CROSSING THE ALPS

EARLY URBANISM BETWEEN NORTHERN ITALY AND CENTRAL EUROPE (900-400 BC)

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Chapter 16

The First Results of Geophysical Prospections Using the ADC Method on the Proto-urban Settlement Site of Como, Spina Verde

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This article presents preliminary results of the first geophysical surveys and a rescue excavation in the area of the extensive late prehistoric Early and Late Iron Age proto-urban settlement of Como/Comum on the Spina Verde ridge towering over the present town. Two short susceptibility surveys demonstrated that this impressive site can be successfully prospected using both geomagnetic and georadar technology and above all by combining their results. We initially demonstrated the susceptibility of the Spina Verde ridge for geophysical prospection in the environs of the excavated Pianvalle site. The results of the following survey of a meadow on the Via Isonzo were remarkably clear, and if the structures are indeed prehistoric, they indicate the presence of a monumental "Casa Alpina"-like cellared building and possible rectilinear walled enclosures. Complementing these findings are the results of a rescue excavation monitored by the Soprintendenza for the province of Lombardy in the Via Ronchetto. Here, the massive walls of a cellared alpine-style building were recovered. We hope to continue surveying in prehistoric Como in order to make a comprehensive plan of this remarkable site.

Keywords: Como; Proto-urban site; Iron Age; Geophysical prospections; Ground-penetrating radar application; ADC – method, Monumental structures; Casa Alpina.

16.1 Introduction: the project

The site of the later prehistoric, proto-urban conurbation Como/*Comum* is unique in northwest Italy because in contrast to contemporary sites, such as Sesto Calende, Bergamo, Milan or Genoa which were subsequently submerged beneath centuries of later urban development, large portions of Pre-Roman Como remain intact. The vast settled area which covers a 2x1 km large expanse on the southwestern flanks of the Monte Croce/Spina Verde spur (De Marinis 1986, 37) was never resettled after the population was moved to *Novum Comum* on the edge of the lake in the 1st century BC. And despite much of its area being engulfed by Como's explosive post-war suburban expansion a large part

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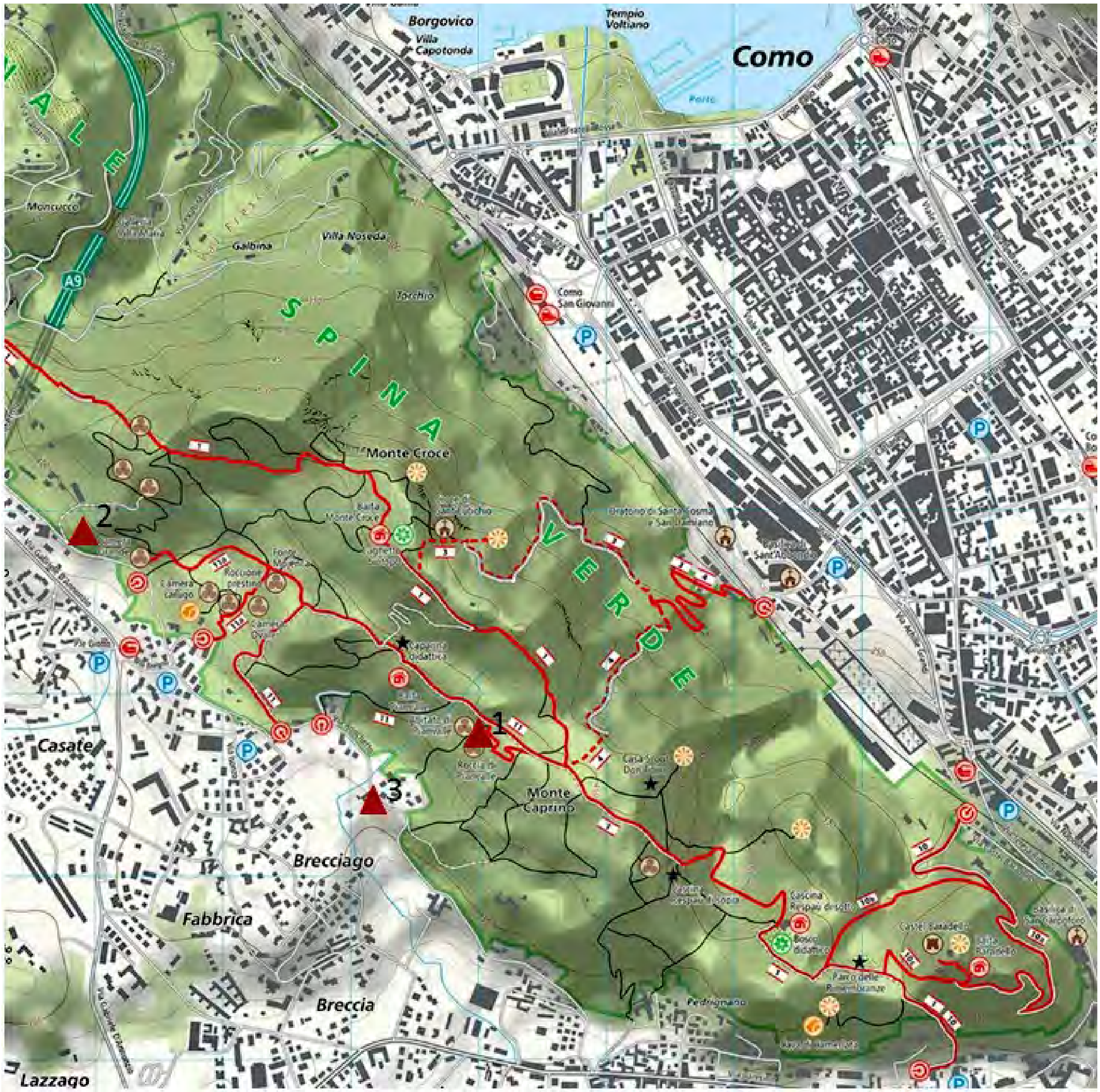

Figure 16.1a: Location of survey areas in 2018: 1. Pianvalle; 2: Via d'Annunzio; and 3. rescue excavation Via Ronchetto. 1b (opposite page). Map of Como, Spina Verde with the Iron Age settlement (yellow), cemetery locations (orange dots), and survey and excavation locations (red), the extent of fluvial and lacustrine sedimentation (blue), indicating the possible original extension of prehistoric Lake Como (1a: after www.http://spinaverde.it/main/mappa-parko; 1b: map L. and G. Nebelsick based on Gioacchini *et al*. 2008, 19 fig. 23; geological map of Como: www.http://commune.como.it/export/sites/default/it/doc/pgt/document-di-piano/carte-della-geologia).

of it lies undisturbed and protected by the Spina Verde Regional Park, which was founded in 1983. While more than a century of archaeological research makes it possible to appreciate the outlines of this impressive settlement[1], there have, to date, been no attempts to reveal the internal organisation of the site with systematic non-destructive

1 See the map of the sites of the protohistoric settlement in Como enclosed in Società Archeologica Comense ed 1986. The site numbers on this map will be referred to as "SAC 1986 nr." in the following text.

