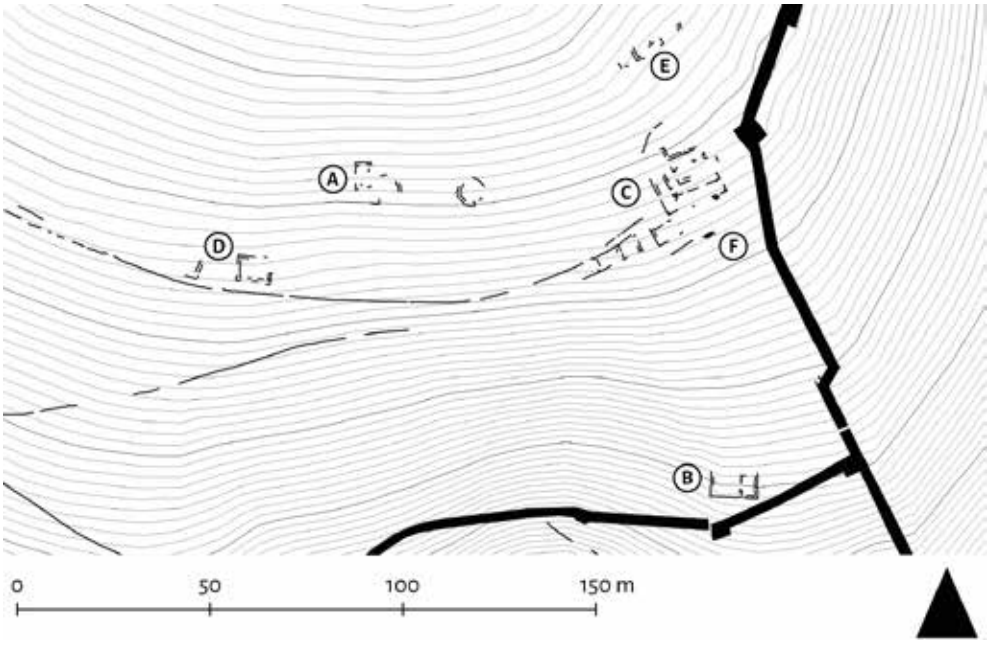

Fig. 60. Plan of structures in southern area of the akropolis. *Plan by J. Klange and R. Rönnlund.*

are adapted to the terrain. The foundations of the buildings clearly resemble domestic architecture from the Classical and Hellenistic periods, with tightly set stones without bonding materials in either a single or a double line, with flat outward facings.[87] No rubble, which is otherwise indicative of later walls at this site (see below), was noted on top of the buildings. Although the evidence is inconclusive, the positioning and construction of the foundations indicate that they were small domestic or auxiliary buildings inside the Phase 2B *akropolis* area. We believe that they may have been related to the upkeep of a garrison.

Other features

Two additional structures were identified within the area of the *akropolis* further downhill on the southern slope. The architecture suggests that they are Classical-Hellenistic. One of

[87] Haagsma 2003, 39–41.

the structures can be identified as the foundations of a rectangular building that stood on a flat area 25 m north of the Phase 1 wall (A in *Fig. 60*). Rock-cuttings suggest that the building was originally 15 m by 11 m and had several several rectilinear rooms.

The second structure is of a smaller but better-preserved building (B in *Fig. 60*) set right above **Postern 8** in the east section of the *diateichisma*. The substantial foundations belong to a 11.9 m by 6.3 m rectangular building with two discernible rooms. Because of the steepness of the surrounding terrain, the south and west façades of the building were raised considerably, with the foundations acting as a terrace, which is still preserved to a maximum height of 1.4 m above ground. The function of the building is unclear, but its position close to an entrance to the *akropolis* through **Postern 8** suggests that it may have had a defensive function.

Quarries

At least eleven small quarries, probably from the building activities of Phase 1 or Phase 2A/2B are visible on the rock face in the summit area (*Fig. 59*). Several of these have adjacent piles of rubble, possibly discarded material from the quarrying process. Additional quarries are most probably to be found along the two descending walls, but erosive forces have made these less distinct than those at the summit of the hill.

LATE ROMAN OR EARLY BYZANTINE STRUCTURES

A substantial group of structures can be noted in the south-east sector of the hill-top, adjacent to where the Phase 1 wall is cut by the Phase 2 wall. These consist of foundations that we interpret as belonging to a small church surrounded by a group of auxiliary buildings. The foundations are drywalled, built in a single or double row of rough stones with flat outward faces. The finger-mark-decorated roof tiles found on the surface suggest that the buildings should be dated to Late Antiquity or somewhat later and this can also be inferred from the rubble covering the remains. The amount of rubble and the width of the foundations differ from the structures that have been interpreted as Classical-Hellenistic. Some of the auxiliary structures were also built either on top of or abutting the fragmentary Phase 1 wall, indicating that they are later in date. Their placement also differs from structures that have been interpreted as Classical-Hellenistic, as these are not found close to the defensive walls of Phase 1 and Phase 2A/2B.

Eight individual structures positioned in three clusters have been distinguished. The largest of the three is in the east, and includes **the church** and the foundations of three narrow rectangular buildings, which may have had an auxiliary function (at C in *Fig. 60*). **The church** remains consist of a three-aisled rectangular structure on a large rectangular terrace which was oriented east-north-east–west-south-west. There are indications of a rectangular porch-like structure that projects northwards from the north-west corner. The fragmentary foundations of an apse can be discerned in the centre part of the east side. The rectangular terrace of **the church** sits on top of the Phase 1 wall and a large protruding and nearly cubical stone suggests that it also covers a gate of a tangential type (**Gate 2**) of the same size as **Gate 3** in the eastern part of the Phase 1 wall (see above). The remains of the three auxiliary buildings in the cluster closest to the church indicate that they were narrow rectangular structures with one or two rooms. Two of the buildings abutted the Phase 1 wall, using its front as their back walls. The third is set above the same stretch of Phase 1 fortification wall, creating a 2-m-wide walkway between the buildings leading to **the church**.

The remains of two square single-roomed buildings can be seen further west along the Phase 1 wall (at D in *Fig. 60*); only one corner of the smaller building can be discerned. A round structure that can possibly be associated with the two buildings is situated above them.

