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LIDAR VIEWS OF BRONZE AND IRON AGE HILL-TOP SITES IN THE SOUTH-EASTERN CARPATHIANS

Abstract: The article offers a glimpse into the potential of a series of recent LiDAR based explorations, in cases combined with geophysical prospections, pin-pointed excavation and radiocarbon dating of enclosures, to contribute to the better understanding of the anthropic modified relief morphology and layout of several hill-top sites from South-Eastern Transylvania dated in the Bronze and Iron Ages. The study area, which is mostly forested, gathers one of the largest concentrations of Late Prehistory and Protohistory earthworks known on the territory of modern Romania. The presented data opens the pathway for the further exploration of relevant themes such as: diversity of the functions played by enclosures, the sites' level of interconnectivity and the existence of hierarchies. It also points out the general need for establishing more accurately the earthworks' chronology, topography and occupation intensity.

Keywords: *LiDAR, Iron Age, Bronze Age, fortifications, hillforts, enclosures.*

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INTRODUCTION

Fortified hill-top sites have attracted much of the attention of the last century's archaeologies of Bronze and Iron Ages throughout Western and Central Europe. Hill-top sites are not necessarily hill-forts, and furthermore, enclosed settlements can be found on low ground, while unfortified settlements were documented in the mountainous areas, too. However, the coincidence of fortifications with elevated positions is a pregnant feature in South-East Transylvania, our case study area, as in much of the continental Europe, as a matter of fact. Fortified sites were initially regarded as purely defensive structures, elements of refuge for communities threatened by frequent violence. Once the role of warfare in prehistoric societies was downplayed within the processualist and post-processualist rationale, the concept of hillforts has evolved in that of central places - settlements with a primary socio-economic function and/or seats of elites.

The exclusive defensive nature of the Bronze and Iron Ages earthworks has been also criticized, since already the late 1980s, moving the interpretation in a more socially and symbolically orientated framework, hence the spread of the term 'enclosed spaces' as addition to 'fortified'.[1] In this approach, ritual performance in dedicated spaces might require spatial delimitation, material

[1] ROMANKIEWICZ *et alii* 2019; PARKINSON/DUFFY 2007.

boundaries would enable the creation of 'corporate' groups[2], while building at monumental scale and taming the nature were symbolic charged actions incorporating collective memory, reference to ancestors, status and prestige of either exceptional authoritative individuals or of groups involved in the building process.[3] More recently, critiques have started to be expressed concerning the generalization of the symbolic over the defensive aspects in all cases[4], but in what concerns the interpretation of Bronze and Iron Age enclosures in the Carpathian area, the local historiography has still too overcome first its fixation for purely functionalist views.[5]

Even if central places continue to occupy the main stage of European scientific interest, the theoretical framework of the last decades shifted the focus towards their microregional/regional integration and elaboration of settlements networks[6], ultimately finding reasons and ways to approach entities quite elusive as rural landscapes and dispersed communities.[7] Remote-sensing based explorations like satellite imagery, UAV aerial archaeology, LiDAR and geophysics have certainly opened a door towards this scale expansion, not only of the geographic setting of the analysis, but of the considered sites samples, too, as new discoveries were thus made, especially in forested terrain, while already known sites were being rediscovered. These have resulted in revealing a larger variety of types of vestiges, earthworks and enclosed sites than previously known, potentially hinting to diversity in settlement/site function and in land use patterns[8], as well as proofs, in some cases, for the recognition of past engagement of large-scale land anthropisation strategies. The archaeological landscapes revealed themselves larger and more complex than formerly thought, palimpsests of vestiges created along millennia of anthropic activity. The challenges brought by this surge in new data have been mainly connected with establishing the correct chronology and occupation intensity for the observed terrain anomalies.[9]

As well relevant for our study here should be regarded the evolution recorded in the past two decades in the archaeology dedicated to Bronze and Iron Ages mountainous sites of the Balkan Peninsula. Even if Transylvania, by large, is relatable with archaeological phenomena characteristic to Central Europe, the South-Eastern part of Transylvania – our area of study here, has been traditionally more integrated, throughout ages, in the cultural processes and material fashions of the Lower Danube and South-Eastern Europe. Therefore, the progress made in recognizing the existence of mountain sanctuaries[10], some fortified, as typical sites for the Thracian cultural circle is certainly important and can open pathways for new interpretations.

RESEARCH OBJECTIVES AND METHODOLOGY

Following the up-mentioned trends of aiming towards regional integration of central places, enclosures and fortifications, the main purpose of the current contribution is to provide basic, but unavailable before data – not in this quality or at all, regarding the anthropic modifications visible in the terrain morphology for a group of twelve relevant hill-top sites from South-Eastern Transylvania, used during Bronze and Iron Ages. Our cross-cultural perspective focusing on the occurrence of fortifications and enclosures in mountainous environment over the long term might help in obtaining valuable *comparanda* models for wider phenomena encountered at similar times in Western-Central Europe or in the Balkan Peninsula, while also enhancing the regional characteristic phenomenon of reoccupation, in a cyclic manifestation, of the same hill-tops, during various ages.