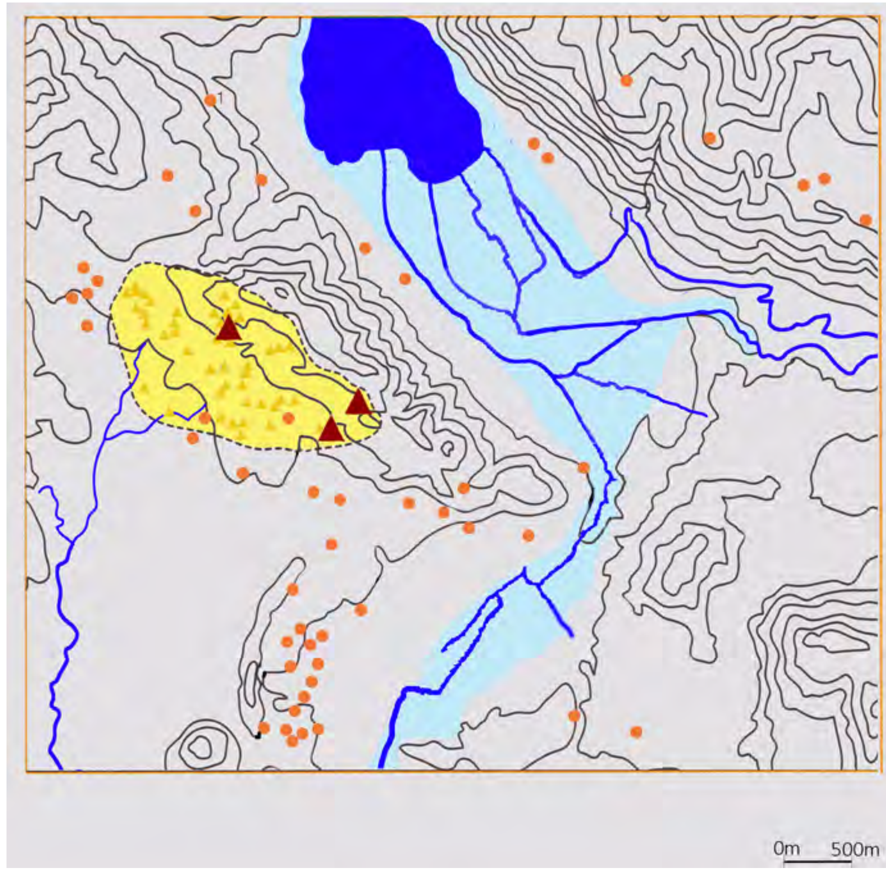

Figure 16.1b

surveys. It is our long-term aim to address this problem. In this article we introduce the results of two geomagnetic susceptibility surveys conducted in 2018 as part of a joint German-Italian-Polish research project[2] at two locations on the slope of Spina Verde above the town of Como. The location (fig. 16.1a-b) of the first one-week survey in March 2018 was carried out in the Pianvalle Archaeological Park on the upper western slope of the ridge[3], the second two-day campaign was carried out in late October 2018 in a meadow on the lower slopes of the Monte Croce on the Via Isonzo in the Rondineto area of Como-Prestino.

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16.1.1 Pianvalle

The Pianvalle site was discovered in 1968 and initially excavated by Ferrante Rittatore Vonwiller in 1971 followed by Nuccia Negroni Catacchio in 1976-1979 (Negroni Catacchio 1981; Negroni Catacchio *et al*. 1986; Negroni Catacchio 2019) revealing a settlement complex beginning

2 The project partners are Carola Metzner-Nebelsick (Institute for Pre- and Protohistoric Archaeology and the Archaeology of the Roman Province, Chair for Pre- and Protohistory, Ludwig-Maximilians-Universität Munich, Ines Balzer (German Archaeological Institute, Rome), Louis D. Nebelsick (Archaeological Institute, Cardinal Stefan Wyszyński University, Warsaw Poland), Alessandro Vanzetti (La Sapienza, Università di Roma) and the Soprintendenza Archeologia Belle Arti e Paesaggio for the provinces of Como, Lecco, Monza and Brianza, Pavia, Sondrio, and Varese (Barbara Grassi). The pilot project was financed by the LMU Munich, the German Archaeological Institute, Rome, and the UKSW, Warsaw.

3 Members of the survey team were: Ines Balzer, Carola Metzner-Nebelsick, Louis Nebelsick, Marion Scheiblecker (Faculty of Geophysics, Department of Earth and Environmental Sciences, and the Institute of Near Eastern Archaeology, Ludwig-Maximilians-University Munich), Alessandro Vanzetti, Dariusz Wach (Archaeological Institute, Polish Academy of Sciences Warsaw), Fabian Welc (Archaeological Institute, Kardynal Stefan Wyszyński University Warsaw, Poland); with student aids Carl Göderz (LMU Munich) and Aurora Palermo (La Sapienza, Università di Roma). We were generously supported and assisted by the director of the Spina Verde Park authority Vittorio Terza, whose representative Marco Pomina advised us on the archaeology of the area, helped us in clearing undergrowth, and supervising visitors.