To the north of the cluster closest to the **church** a curved rock-cut path leads to the third cluster of possible auxiliary buildings (E in *Fig. 60*). They are situated on flat ground near a small quarry that probably belongs to Phase 1 or 2A/2B and the remains consist of a rectangular building foundation of the same size as the one found near the **church** and of traces of what appears to be a round structure.

Additional features that can possibly be associated with the buildings surrounding the church include a rock-cut cist tomb (*Fig. 61*), which lies just below (south of) **the church** (at F in *Fig. 60*). It is aligned on the same axis as **the church**, and was constructed of slabs in three courses bound together with a yellowish grey mortar. The cist is trapezoidal with a wider straight side to the west and a rounded somewhat narrower side to the east. The tomb was the subject of a rescue excavation by the Ephorate in the 2000s and the finds indicated a Late Roman date. It has since repeatedly been vandalized by looters.[88] The alignment of the tomb, its proximity to **the church**, and the date of the finds suggest that it was Christian. The date of the finds also further supports our assumption that structures near **the church** belong to the Late Roman period or later.

Another group of features possibly relating to the date of **the church** are five cisterns positioned in a V-shape on the summit of the hill (at H in *Fig. 59*). Only the mouths of the cisterns can be observed, but their close grouping suggests

[88] Information provided from testimonies of Ephorate workmen participating in the rescue endeavours.

Fig. 61. Rock-cut cist tomb in the south-east area of the akropolis*. Photograph by R. Rönnlund.*

that they could be interconnected. As the southern part of the **summit enclosure** (see above) had been cleared for the cisterns, they must be later in date than the enclosure. As there is no evidence of any extensive activity on the *akropolis* after the Hellenistic period and prior to the very Late Roman period, it seems likely that this group of cisterns provided water for activities related to the period of construction of **the church**.

Slopes

Structures can also be noted on the southern and western slopes of the hill at points where the terrain is slightly less steep.

In an area of the south-east ridge, nine structures were found. The largest (A in *Fig. 62*), a 21 m by 10 m platform-like feature, is probably Classical-Hellenistic in date. The remains of a smaller rectangular structure on top of this platform may be part of a small rectangular building built on the west side of the back of the platform. The remaining structures consist of fragmentary foundations of five small rectangular buildings (B in *Fig. 62*) possibly of a Late Roman or Early Byzantine date, a semi-circular structure (C in *Fig. 62*),[89] and two animal pens (D in *Fig. 62*). The latter are constructed in rubble, and are probably of a Modern or an Early Modern date as they partly cover earlier structures. The exact functions of the buildings are uncertain, but the building on the rectangular platform is most likely not residential in nature, and should probably be seen as a monumental structure of some sort. The function of the smaller square buildings is also uncertain, but if they are contemporary with the Phase 4 fortifications, it is possible that they were auxiliary buildings of some kind or residences for a garrison.

Additional structures have been found in other parts of the southern slope, but only one fragmentary foundation (above B in *Fig. 4*) has been identified as part of a possible building. It was situated within the Phase 4 fortified area and was of the same date as the small rectangular buildings on the south-east ridge.

[89] The small size of this structure suggests that it was not a threshing floor (*aloni*).

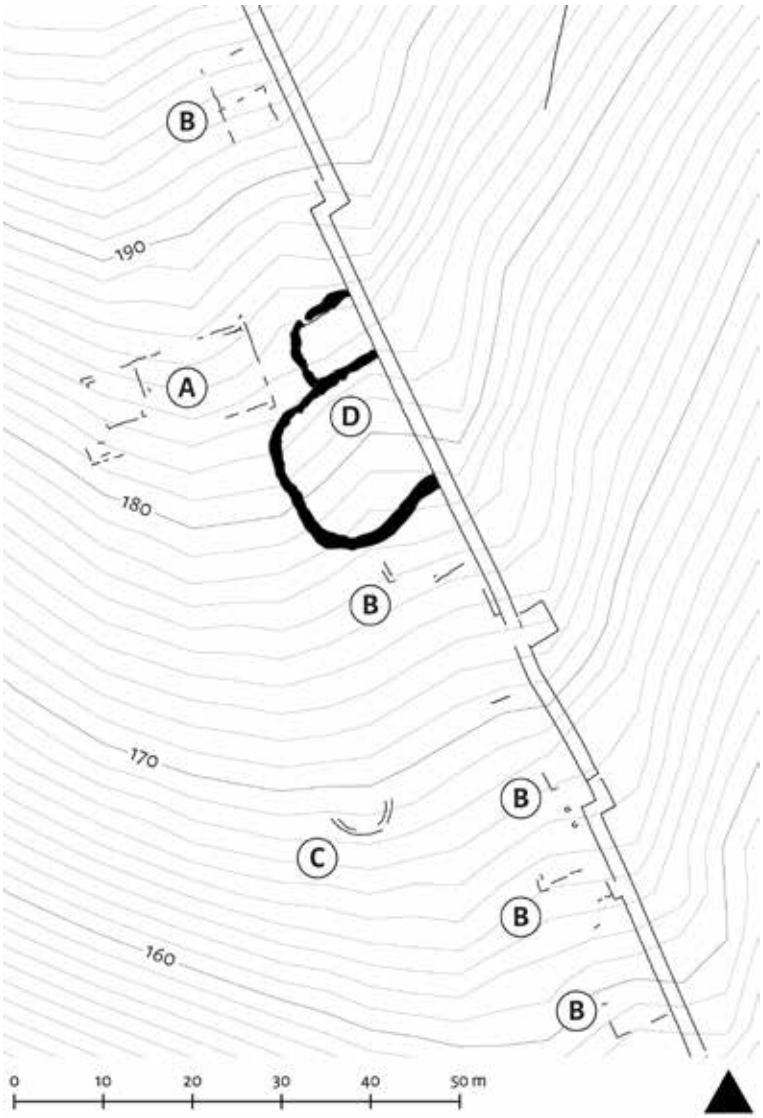

Fig. 62. Structures on the south-east ridge. Plan by J. Klange and R. Rönnlund.

The fragmentary remains of a rectangular structure (at least 8.8 m by 4.5 m) can be seen about halfway up the western slope (at J in *Fig. 4*), above the west colluvial fan. The drywall foundations suggest a Classical-Hellenistic date, but no surface material could be noted to support this date. A collapsed cave entrance lies 15 m south of the structure, from which it is easily accessible. The flat ground contrasts sharply with the steepness of the slopes immediately below and above it and the outer west façade of the foundations must have functioned as a terrace supporting the structure. Access to this flat area could have been from the short western extension of the **North road** which runs *c.* 100 m further uphill. However, there are no discernible traces of any continuation of the latter, and the connection between the rectangular feature on the slope and the **North road** is therefore speculative.

Lower settlement

The visible architectural remains in the Patoma area are in a much more fragmented state than those found on the *akropolis* and on the slopes. This is mainly due to accumulative alluvial and colluvial processes, but also in certain areas to destructive human activities. The latter is especially true in the areas close to the modern quarries, as well as in the vicinity of the modern chapel of Ayios Modhestos. Nonetheless we managed to document a number of structures, including defensive walls, fragmentary foundations of domestic or public buildings, and looted remains of sarcophagus tombs. In spite of their fragmentary distribution, the documented structures facilitated the interpretation of the results of the geophysical investigation. The discernible architectural surface remains conform with building techniques utilized in the Classical, Hellenistic, and Roman periods, supporting the dating inferred from the geophysical prospection. Additionally, the stylistic Roman date of the sarcophagi, combined with their position in the western half of the Classical-Hellenistic urban area, substantiates our interpretation that this part of the Patoma area was not part of the Late Roman settlement.

Structures of undetermined function and/or uncertain date

The foundations of three circular structures were noted on the slopes. They had been constructed of uncut stones with flat outward faces in a single or a double row without bonding. Two (diameter 6.9 m and 7.0 m) are free-standing and, the third (diameter 4.7 m) appears to have been connected to another building (**Building 14**). The masonry, which consists of a variety of stone sizes with spaces in between, suggests that they date to after the Hellenistic period and are contemporary with the Late Antique or Medieval structures found on the slopes. The foundations of the documented structures are relatively narrow (0.65 m), and the manner of construction indicates that they did not support considerable superstructures, suggesting that the buildings only had one storey. Indications of a single doorway were found in **Building 13**.

Further investigation would be needed to establish the functions of these circular structures, but our present under-

standing is that they could have been used as shelters or for storage after the end of Antiquity.

DISCUSSION: INTRAMURAL FEATURES IN THE PATOMA AREA

Geophysical and aerial surveys when combined with each other, and used with other survey techniques, are a powerful tool for interpreting buried remains. Not only can aspects of the layout be discerned but elements of urban planning, architecture, organization, and phasing can be explored. This is extremely important at a site such as the Patoma area, which was the main inhabited area of the ancient site at Vlochos. The *c*. 15-hectare space presents quite varying conditions for each survey technique, but the combined results of magnetometry, GPR, aerial, and NRTK-GNSS surveying provides an excellent overview of the buried remains at a scale that is not possible with conventional excavation.

Street surfaces

The most striking result of the geophysical and aerial surveys is the visible street grid in the Patoma area, which appears as streaks of magnetically enriched earth caused by the continuous compression of soil and the addition of burned waste from the adjacent buildings. It is important to note that elements of the street grid seen in the magnetic results (*Fig. 20*) belong to different phases of the site and are not to be regarded as a plan of the remains at any single time. There is, however, a clear coherence within the alignment of the streets with a large avenue running broadly south-east–north-west, connecting to a grid-like network of side-streets.

Overall, the layout shares certain characteristics with what could be considered a typical Classical-Hellenistic street grid (supposedly contemporary with the Phase 2A/2B fortification). It also displays elements that are more organic in character, reflecting the topography and the orientation of the hill. When compared to contemporaneous Thessalian sites such as Kastro Kallithea,[90] New Halos,[91] and Ghoritsa,[92] the street layout shows both comparable elements (perpendicular streets), and unique features (curving main avenue, off-grid streets, and differing street-width). Recent geophysical prospection at the site of Pherai (at modern Velestino), however, has shown that the strictly rectilinear (or "Hippodamic") street grid system may not have been universally applied in Thessaly, as the remains of slanting and non-parallel streets were noted in the northern sector of that ancient city.[93]

The main avenue-like street visible in the magnetic plot of the Patoma area can be traced nearly in its complete course, beginning in the area of the **Peirasia gate** in the south-east corner of the lower settlement and continuing along the outer fortifications in the south towards the (as yet un-surveyed) **Pharkadon gate** in the south-west corner. The discernible length of the street is *c*. 860 m, with an approximate original length of *c*. 930 m. It has a constant width of *c*. 10 m, except for a *c*. 70-m-long section at the centre of the settlement area, where it appears to narrow down to 8 m. It is flanked by clear indications of houses along its full course except at its western end, where it runs along the fortification wall for *c*. 40 m. A distinct square anomaly can be observed in the street surface in the west sector of the magnetic plot. Whether this represents a Roman sarcophagus tomb (a number of which have been looted in the vicinity) cannot be ascertained, as nothing can be observed in the ground.

Just inside the **Kierion gate**, the avenue-like street crosses the south side of what we interpret as the *agora* of the Classical-Hellenistic settlement. This is a square area, *c*. 50 m by 50 m, apparently containing relatively little architecture except for what could possibly be a *stoa* or a similar public building, *c*. 41 m long and 5 m wide, built along the inner (north) side of the space. It appears that this area, just as most of the east sector of the magnetically surveyed area has been subjected to considerable reconfiguration after the Classical-Hellenistic period, which together with disturbance caused by much magnetic waste (such as spent bullets, car tyres, broken beehives, etc.) in the area does not allow for any definite interpretation. Another possibly open space can be noted in west sector of the magnetic plot, close to the centre of the settlement area. Whether this constitutes yet another *agora* or some other space devoid of discernible architecture cannot be ascertained.[94]

Thirteen perpendicular side-streets can with some certainty be identified as deviating from the main street towards the south, i.e. towards the fortification wall, and another 20 towards the north (not counting the two flanking the *agora*). As a rule these streets intersect the main street at a right angle. There appears to be no standardized width of these streets, as they range between 2.5 m and 4 m. The parts of side-streets which are closest to the hill-slope appear less distinct in the

[90] Chykerda *et al*. 2014, fig. 1.
[91] Reinders 1988.
[92] Bakhuizen 1992.