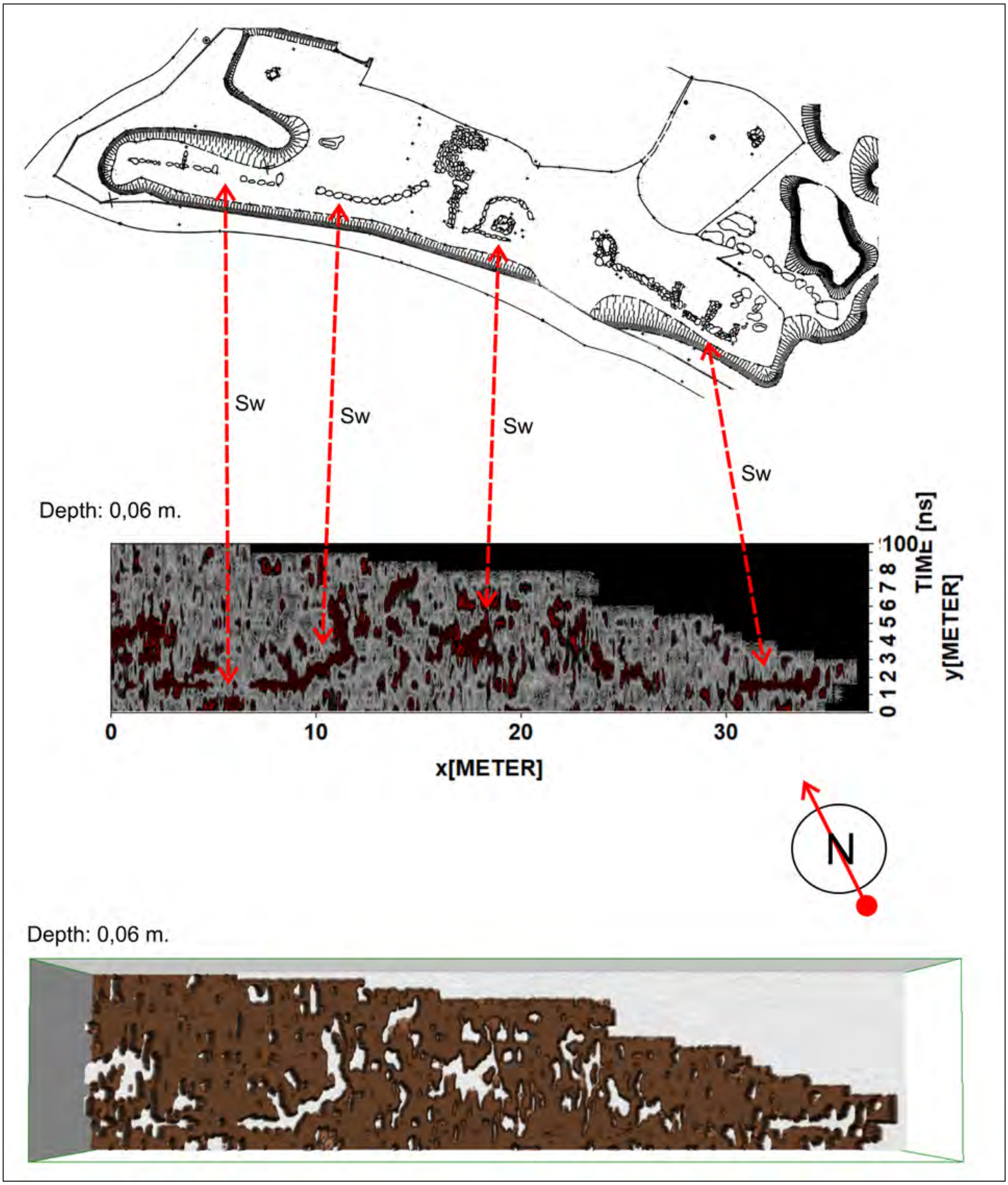

Figure 16.2. Polygon 1 of the March 2018 survey in an excavated area next to the rock carving. The stone structures (SW) which are still partially visible are clearly shown on the GPR-image (GPR-image: F. Welc; excavation plan after Molteni 2003, pl. 8).

in the 9th century and climaxing in the 6th to 4th centuries BC. A large multiphase building complex with boulder and dry-stone rubble foundations was revealed surrounding a large exposed stone surface decorated with what are likely to be Copper to Bronze Age petroglyphs (Negroni Catacchio and Priuli 1992; Priuli 1986). The trenches of the excavations were kept open and the partially restored foundations, which are explained by pedagogical plaques, are one of the main attractions of the Spina Verde park. To date, La Tène material and features from the site have been published (Negroni Catacchio 1982), as has the surprisingly large amount of high-quality Attic pottery (Casini 2007). Particular attention has been given to evidence for metallurgical activities recovered from the site (Negroni Catacchio *et al*. 1983; Roncoroni 2013).

We initially chose the environs of the excavations at Pianvalle in order to test the susceptibility of various geophysical methods on the Spina Verde ridge. By working from the known to the unknown, we knew that there were substantial prehistoric structures at this site whose margins remain unexcavated. These include various stone and boulder foundations of buildings but also kilns abutting the well-known rock carving (Negroni Catacchio *et al*. 2019). Much of the surroundings which were once groves and gardens, are now overgrown, which with thick bushy vegetation and/or are located on steep slopes. Both make geophysical surveying difficult with the exception of an area currently used as a parking and picnic site just to the north of the petroglyphs. Fabian Welc conducted the survey on Pianvalle using ground-penetrating radar. He and his assistant, Dariusz Wach, also used a Bartington Fluxgate gradiometer (type Grad601) for an accompanying magnetometer-prospection to cross-check the results of the GPR-measurements. Marion Scheiblecker applied the cesium Geometrics G-585 magnetometer as total field magnetometers using a duo-sensor configuration for the flat parking/picnic area. Seven prospection areas, *i.e.* polygons were selected: 1. the excavated area adjacent to the rock carvings and immediate surroundings; 2. an excavated area with visible stone architecture; 3. the open area, used as a parking and rest area east of trench 2, not excavated before; 4. a flat area on a hilltop above the excavated areas; 5. and 7. narrow polygons next to area 1; 6. small triangle east and above area 1.

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16.2 Results of the March survey

Volcanic stones used in the foundations of the Iron Age structures as well as the uneven surface of the excavated areas, thick vegetation, and steep gradients of the terrain outside it made using the Geometrics G-585 magnetometer problematic. Best results were obtained on the flat and open parking/picnic facility adjacent to the petroglyph rock, where features could be isolated that Marion Scheiblecker, who carried out the survey at this point, has tentatively interpreted as anthropogenic features, possibly putative postholes or pits.

Ground-penetrating radar (GPR) proved to be the most effective method of prospecting this site. Preliminary results of the geophysical prospection indicate that despite the aforementioned problems, large anthropogenic stone structures are indeed visible under the present topsoil as well as under higher lying archaeological structures in excavated areas (fig. 16.2). In particular, in area 2 the GPR was able to show both the depth of the bedrock in what was a heavily silted hollow as well as the clearly anthropogenic structures at different depths of its fill, showing that there are still undisturbed archaeological deposits underneath the level reached by the older excavations. Thus, we felt confident that under more optimal circumstances, *i.e.* open or semi-open terrain, which was previously cleared of undergrowth, we would be able to significantly contribute to understanding the structure of the upland settlement on the Spina Verde ridge using geophysics. Moreover, it should also be possible to reconstruct other, now disconnected, anthropogenic elements of the paleogeography of the site (*i.e.* sunken roads, water channels, etc.) (Alivernini 2008; Roncoroni 2016).

In conclusion, in this short preliminary survey we achieved our goal of showing that magnetic and GPR prospection can significantly enhance our picture of the prehistoric occupation on the western flanks of the Spina Verde, even in areas previously excavated; as it is generally possible to interpret structures at different depths using GPR. Parallel to the geophysical survey in this campaign the rock surface with its petroglyphs were photographed with pass-point for a 3D-modelling with Structure-from-Motion[4].

In October 2018, we extended the scope of our preliminary survey by asking Fabian Welc to investigate an open meadow on the archaeological settlement site of Como-Prestino on the flanks of the Spina Verde/Monte della Croce ridge which lies next to known areas of dense prehistoric settlement.

16.3 Searching for the prehistoric settlement at Como-Prestino using geophysical Amplitude Data Comparison method (ADC)

Local geological settings: The steep 1155 m high Spina Verde/Monte della Croce massif is a pronounced ridge which rises above Como's historic centre and was the site of intensive pre-Roman settlement (fig. 16.1b). It is composed mostly of Tertiary sedimentary rocks which are characterised by conglomerates irregularly alternating with marls and sandstones. Most of these

4 Carola Metzner-Nebelsick, Ines Balzer and Alessandro Vanzetti documented the rock carvings for a Structure-from-Motion animation.

Figure 16.3. Location of measurement polygons no. 1 and 2 with direction of the GPR and magnetic profiling (source: Google Earth, graphics F. Welc).

rocks were transported by a palaeo-river running along the course of the modern river Lario. At the end of the Pleistocene, numerous surfaces were additionally covered by mixed deposits of rock fragments, gravels, sands, and silt (Bernoulli *et al*. 1989; Bini *et al*. 1998; Comerci *et al*. 2007; Giardina *et al*. 2004).