[93] Donati *et al*. 2017, 458–459, fig. 13. A similar situation can be noted at Boeotian Haliartos, see Bintliff 2016, 4.
[94] Cf. Arist. *Pol*. 1331^{a}30–1331^{b}4, who claims that the Thessalian cities had two *agorai*, one for religious purposes and one for commerce. This has for long been taken as reflecting an actual situation, see Marzolff 1994, 262. For a discussion on double *agorai* in Thessaly, see Mili 2015, 124–128 and Dickenson 2016, 53–54.

magnetic plot, as the buried remains here have been covered by more substantial masses of colluvium than areas further away from the hillside.

The general right-angle grid layout is found in all parts of the site, and probably reflects a planned or semi-planned layout of the Classical-Hellenistic periods (Phase 2A/2B). As the streets are arbitrarily truncated in the east sector of the settlement area by a later fortification wall (of Phase 3, see above) and do not seem to continue outside this wall, it appears likely that the street system dates from the period of the fortifications. This intramural area of Phase 3 was used as a shooting range in the 20th century, leaving much magnetic waste and causing a loss of resolution compared with what we see in the western sector of the Patoma area. Luckily, the snow-marks of January 2019 provide additional information about the buried remains in this part of the site, showing a slightly more organic street layout than in the western part of the Patoma area.

A comparison between the magnetic plot and the snow-marks (*Fig. 12*) in the area of the Phase 3 settlement highlights the great conformity between the methods. The snow-marks, however, appear to relate to the Phase 3 remains only, whereas the magnetic plot contains elements potentially belonging to previous building activities (see below). The Phase 3 street grid, where discernible, appears to divide the inhabited area into *insulae* in a much more distinct manner than in the Phase 2A/2B areas in the western part of the settlement. Close to the centre of the area, at the modern shooting range, the snow-marks highlight a smaller square, *c*. 30 m by 23 m in size, aligned with the rest of the street grid. A street of a deviating alignment, however, leads for *c*. 90 m from the east side of the square towards the eastern edge of the walled area, where it possibly passed through a tower gate.[95]

Not discernible in the snow-marks, however, is a street that runs along the east flank of the *agora* and then soon deviates from its north-eastern course to a slightly more eastern one. Several larger magnetic anomalies—indicative of buildings—are aligned with this street, which suggests that it constitutes a reconfiguration of the previous street grid and probably belongs to Phase 3.

Buildings and other structures

The results of both the geophysical and aerial surveys display clear indications of buried building remains all over the Patoma area. The buildings are organized into blocks or *insulae*—referred to by us as plots—separated by the street grid. In many cases, the results allow for the identification of individual rooms and spatial divisions within each house unit.[96]

The magnetic image contains several examples of clearly discrete structures. However, the building technique employed, with foundations having broadly the same magnetic characteristics as the natural soil, means that the foundations of the structures appear only in their broad outline, rather than as detailed floor-plans. The nature of the survey method means that buried walls appear as low magnetic streaks between the larger anomalies corresponding to the magnetically enriched surfaces of floors, courtyards, and street surfaces. In the areas where the GPR survey was successful, we acquired a much higher resolution of the buried remains than it was possible through magnetometry, and we managed to identify the fragmentary plans of discrete buildings (*Fig. 22*). However, the number of structures visible in the radar image is low, meaning that such floor-plans are scarce. Indications of buried buildings could also be noted through the aerial survey, mainly as snow-marks in the eastern part of the Patoma area (corresponding to the intramural space of Phase 3). In contrast to the magnetic image, the snow-marks most probably correspond to the actual buried stone foundations of the buildings. Moreover, the architectural survey of surface remains in the Patoma area recorded visible elements belonging to the buried structures, including parts of the external walls and corners of buildings.

The combined results of the survey techniques provide a somewhat blurred image, however, and the functional interpretation of individual floor-plans would require further investigation. An extension of the GPR survey and possibly an additional electric resistivity survey would certainly complement our results, but would also require ground confirmation through invasive archaeological techniques. In the meantime, the results from the geophysical, aerial, and architectural surveys provide enough detail for us to be able to define the general urban layout, including the plots of the settlement area.[97]

In total 148 plots can be distinguished within the Patoma area, ranging from 35 m^2 to 2,446 m^2 in size, with a mean area of 544 m^2. The smallest should not be considered as individual houses but as other types of structures in the urban environment, whereas the largest plots probably represent of several buildings. The distribution of the different sizes of plots displays clear differences between the eastern and western parts of the Patoma area. The more substantial plots are found to

[95] The recent disturbances caused by a dirt track crossing this area, however, makes a definitive interpretation difficult.

[96] A similar situation to other sites, most notably in Boeotia. Konecny *et al*. 2013, 154–160 (Tanagra); Bintliff 2016, 4 (Haliartos), 10 (Tanagra).

[97] We define plots as built-up areas separated by streets or otherwise distinctly delimited by apparent wall divisions. To regard all such plots as *insulae* would be misleading, as the urban layout is not fully arranged according to this concept.

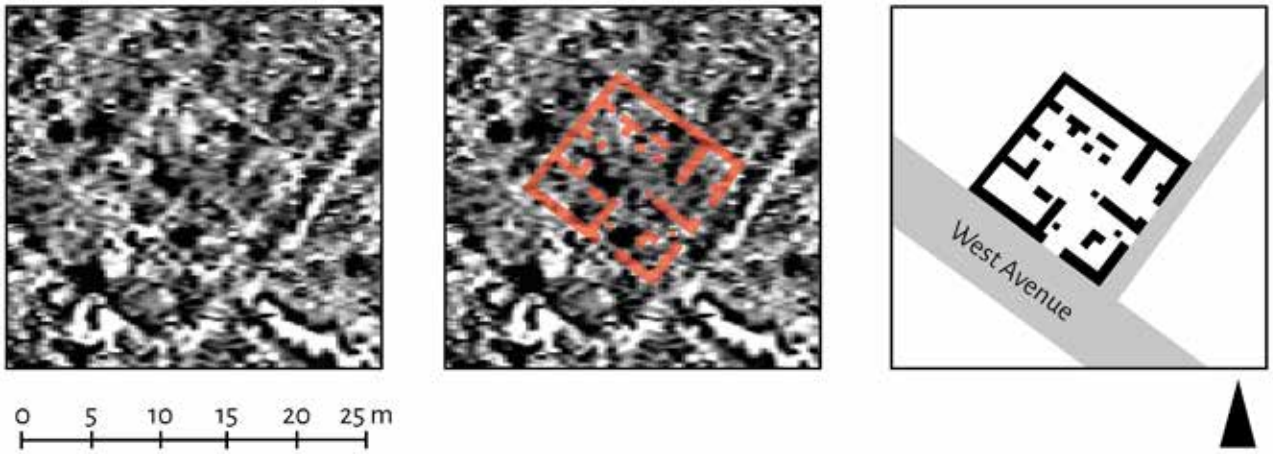

Fig. 63. Traced low-magnetism anomalies highlighting the possible internal organization of a domestic housing block. Plot and plan by D. Pitman.