16.3.1 Surveying methodology and introduction to ADC method

On a rainy 30th of October 2018 two neighbouring sites (measurement polygons) were surveyed by Fabian Welc assisted by Louis Nebelsick (both UKSW) and Dario Monti (University of Bologna) using Ground-Penetrating Radar (GPR) and a gradiometer. The measurement polygons were located in a meadow on a narrow plateau at the foot of the Monte Croce, in the Prestino suburb of Como city on the property of Fabio Brusa[5]. This meadow lies between the Via Isonzo and the steep mountain slope (fig. 16.3). The first polygon was located on the top of a low flat-topped mound with a stepped perimeter, which was covered by loose stones and small fragments of prehistoric pottery (fig. 16.4a). The second measurement polygon was located at the southeast foot of this mound and comprised of a flat terrace which was a bordered by an embankment with a height of approximately 1 m at the north and the retaining wall of the Via Isonzo to the south. It is orientated on a NW-SE axis (fig. 16.4b). During the survey two geophysical methods were applied and used interchangeably, *i.e.* GPR and a gradiometer. The Amplitude Data Comparison (ADC) method was applied during the data processing and interpretation of the results (Welc *et al*. 2019).

GPR is a very effective method for shallow subsurface geophysical prospection. The ground-penetrating radar device emits electromagnetic waves with a high and ultra-high frequency (from 50 MHz to 1.6 GHz) via a transmitting antenna. The receiving antenna set registers impulses reflected directly from underground objects or lithological boundaries, which differ in electrical properties (dielectric constant). The maximum range of the geo-radar prospection depends mainly on the nominal frequency of the transmitting antenna and the electrical resistivity of the local geological medium (Conyers 2013; 2016; Welc *et al*. 2019).

An advanced ground-penetrating radar system (Groundexplorer Abem Malå produced by Malå Geoscience Förvaltnings AB) was used during the Como survey. The prospection was carried out with an application bimodal-screened transmitting antenna with the frequency of 450 MHz. All obtained GPR reflection profiles were processed using professional GPR software (ReflexW). The following processing procedures were applied to the enhancement of useful signals in relation to the background (noise): running average (calculation

5 We thank Mr. Fabio Brusa (Como) for his kind permission to survey on his property, and are also thankful for his generous and active support.

Figure 16.4a. View of polygon no.1, located on the low mound with clearly visible stepped sides and 4b. from the mound in the direction of polygon 2 with the low embankment extending from the ranging rod and the stone retaining wall of the Via Isonzo to the right. On the spur in the background lies the Camera Grande (F. Welc).

of the running average), DC-shift (removal of the constant component of the GPR signal), subtract-mean (removal of the component mean), gain (enhancement of GPR signal), bandpass frequency (procedure used for frequency filtration), background removal (removal of random noise and direct waves), and average xy-filter (the sum of GPR traces). The last important procedure was to arrange the reflection profiles in quasi 3D block-diagrams using the Reflex View 3D data interpretation mode. Finally, numerous GPR maps for particular depths (= time slices) were created for further archaeological interpretation. Because dry sands and clay additives prevail in the investigated area, the average velocity of electromagnetic wave propagation was accepted at the level of 0.06 – 007 m/ns.

The magnetic method is based on a different physical phenomenon than GPR. The magnetometer (gradiometer) detects small changes in the earth's magnetic field which are caused by concentrations of ferrous minerals in the soil and subsoil. They produce characteristic anomalies visible on magnetic maps. Magnetometer surveys are generally very useful for the identification of former settlement areas with features such as hearths, kilns, and large storage pits. During the survey in Como a single sensor gradiometer (Grad601 produced by Bartington Instruments) was used. The results of the magnetic measurements are presented here in the form

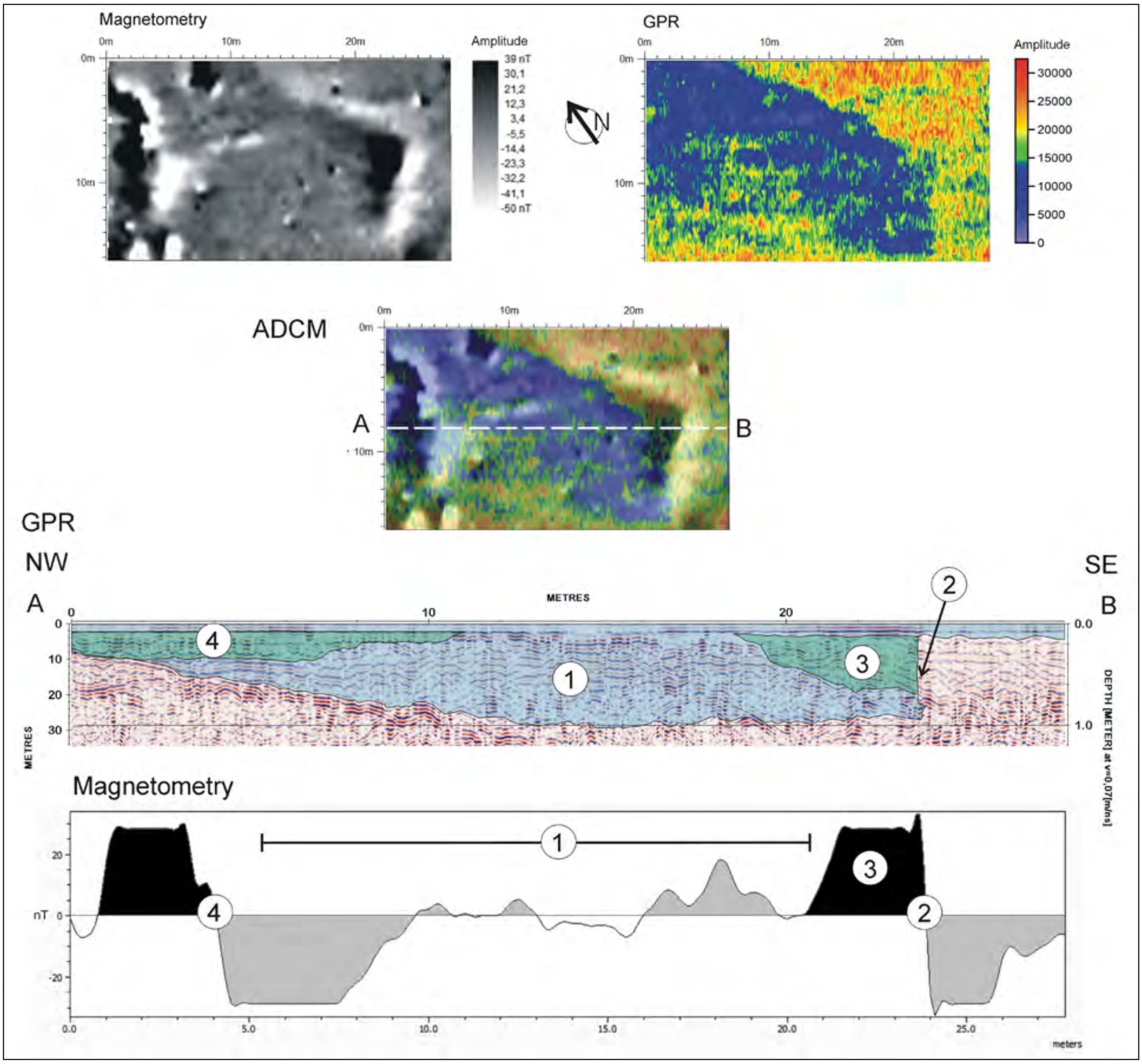

Figure 16.5. ADC method analysis of the polygon no. 1. Upper left: results of the magnetic (gradiometer) survey. Upper right: GPR slice, prepared for a depth of c. 0.70 m. Middle: superimposed GPR and gradiometer survey results with marking GPR profile used for ADC analysis. Lower: ADC analysis and interpretation: 1 – wide depression filled with slope sediments, 2 – rock edge, 3 and 4 – depressions filled with fine stone rubble mixed with organic soil (processing and interpretation by F. Welc).

of black-white maps of the distribution of the anomalies. Darker areas correspond to the anomalies with a higher value of magnetic field amplitude (in nano Teslas – nT). Light areas indicate low values of magnetic amplitude. In other words, the blacked areas indicate a greater concentration of ferromagnetic minerals or sediment enriched with it. In most cases these areas are the site of intensive past human activity (Fassbinder 2005; 2015; 2017).

The results of magnetic and GPR maps, when they are analysed independently, do not allow us to determine the possible origins of the anomalies they reveal. GPR reflection profiles present images of all kinds of buried materials, irrespective of their magnetic properties (Conyers 2018). In contrast, maps of magnetic anomaly distribution mainly represent concentrations of ferromagnetic minerals in the soil. The integration of magnetic and GPR and magnetic methods provides mutually consistent results. In other words, these two methods supply images of different types of buried materials, and this forms the basis of the Amplitude Data Comparison method (Conyers 2018; Welc *et al.* 2019). When individual GPR reflection profiles are compared to corresponding magnetic amplitude values it is possible to interpret the types of materials visible in

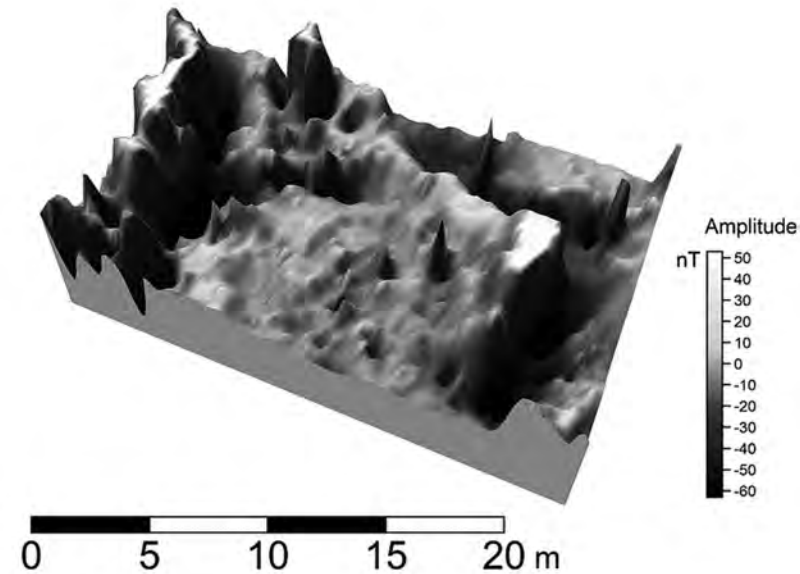

Figure 16.6a: 3D-image of the results of the magnetic survey performed within polygon no. 1, most probably presenting a prehistoric structure hewn into the bedrock (F. Welc). 16.6b: view of the corner of the "Camera Grande", a rock-hewn structure preserved in Spina Verde Regional Park (after Molteni 2003, 14).

the GPR images and then these two data sets are in some way complementary (Welc *et al*. 2019).

For ADC analysis purposes, in a first step the magnetic map obtained in Spina Verde was compared with the corresponding GPR time slice, prepared for a depth of c. 0.5 m (limit of gradiometer prospection). In a second step, selected GPR reflection profiles were combined with their corresponding gradiometer readings (amplitude value in nanoteslas – nT) taken from the magnetic database to determine the real character of underground features. This procedure allows us not only to determine what is producing specific types of anomalies on magnetic and GPR plans, but also helps us to recognise the vertical stratigraphy of the surveyed area (Welc *et al*., 2019).

F. W.

16.3.2 Results

Polygon 1: Magnetic measurements were carried out within area no. 1 (27 x 16 m NW-SE), which is located on the flat top of a low mound covered by small stones and numerous fragments of prehistoric pottery (fig. 16.3 and 16.4a). The resulting map of magnetic anomalies indicates the presence of numerous high-amplitude zones (darker areas) (fig. 16.5). Notable features include a dipole anomaly visible in the eastern part of the polygon, which can be interpreted as a corner of a rock structure carved into the rock itself. In the southwestern part of the polygon there are also slightly chaotically distributed high amplitude-dipole anomalies that should be linked with the accumulation of organic matter directly under the surface (perhaps modern rubbish?).

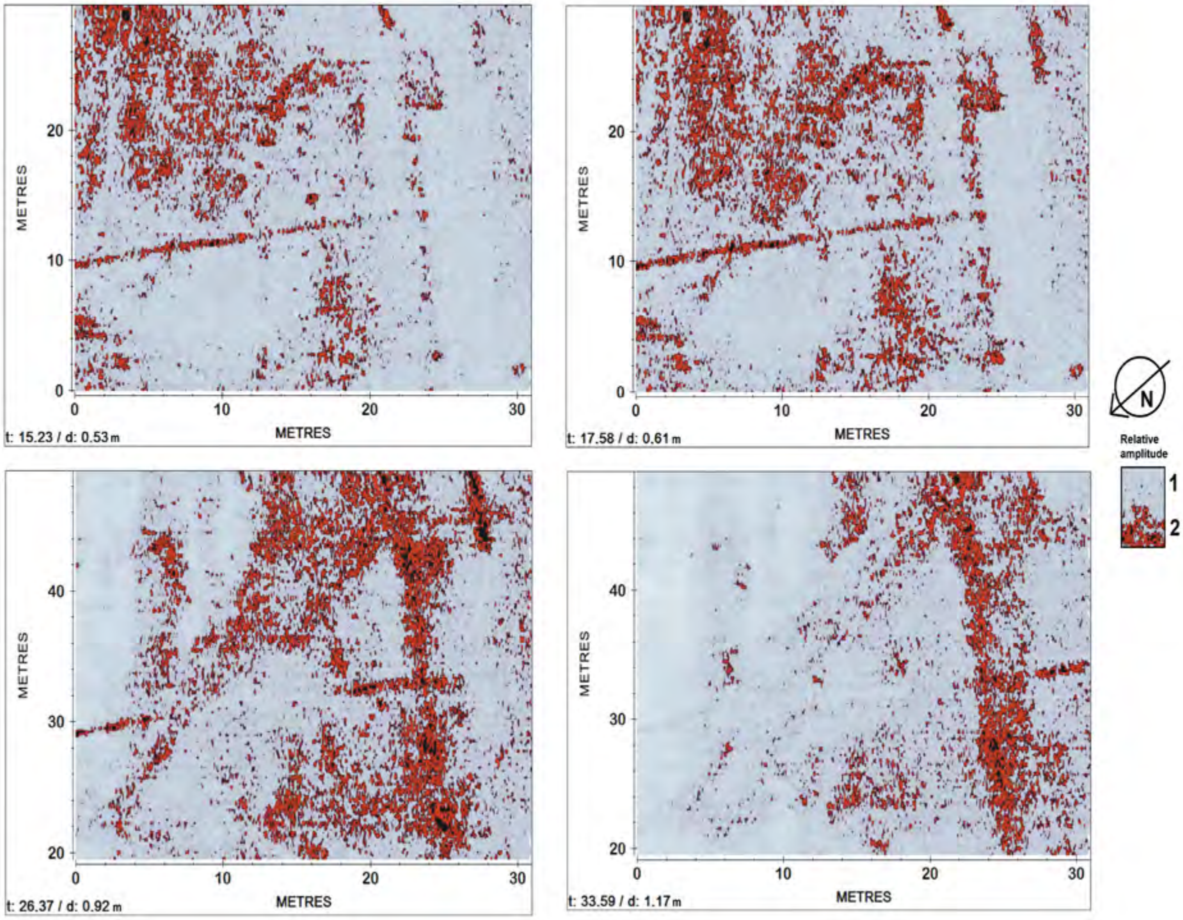

Figure 16.7. GPR- time slices prepared for a depth of c. 0.53 to 1.17 m. Amplitude value description, 1 – signal from buried structures, 2 – surrounding sediment and subsoil (processing: F. Welc).