the east, where we also have a higher number of smaller plots probably representing individual houses (compared to the west, which is dominated by medium-size plots). The differences in plot size between the western and eastern part of the Patoma area highlight the apparent differences in urban layout between the two. The general scheme of the western part is that larger individual house units are located along the main street, with smaller house units placed along the adjacent side streets. In the east, we see a central core of large *insulae*-like plots each containing several buildings, many of which are centred around large courtyards. These are most evident in the snow-marks, and appear as blurred and indistinct in the magnetic survey. Individual and small house units can also be noted in the eastern part of the Patoma area, but these are much smaller and occur mainly at the south-eastern corner of the fortified area (similarly to what we find in the west) (*Figs. 12, 18*).

The layout of individual houses, when discernible, also differs between the eastern and the western parts of the Patoma area, with nearly square house units in the west and more elongated rectangular examples in the east. The houses in the west range in size from *c.* 20 m by 12 m to up to *c.* 39 m by 29 m, and are oriented along a general north-east–south-west axis, in some places slightly adjusted to the natural topography. There are exceptions to this rule, as a number of houses are oriented north-west–south-east, that is not in a "strictly" Hippodamic system. When the magnetic plot is of a sufficient quality to provide an approximation of the floor-plans of an individual house (*Fig. 63*), they display close similarities to Classical-Hellenistic domestic architecture found at other locations in the Greek world.[98] However, the urban layout at Vlochos appears to be of a more "organic" nature, with the street grid partially adopted to the local terrain.

Apart from the apparent domestic buildings discernible mainly in the magnetic plot, there are a number of structures in the central part of the Patoma area that can possibly be identified as public buildings. These differ in layout from the building foundations forming the plots, and appear to be solitary and often substantial in size. The most notable of these is found in the central part of the site (*Figs. 64, 65*), in the lower part of the south-east colluvial fan (D in *Fig. 4*), and consists of a square platform-like feature, *c.* 23 m by 23 m in size. Stronger magnetic anomalies within the feature indicates a central, 4 m by 8 m rectangular structure and an elongated structure located along the back (the north side) of the platform. The layout of this feature or complex of structures suggests that it is a sanctuary, but positive identification would require excavation.

The buildings identified within the eastern part of the Patoma area display a higher degree of internal conformity than in the western part. Plots of a distinct (Roman) *insula* type can be noted here, containing large building units centred around large courtyards, and ranging in size from *c.* 30 m by 40 m to *c.* 40 m by 60 m. Whether these building units were connected to form even larger units with multiple courtyards cannot at present be ascertained. In the largest and central plots/*insulae*, the courtyard building units did not occupy the whole extent of the plot, but were flanked by smaller adjacent buildings, possibly of an auxiliary of commercial nature, along their western sides. These do not extend more than 15 m from the side street, with some internal rooms discernible in the snow-marks. Indications of additional smaller buildings, the function of which cannot at present be ascertained, can be seen along the southern and eastern lines of the fortification.

In the area immediately north of the supposed Classical-Hellenistic *agora* are indications of substantial structures, possibly to be identified with public buildings. The amounts

[98] Bakhuizen 1992, 171–230 (Ghoritsa); Cahill 2002, 75–77 (Olynthos); Haagsma 2003, 47–76 (New Halos).

Fig. 64. Rectangular platform in lowest part of the southern slope, looking towards the north. Photograph by R. Rönnlund.

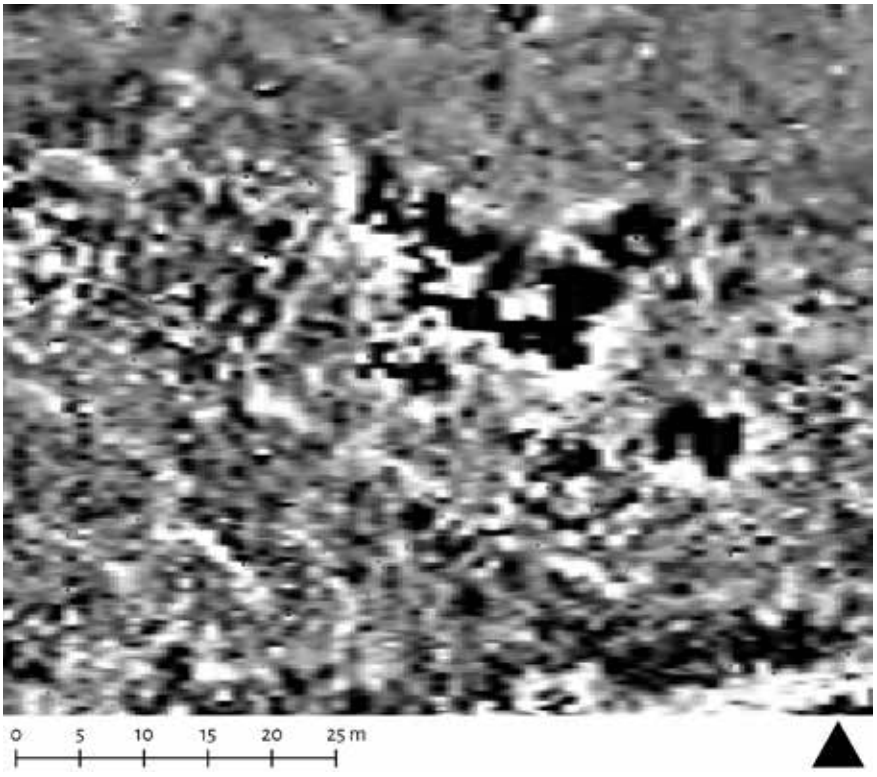

Fig. 65. Rectangular platform in lowest part of southern slope in magnetic plot. Plot by D. Pitman.

of magnetic waste in the area, combined with very strong magnetic responses (supposedly caused by burning?), blurs the image at this point, making a positive identification impossible. The outline and size of these features, and the fact that they do not conform to any recognizable type of domestic installation, makes it probable that they were not living quarters.