GPR profiling which was performed within area no.1 is based on the same coordinates as in the case of the magnetic measurements (fig. 16.5). The time-slice prepared for the depth of c. 0.70 m revealed a low amplitude GPR signal-zone in the middle part of the polygon, most probably generated by a large hollow hewn into the rock.

In order to further define the origin of the features discovered by magnetometry, GPR-data obtained within polygon no. 1 was implemented in the next stage of interpretation, using the ADC-method (fig. 16.5). An analysis of the GPR-reflection profile was made and correspondences to the values of the magnetic amplitude revealed numerous features, both of anthropogenic origin and those connected with geological sedimentary processes. Between the c. 5th and 24th metres of the GPR reflection profile a wide depression is visible, the outline of which can also be traced on the magnetic map (fig. 16.5.1). The central part of the depression does not show distinctive anomalies which suggest that it is filled with fine sediments, most likely sands and silts, which seems to be confirmed by a low value of magnetic amplitude. More coarse deposits predominate at a depth of below 1 m. The boundary between this package generates a clear reflection surface, visible on all the analysed GPR-profiles as distinctive horizontal and diagonal lines at the depth of ca. 1 m. This indicates that the depression was gradually filled with slope deposits in several stages due to the activation of soil flows from the higher ground. The analysis of the GPR-profile suggests that the northern edge of the pit is almost vertical (fig. 16.5.2). The magnetic amplitude records present a characteristic dipole-anomaly in this place, whose high amplitude value corresponds to the accumulation of sediment enriched with organic matter next to the edge of the rock-hewn feature, while a low value corresponds to the rock itself (fig. 16.5.3). Another distinctive dipole-anomaly marks the location of the aforementioned shallow depression, visible in the northern part of the GPR-profile, which is most probably filled with modern rubbish (fig. 16.5.4).

The analysis of the magnetic and GPR-plan together with the reflection-profile and their correspondence to the magnetic readings revealed the outline of a rectangular depression with a length of over 20 m and a width of about 5 m. The GPR-plans clearly show that the northern and

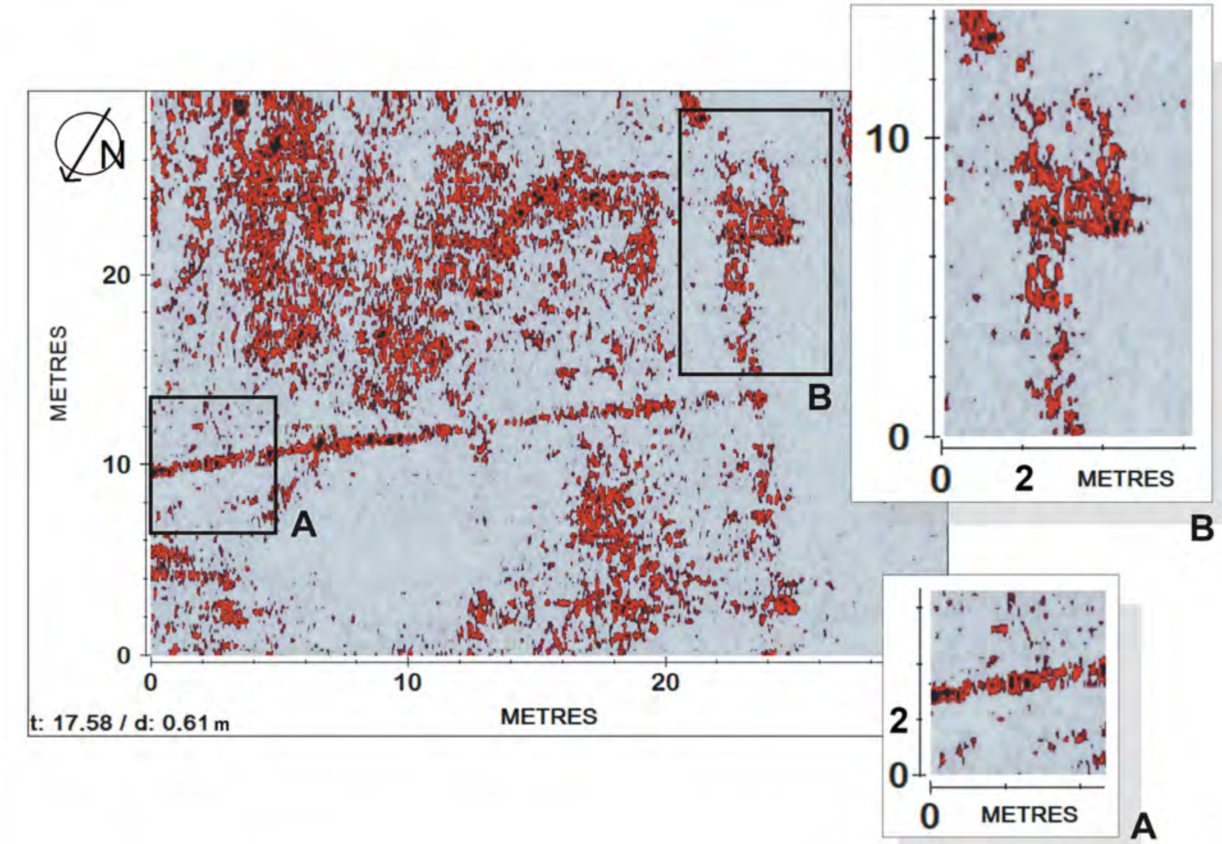

Figure 16.8. GPR-time slice for a depth of c. 0.61 m. A: stone wall, B: wall with bastion-like extension (Author: F. Welc).

southern walls of the structure continued their course towards the northwest, which indicates that the feature is significantly larger and occupies a much bigger space (fig. 16.6a). Based on the geophysical data, we can assume that the captured anomaly represents a monumental feature, partially hewn into the rock. It is a similar, but a significantly larger feature than the nearby ca. 9x5 m stone-hewn structure, Prestino-Camera Grande (fig. 16.6b).