In conclusion, the eastern part of the Patoma area would seem to be a planned urban environment, which was established after the Classical-Hellenistic period, sometimes re-using material from its predecessor. The layout of this later town and its buildings, the outline of its fortifications and the abundant Late Roman surface material, suggest that it represents a 4th-to 6th-century (re-)establishment. As Roman sarcophagi

from looted tombs can be found in the road surfaces of the western part of the Patoma area, it is probable that the settlement at this point was confined to the east.

IDENTIFICATION OF THE URBAN REMAINS

Ever since the first reports of the site at Vlochos, scholars have tried to identify the remains with *poleis* mentioned by ancient authors.[99] The most common theory has been that Strongilovouni is the location of ancient Peirasia(i)[100] or the Asterion mentioned in the Homeric *Catalogue of Ships*.[101] These have, however, not been the only suggested identifications and another candidate is ancient Phakion.[102] The most detailed survey of the possible candidates for the ancient cities in the area is that of Decourt, who concluded that the site at Vlochos is to be identified with the Limnaeum (*Λιμναῖον) mentioned in Livy.[103] The evidence has also been summarized by Charalambos Intzesiloglou, who abstained from presenting any suggestions of his own.[104] As Peirasia(i) was later securely identified with the site at Ermitsi (see above), many of the analyses of the literary evidence have to be revised.

We believe that it is only through the discovery of an inscription or a stamped roof tile with the name of the settlement that the identity of Vlochos can be definitively ascertained. The number of possible candidates is, however, limited to Phakion, Limnaeum, and Pharkadon.[105] We think it is likely that the city at Strongilovouni was one of these three.

There is an argument for the identification of the city with ancient Phakion that has as of yet not been presented. This is based on the reading of three inscriptions of the late Hellenistic period, around 200 BC. The first of these is a long and fragmentary list of *theodorokoi* found at Delphi dated to 230–220 BC mentioning a certain Aphareus Megalokleos of Thessalian Phakion.[106]

The second inscription is a list of gymnasiarchs and victors in the *tristadion* from ancient Pelinna (?),[107] *c.* 15 km northwest of Vlochos, dated 190–170 BC.[108] Among the gymnasiarchs in the list, there is an individual whose name has been translated by the editors of the inscription as "*Megaloclès fils d'Aphareus*" (lines 28–29),[109] whom they suggest was the son of the *theodorokos* of Phakion mentioned in the Delphic inscription.[110] The name Aphareus is quite rare, and is only attested in Thessaly in the previously mentioned Delphic inscription, which suggests that it is probably the same person. The reason why this individual is mentioned as a gymnasiarch in a different city from where his father held office, the editors argue, could either be because he (or his father) "emigrated" to Pelinna, or that Phakion was synoecized by Pelinna. They appear to favour the former alternative, arguing that after the destruction of Phakion in 198 BC by Philip V and the following capture of the city in 191 by the Romans, citizens of Phakion might have found it necessary to abandon their ruined city and move to the still-prosperous Pelinna.[111]

The third and shortest inscription is a 3rd-century funerary *stele* from Vlochos containing only the name Megalokleas, found in the fields immediately south of the area of Patoma.[112] If the remains at Vlochos are those of ancient Phakion, the funerary inscription presents an interesting possibility. Even if the date of the funerary *stele* makes it probable that it is not that of the same Megalokleas mentioned in the inscription from Pelinna, it could well be that of his grandfather, the father of Aphareus. Megalokleas/Megaloklēs is a relatively rare name in the Greek world, but is well attested in Thessaly. Most other examples of this name from western and central Thessaly have been dated to a few centuries after the three mentioned inscriptions. That the name was in use at Vlochos at the same time as the inscription from Delphi *could* therefore suggest that we are dealing with the same family, and that Vlochos should be identified with ancient Phakion.

[99] Edmonds 1899.
[100] Thuc. 2.22.3; Liv. 32.13.9; Stählin 1924, 134; 1937a.
[101] Hom. *Il.* 2.735; Leake 1835, 323; Stählin 1924, 134; 1937a, 103; Roller 2018, 574–575.
[102] Thuc. 4.78.5; Liv. 12.13.9, 16.13.3. This *polis* has also been interpreted as located elsewhere, see Darmezin 1992, 150 (at Nea Smolia in the Chassia mountains); Stählin 1924, 134 (at Petrino, which appears to be highly unlikely due to the lack of ancient remains at this site, see above).
[103] Liv. 36.13; Decourt 1990, 162.
[104] Intzesiloglou 1999.
[105] The location of the *polis* of Pharkadon, traditionally identified with the site of Klokotos/Baklalı 9 km north-west of Vlochos, is as yet not securely identified, see *SEG* 43:293.
[106] Passart 1921, 16, no. 1, column 3, line 25: "ἐν Φακίωι Ἀφαρεὺς Μεγαλοκλέος".
[107] The site at Paleoghardhiki is traditionally identified with this ancient *polis*, but—as pointed out in *SEG* 43:293—there are indications that this might not be correct.
[108] Published in Darmezin & Tziafalias 2005, 54–67.
[109] As the Thessalian dialect often had -κλέας (from -κλέϝας?) instead of -κλῆς in the nominative (as it lacked a vocalic η), it is possible that the genitive of the name in the second inscription is actually that of Μεγαλοκλέας rather than *Megaloclès*/Μεγαλοκλῆς as suggested by Darmezin & Tziafalias 2005. See Kühner 1890, 434.
[110] Μεγαλοκλέους τοῦ Ἀφαρέως.
[111] Darmezin & Tziafalias 2005, 61–63.
[112] Decourt 1995, 5, no. 10: Μεγαλοκλέας. The inscription is currently on display in the lobby of the Archaeological Museum of Karditsa.

Main conclusions and future work

The results of VLAP have added much to our knowledge of this little-known site and also to our knowledge of this part of ancient Thessaly. Having previously been regarded as a relatively unimportant place—a "small fortified settlement"[113]—our results clearly show that the remains at Vlochos are those of a substantial *polis*-like settlement and probably a major local centre.

The existence of multiple discrete phases of habitation highlights the importance of the location in the periods preceding and subsequent to the large Classical-Hellenistic city. Whether the settlements were known under the same name during all of these phases cannot be ascertained, but the apparent hiatuses between them indicates that this may not necessarily have been the case.

Our methods have proven to be highly productive and cost-efficient, producing large quantities of high-resolution data which the team will continue to study and interpret. However, we still lack the more precise chronological data that can only be acquired through invasive methods such as excavation, auguring, and fieldwalking. We plan to conduct a systematic fieldwalking survey and excavations within the ancient city. This will be done in our follow-up project, *The Palamas Archaeological Project* (2020–2024), which has been approved by the Hellenic Ministry of Culture. We hope to be able to confirm the interpretations we have presented in this article and to add to our knowledge of the site at Vlochos and to contribute further to our understanding of ancient Thessaly.

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[113] Mili 2015, 181.

Fig. 66. Fragment of stamped Laconian type roof tile. Scale in cm. Drawing by R. Rönnlund, R. Potter and L. Tasiopoulou.

Fig. 67. Fragment of stamped Laconian type roof tile. Scale in cm. Drawing by R. Rönnlund, R. Potter and L. Tasiopoulou.

Fig. 68. Fragment of Laconian type roof tile with stamped inscription. Scale in cm. Drawing by R. Rönnlund and L. Tasiopoulou.

Appendix: Surface finds

Finds are labelled after their inventory number in the Archaeological Museum of Karditsa (AMK). All coordinates are presented in the Greek national geographical grid (GGRS87).

During the course of the geophysical and architectural survey of 2016–2018, artefacts found on the ground surface were distributed all over the Patoma area, corresponding to the area of the ancient settlement. As no systematic collection of surface finds was carried out, these artefacts are to be regarded as chance discoveries.

STAMPED ROOF TILES

Stamped roof tiles bearing the name of the maker represent a relatively common category of find on the Greek mainland.[114] The type of large, figurative stamps, however, are less common, but have been noted at several locations within Thessaly.[115] It appears that there was a local custom to inscribe the name of the *polis* on tiles belonging to public buildings, as this has been noted at several sites in western and central Thessaly. Several of the urban sites within the region have been securely identified with ancient *poleis* due to these finds, making them important artefacts for the understanding of the ancient topography of the region.[116] No such tiles, however, were found during fieldwork, and thus were not able to assist in the identification of the ancient *polis* located at Vlochos.

AMK 17720

Found at south-east colluvial fan (B in *Fig. 4*), in the slope above the area of Patoma (335397/4374286/125 m). Length 11.0 cm, width 10.5 cm, thickness 3.0 cm. Unknown date, possibly Classical.

Probably of the same stamp as a fragment found in the south part of the settlement area (**AMK 17722**).

AMK 17721

Fig. 66. Fragment of Laconian type roof tile, found at south-east colluvial fan in the area of Patoma (335460/4374257/112 m). Length 11.3 cm, width 12.2 cm, thickness 2.5 cm.

The preserved section of the stamp depicts the lower part of a standing anthropogenic figure, facing left. Along the left side of the stamp, written vertically in two lines is the fragmentary inscription Δ[…] | ΘΑΥΛ̣[…]. The letter-shapes are those of the 4th century BC, with an epichoric form of *hypsilon* ϒ, probably mirrored due to the inverted stamp. We reconstruct the inscription as Δ[ιὸς] Θαυλ[ίου] or Δ[ῖ] Θαυλ[ίου] or

[114] For the area of western Thessaly, see Intzesiloglou 2000.

[115] Felsch 1990. Few of the Thessalian ones are, however, published, see *IG* IX,2 269 and Hatziangelakis 2012, 162 (Ermitsi, Karditsa); Karagiannopoulos 2018, 119–120, fig. 105 (Filia, Karditsa).

[116] Hatziangelakis 2007, 48 (Kierion), 39 (Methylion); 2012, 162 (Peirasia).

Δ[ὶ] Θαυλ[ίω], either meaning "(given) to Zeus Thaulios" or "(belonging) to Zeus Thaulios".

Inscriptions containing dedications or mentions of Zeus Thaulios have been found at several locations, yet only within Thessaly. We may note two from nearby ancient Atrax,[117] five from Velestino (ancient Pherai, all from the Archaic temple),[118] one cut into a rock at Tambachana close to Farsala,[119] and a final one on a stone altar found at the *kastro* at Xiladhes east of Farsala.[120] If the figure on this stamp is that of Zeus Thaulios, it would to our knowledge represent the only known depiction of the deity.

It is at present impossible to ascertain whether this stamp is identical to that of the tile fragments **AMK 17720** and **AMK 17722**.

AMK 17722

Fig. 67. Found at excavated section of the fortification wall at the southern end of the area of Patoma (335400/4374019/89 m). Length 10.0 cm, width 11.1 cm, thickness 3.0 cm.

Fragment of a Laconian type roof tile with traces of red paint on the back. At the front, stamped impression of eroded anthropomorphic figure turned right, seemingly holding a spear. Line of red paint visible along outer edge of front. Unknown date, possibly Classical.

Yet another tile fragment of the same stamp (**AMK 17720**) was found higher up the slope.

AMK 17723

Fig. 68. Found at south-east colluvial fan (335502/4374296/128 m).

Small fragment of a Laconian type roof tile with part of a preserved stamped impression […]A. Possibly containing the name of the tile-maker. Unknown date, possibly Classical.

COINS

Fig. 69. Several coins were found during fieldwork in 2016–2018, many as a felicitous by-product of the manual detection of the ground for potential metallic waste that could disturb the magnetometric survey. The metres above sea level (Z value) was unfortunately not recorded for the coins. In 2017, two additional coins found in the same area were given to the Archaeological Museum of Karditsa by Mr V. Bandelas, who also provided their coordinates. These are also presented here.