Polygon 2: The measurement polygon no. 2 is located on a narrow and flat terrace bordered in the north by the embankment with a height of approx. 1 m and orientated on the northeast-southwestern axis (figs. 16.7-9). The resulting map of magnetic anomalies indicates the presence of numerous high-amplitude zones (darker areas) (fig. 16.9). Notable features include linear anomalies corresponding to the course of two walls visible in the southern and northern margins of the polygon as narrow zones with slightly lower amplitude values (fig. 16.7). Between them there are a lot of chaotically distributed dipole anomalies that should be most likely linked with the accumulation of organic matter, burnt material and metal objects under the surface (possibly settlement debris). It is worth mentioning that the zone of the most high-amplitude value anomalies primarily covers the northern part of the area and coincides with the range of a low embankment, which is visible in the morphology of the area (fig. 16.4b).

The GPR profiling was performed within area no. 2 and based on the same coordinates as in the case of magnetic measurements. The time-slices prepared for depths ranging from c. 0.50 to 1.17 m (fig. 16.7) presented numerous distinctive linear anomalies orientated north-south and west-east. They were likely generated by stone walls located just under the surface. Another set of high amplitude anomalies is visible in the north-eastern part of the polygon. In this case they are generated by a vast and shallow depression filled with numerous stones or rock fragments.

A most distinctive linear anomaly orientated on the north-south axis is visible in the southern part of the polygon (26 m of the x-axis) at a depth of 0.60 m (fig. 16.8). This feature is generated by the top of a solid stone wall. Most probably, the wall had openings or gates. A bastion-like rectangular extension is shown by the rectangular anomaly visible within the eastern section of the wall (fig. 16.8a). Moreover, there is another linear anomaly – probably another wall – visible in the middle part of the measurement polygon, orientated towards the north-south axis (fig. 16.8b).

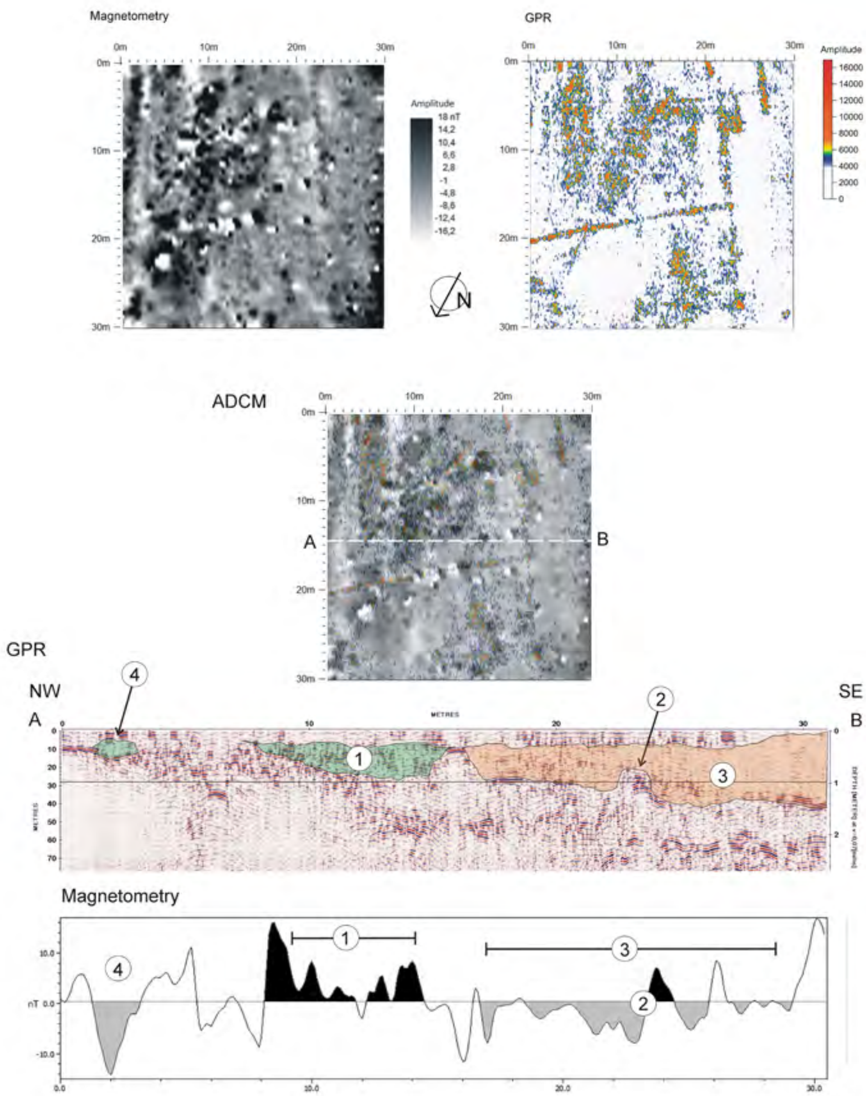

Figure 16.9. ADC-method analysis of the polygon no. 2. Upper left: results of the magnetic (gradiometer) survey with marked two parallel walls labelled as a and b. Upper right: GPR-slice prepared for a depth of ca. 0.60 m. Middle: superimposed GPR and gradiometer survey results with marking of the GPR-profile used for ADC-analysis. Lower: ADC-analysis and interpretation: 1 – depression filled with organic matter and burnt material, 2 – top of a solid stone wall, 3 – depressions filled with slope sediments, 4 – top of another stone wall (processing and interpretation by F. Welc).

The analysis of the GPR-reflection profile located in middle part of the measurement polygon (fig. 16.9) and corresponding magnetic readings revealed numerous underground features, mostly connected with past human activity. A depression is visible between the 8th and 14th m of the profile, which is characterised by a high value of the magnetic amplitude (fig. 16.9.1). It can be interpreted as a pit filled, most probably with ashes and/or other burnt material. Remains of a southern wall with bastion-like extensions are visible as a series of diffraction hyperboles at the depth of ca. 0.60 m and on the 23rd m of the profile. This is emphasised by a dipole-anomaly recorded on the associated magnetic profile (fig. 16.9.2). Above the stone wall there is an electromagnetic wave suppression-zone (without distinctive anomalies), which corresponds to reduced values of magnetic amplitude (fig. 16.9.3). It indicates that this part of the site is covered with a thick series of slope sediments with a predominating fine fraction, which ceased greater conductivity and led to EM wave-suppression. Moreover, we can also clearly trace the top of the slope, which is gently inclined towards the south in this place. On the 3rd m of the analysed GPR-profile, an anomaly is also visible which can be linked with the location of the northern wall. The corresponding low value of the magnetic reading suggests that the structure was built of limestone or sandstone (fig. 16.9.4).

F. W.

16.4 Conclusion and discussion

Within an archaeological site on the western flank of the Spina Verde/Monte Croce massif a total of two polygons intended for geophysical measurements (GPR and magnetic) were selected. They are marked from 1 to 2 and located on a narrow plateau at the foot of the spur. The

Figure 16.10. Results for GPR-survey, time slices for depth c. 1 m (authors).

first polygon was set up on the top of a low mound with steep stepped banks, another on the flat terrace which is bordered by a shallow embankment to the north and a stone wall to the south. The analysis of the survey's results using the Amplitude Data Comparison (ADC) method clearly indicates that the integration of GPR and gradiometry allows a detailed and effective identification of potential buried archaeological structures.

Our preliminary interpretation of the GPR and magnetic measurements performed within polygon 1 includes (fig. 16.10):

1. The so-called positive map of magnetic anomalies which indicates the presence of a corner of a monumental structure hewn into the rock.
2. The GPR time-slices prepared for the range of depths from 0.50 to 1.17 m presented linear anomalies orientated northwest-southeast, probably generated by a rectangular structure hewn into the rock.
3. The combination of the magnetic plan and the GPR-time slices revealed the outline of a rectangular depression with a length of over 20 m and a width of about 5 m.
4. Based on geophysical data, we can assume that the revealed anomaly is presenting a prehistoric house, partially hewn into the rock and similar to, but much larger than the nearby Camera Grande.

The GPR and magnetic measurements performed within polygon 2 resulted in the following findings (fig. 16.10):

1. A positive map of magnetic anomalies has indicated the presence of numerous high-amplitude anomalies. A series of anomalies corresponding to the course of two parallel walls visible in the southern and northern margins of the polygon. Numerous point-source anomalies certainly indicate the position of settlement debris and other features like metal objects.
2. The GPR – time slices prepared for the range of depths from 0.20 to 0.50 m presented numerous linear distinctive anomalies orientated north-south to west-east. Most probably they are generated by stone walls very close to the surface. Another set of high amplitude anomalies is visible in the north-eastern part of the polygon. In this case they are generated by numerous stones or rock fragments which filled the vast and shallow depression. A quite distinctive linear anomaly orientated towards the north-south axis is visible in the southern part of the polygon at a depth of 0.50 m. This feature is generated by the top of a solid stone wall. Most likely, the wall had gates or bastion-like extensions (towers?). Below 0.80 m the GPR-plans revealed a continuation of these features. Additionally, there is one more linear anomaly (NW-SE orientated) which is orientated at an angle to the two previous ones.
   F. W.

Figure 16.11. View of the wall constructed of large stone blocks in Como, Via Ronchetto, excavation 2019 (SAP company, Archivio Soprintendenza).

16.5 Preliminary interpretation of the Via Isonzo site

The results of the two surveys of selected areas (polygons) at two different locations on the Spina Verde ridge revealed that non-invasive prospection methods proved to be a useful tool for detecting archaeological features. In particular, GPR measurements are a perfect way to detect the stone foundations of houses and other installations in the Iron Age proto-urban settlement of Como. Although without an excavation we cannot say for sure, whether the features detected on the meadow and stepped slope on the Via Isonzo site are indeed prehistoric, or rather show cellars and walls of more recent architecture. It is worth noting that we noticed a scatter of prehistoric small sherds covering the meadow. Moreover, it lies in the midst of a thick carpet of archaeological finds which have been recorded and to some extent excavated over the past 150 years. Across the road from the site on Via Isonzo 63, satellite imagery (Google Earth) shows boulder alignments crossing an exposed stone surface which are analogous to the foundations seen in Pianvalle. Moreover, 100 m east of the site (SAC 1986 nr. 24) a drystone boulder foundation of a large, more than 34 m long rectangular sunken structure with an entrance ramp were excavated in 1965. The structure dates to the 6th-5th centuries BC and is still partially visible today (Luraschi *et al.* 1969; Maggi 1986, 20-21).

A scatter of sites was investigated on the steep slope rising north of the surveyed meadow (SAC 1986 nr. 35-39) in the 1870s (Maggi 1986, 19). More importantly, just east of the surveyed site the terraced cliff-like slope showed signs of house platforms and three impressive stone-hewn later Iron Age structures, the Camera Grande (8.71x5.05x3 m, SAC 1986 nr. 47) (Casini *et al.* 2001, 105 f., fig. 3-4) and the Camera Carugo (6x4.70x2.40 m, SAC 1986 nr. 51) (Casini *et al.* 2001, 106, fig. 5), lie on neighbouring spurs. Perhaps the much smaller Camera Ovale (3.10x2.80 m, SAC 1986 nr. 51) which lies further to the east, belongs to this group as well. These impressive structures are the basements of the typically Late Iron Age massive, wooden alpine houses ("*Casae Alpinae*") which are cut into mountain slopes and are also known as *Casae Raeticae* (Perini 1967). While they are concentrated in the Raetic cultural provinces of Tyrol and Trentino, significant eastern outliers are found in the Julian Alps and the Isonzo/Soča Basin (Migliavacca 2013; Pisoni and Tecchiati 2014, 57; Sölder 1992; Tomedi 2014). Most examples are found as isolated farmsteads (Wild 2019) or grouped into small hamlets. But, as excavations in Most Na Soči (Svoljšak 1998; see also Tecco Hvala this volume) and Sanzeno (Marzatico and Stelzer 1999) have shown, this highly specific mountain architecture was also incorporated into proto-urban settlement settings. Western examples are found in the Valcamonica (Rossi 1999; Solano 2014b). Significantly, a monumental rectangular cellar structure on the acropolis of Brescia (Solano 2014a) that has been related to this house type, may have had a sacred function. The most western "*Casae Alpinae*" are the Como examples which probably reflect the polyethnic make-up of its Late Iron Age inhabitants (Haeussler 2016, 88-91). Yet, the size of the structure Fabian Welc has found in polygon 1 (20x5 m) is far greater than any of these stone-hewn cellars known to date, and it will require trial excavations to make sure that the rectangular cellar, as well as the stepped mound into which it is deepened, is not a post-prehistoric feature. The same can be said for the linear stone structures found in polygon 2. Obviously, these wall foundations run parallel to both the embankment seen in northeastern part of the field and ultimately the steep cliff behind it. But it is also parallel to the modern wall facing the Via Isonzo making it at least possible that we are dealing with the remains of modern garden walls. Whatever the case will finally be, the results of this campaign are stunningly lucid and make it clear that complex geophysical surveys will have an enormous impact in improving our understanding of the structure of this important late prehistoric proto-urban site.

Another stone-built feature was recently revealed c. 1 km to the southeast following the edge of the slopes of the Spina Verde ridge.

L. N., C. M. -N, I. B., A. V., B. G, F. W.

16.6 A rescue excavation at the Via Ronchetto, Spina Verde Park

In spring 2019, a section of via Ronchetto, located in the Spina Verde Park, was investigated by the Soprintendenza in cooperation with the SAP company during the installation of the new municipal sewer pipe, on the steep slope of a pronounced spur. The excavation brought to light an imposing wall structure made of large stone blocks (diorite, granodiorite, and amphibolite) orientated from northwest to southeast, 1.70 m wide, at least 11.85 m long and preserved to a height of 2.50 m (fig. 16.11). The structure was built into a prepared recess, cut into the bedrock with a level floor. This building technique has been repeatedly observed in the house constructions of Spina Verde. To the east the limit of this structure was found, consisting of a right angle which makes it possible to reconstruct a rectangular shape of a building. Its hypothetical dimensions (14 m length, 10 m width, and at least 3.50 m height) are derived from the extent of the stratigraphic deposits which can be related to the collapse and abandonment of the building. The course of the putative parallel wall section can only be hypothesised due to the impact of modern terracing works.

The preliminary examination of the finds suggests that the first phase of this building can be assigned to the Iron Age. The collapse of the large room was followed by a second phase, which saw the construction of a second wall, which can be dated to a more advanced phase of the Iron Age. The analytical study of the finds will allow a greater chronological precision; however, a preliminary examination suggests that many finds can be dated to the III phase of the Golasecca Culture, and in particular between the 5th and 4th centuries BC. While the large size of the structure indicates its exceptional nature, its intended use cannot be determined at this preliminary stage.

B. G.

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