The coins (when datable) support the identification of several discrete phases of activity on the site, ranging from the late Classical period (**AMK 17437**; **AMK 17442**; **AMK 17710**; **AMK 17717**), through the Hellenistic (**AMK 17440**; **AMK 17711**) and Roman periods (**AMK 17439**; **AMK 17444**), to the Late Antique (**AMK 17725**; **AMK 17726**) and possibly Ottoman periods (**AMK 17438**).

AMK 17437

Bronze. Diameter: 1.7 cm. Weight: 3.03 g. Found at 335064/4374238.

Larissa. Classical period (*c.* 400–344 BC).[121] Obv: Head of the nymph Larissa facing left. Rev: Grazing horse facing left, fragmentary text.

AMK 17438

Bronze. Diameter: 2.1 cm. Weight: 0.26 g. Found at 335553/4374605.

Unknown mint. Eroded. Probably Medieval or Ottoman.

AMK 17439

Bronze. Diameter: 1.5 cm. Weight: 1.2 g. Found at 335060/4374260.

Unknown mint. Eroded. Probably of the Roman period (?). Obv: head facing right. Rev: standing figure, possibly dragging another figure (captive?) by the hair or arm.

AMK 17440

Bronze. Diameter: 2.0 cm. Weight: 6.7 g. Found at 335060/4374258.

Larissa. Hellenistic period (*c.* 305–197 BC).[122] Obv: Head of Apollo with laurel wreath facing left. Rev: Artemis with bow, facing right, fragmentary text.

AMK 17442

Bronze. Diameter: 1.3 cm. Weight: 1.76 g. Found at 335370/4374167.

Larissa. Classical period (*c.* 395–344 BC).[123] Obv: Head of the nymph Larissa facing right. Rev: Grazing horse facing right. Partially illegible inscription […]A[…].

AMK 17443

Bronze. Diameter: 2.0 cm. Weight: 4.07 g. Found at 335142/4374280.

Unknown mint and date. Very eroded.

[117] *ADelt* 32 *Chron*. B1 (1977), 137; *ZPE* 137, 147; Tziafalias *et al.* 2016, 181–182.
[118] Béquignon 1937, 87, 91, 92, 94; Chrysostomou 1998, 236.
[119] Arvanitopoulos 1907, 151–153.
[120] Decourt 1995, no. 63.
[121] Breitenstein & Schwabacher 1943, no. 142; Tsourti & Trifirò 2007, no. 375.
[122] Breitenstein & Schwabacher 1943, no. 149; Tsourti & Trifirò 2007, no. 376.
[123] Breitenstein & Schwabacher 1943, no. 122.

Fig. 69. Coins found during fieldwork. Scale in cm. Photographs by F. Tsiouka and R. Potter.

AMK 17444

Bronze. Diameter: 2.0 cm. Weight: 5.8 g. Found at 335203/4374205.

Unknown mint, Larissa? Roman period (Thessalian League). Reign of Hadrian (AD 117–138). Obv: Head of the emperor with ribbon in hair facing right. Partially preserved inscription [ΑΔΡΙΑ]ΝΟΝ ΚΑΙCΑΡΑ ΘΕ[CCΑΛΟΙ].[124] Rev: Athena Itonia holding shield facing right. Partially preserved inscription [ΟΧ ΝΙΚΟ]ΜΑ[ΧΟΥ].

AMK 17445

Silver. Diameter: 1.0 cm. Weight: 1.65 g. Found at 335249/4374153.

Unknown mint and date (Roman?). Eroded. Obv: Head facing right. Rev: eroded.

[124] Rogers 1932, 25–57; Breitenstein & Schwabacher 1943, no. 340.

Fig. 70. ***AMK 17441****. Fragment of Attic red figure pottery. Scale in cm. Photograph by R. Rönnlund.*

AMK 17710

Bronze. Diameter: 1.7 cm. Weight: 5.54 g. Found at 335335/4374074.

Larissa. Classical period (4th century BC).[125] Obv: Head of the nymph Larissa turned left. Rev: Grazing horse facing right, as if preparing to lay down. Above horse the partially preserved inscription [ΛΑΡ]ΙΣ[ΑΙΩΝ].

AMK 17711

Bronze. Diameter: 1.1 cm. Weight: 2.0 g. Found at 335602/4374030.

Boeotia (federal issue/Onchestos).[126] Hellenistic or early Roman period (196–146 BC). Obv: Boeotian shield. Rev: Trident and possibly dolphin.

AMK 17717

Bronze. Diameter: 1.7 cm. Weight: 5.76 g. Found at 335442/4374126.

Macedon. Late Classical period. Reign of Alexander III?[127] Obv: Head of Heracles in lion skin facing right. Rev: Club, quiver and bow.

AMK 17719

Bronze. Maximum diameter *c.* 1.4 cm. Weight: 2.92 g. Found at 335142/4374280.

Unknown mint and date. Heavily eroded.

AMK 17725

Bronze. Diameter: 1.9 cm. Weight: 5.97 g. Found at 335478/4374262.

Unknown mint (Thessaloniki?). Late Roman. Reign of Justinian I (AD 527–565).[128] Obv: Head facing right. Rev: Inscription AISP. Small rosette above the letter S.

AMK 17726

Bronze. Diameter: 1.9 cm. Weight: 6.77 g. Found at 335478/4374262.

Thessaloniki. Late Roman. Reign of Justinian I (AD 527–565).[129] Obv. The emperor facing right wearing diadem. Inscription […]N IVSTINIAN[…]. Rev: Inscription AISP. Underneath relief line inscription TES.

DECORATED POTTERY

AMK 17441.

Fig. 70. Found in area with disturbed soils produced by illegal quarrying at 335175/4374273. Small fragment of late Archaic Attic red figure vessel, possibly that of a plate. Most probably from the Athenian workshop of Paseas (*floruit c.* 510 BC).[130]

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[125] Rogers 1932, 95, no. 282, fig. 136; Sear 1978, 2014, no. 2124.
[126] Tsourti & Trifirò 2007, no. 618.
[127] Tsourti & Trifirò 2007, no. 338.
[128] Sear 1987, no. 177.
[129] Sear 1987, no. 177.
[130] Iozzo 2014; pers. comm. M. Iozzo, 25 November 2016.

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