The occasion was also used to review prior archaeological work done in the discussed sites, some last visited as long as 45 years ago, and to contextualize earlier results by proposing revised interpretations and connections. The exploration of the recently acquired LiDAR[11] models of the areas located mainly under the canopy, allowed the mapping and measuring of the enclosures' elements morphology, facilitating thus a more accurate understanding of the sites' size and spatial complexity (their inner organization or land division, degree of terrain anthropisation, structure and complexity of enclosure elements) or of their relations with the surrounding relief. Where possible, special attention was given to establishing the degree of occupation intensity and sequence of site use (based on interpreting publications of older trenches, or on our own geophysical surveys and excavations). These features, characterized essentially by a rather technical nature, are very much mandatory to be known for anyone wishing to attempt an integrated analysis of sites typology, assessment of enclosures' functionality or establishing hierarchies and network development, and from here to move further to discuss social structure or social aggregation at regional and territorial scale. Even if the moment for such an interconnected analysis has not yet come, as the current batch of twelve sites must be enlarged by at least two more scheduled contributions[12], the individual analyses taken in detail still provide important data.

CHALLENGES IN THE RESEARCH OF SOUTH-EASTERN TRANSYLVANIAN HILL-TOP SITES

Many of the hill-top sites in South-Eastern Transylvania, including those comprised in the current catalogue have been known and briefly described already

[2] HINGLEY 1984, 22.
[3] BOWDEN/MCOMISH 1987, 80.
[4] ARMIT 2007.
[5] Among the few studies arguing for the recognition of the symbolic functions of LIA walls in pre-Roman Dacia see PUPEZĂ 2011; SÎRBU/MATEI/DUPOI 2005.
[6] GOGÂLTAN 2016; PUSKÁS 2016; ȘTEFAN/ȘTEFAN/BUZEA 2015c; ȘTEFAN/ȘTEFAN 2019.
[7] COWLEY *et alii* 2019.
[8] LAHARNAR/LOZIĆ/ŠTULAR 2019.
[9] LELOCH *et alii* 2021; HLOŽEK/MENŠÍK/PROCHÁZKA 2019.
[10] NEKHRIZOV 2005; DIMITROVA 2008; SÎRBU/MATEI/DUPOI 2005.

[11] The LiDAR data was acquired by airplane at 8 points/meter resolution in HiLands Project - *Hidden Landscapes: Exploratory Remote-sensing for the Archaeology of the Lost Roads, Borders and Battlefields of South-Eastern Carpathians (PN-III-P4-ID-PCCF-2016-0090)*. The elevations were related to the Romanian reference system – Black Sea 1975.
[12] The authors are preparing publications resuming analyses done for the group of enclosed hill-top sites found in the Olt Gorge in Perșani Mountains (Bronze Age to Medieval period) and for the group of hill-top sites (Eneolithic to Medieval) marking the northern exit of the mountain corridor passing through Buzău Pass to Covasna – Borosneu area. For the latter topic you can see also some preliminary data in ȘTEFAN/ȘTEFAN 2018b; ȘTEFAN/ȘTEFAN/BUZEA 2020.

since the second half of the 19th century[13], while the initial proper field surveys and excavations were made throughout the first half of the 20th century.[14] Despite the early interest, the forested mountain environment prevented the full and detailed research, especially of the terrain morphology and general layout of enclosures. Due to the sites' localization in remote areas covered regularly in evergreen forests, the traditional field exploration has been particularly difficult, some fortifications mentioned during the 1930s, remaining unlocalized since for a long time, while many sites, like Jigodin II,[15] were not properly spatially documented (until now), beyond idealized topographic sketches. A second stage of research occurred between 1970-1980 with the intense activity of local archaeologist Zoltan Székely[16] and Bucharest based researchers Alexandrina D. Alexandrescu[17] and Petre Roman.[18] During the late 1990s and throughout early 2000s important excavations took place in the main fortified sites of the Late Iron Age, conducted by Viorica Crișan, in Covasna (*Cetatea Zânelor*) and Harghita counties (Merești *Dâmbul Pipașilor*, Jigodin I and III)[19] and Florea Costea in Brașov region (Racoș-Augustin area).[20] Important excavations in the Middle Bronze Age site of Păuleni Ciuc Ciomortan were directed, in the same period, by Valerii Kavruk. He has also coordinated the publication of the two archaeological repertories of Covasna and Harghita counties, where data recorded up to late 1990s regarding these enclosed hill-top sites was systematized.[21] Florea Costea wrote the archaeological repertory of Brașov county.[22]

Overall, the topography and/or chronology of the South-Eastern Transylvanian enclosures, as well as their occupation intensity continue to rise issues, requiring further explorations and clarifications. The authors of this article resumed terrain activities in the area since 2015, bringing new data, especially in what concerns Iron Age enclosures.[23] Field surveys in Bronze Age sites were recently carried on by our colleague Puskás József.[24]

In the studied area the elevated sites, being these fortified or not, represent a true trademark of the regional Prehistory and Protohistory due to the Curvature Carpathians' configuration that stand as both natural border on three sides, and the most accessible gate of the mountainous range in relation with the Lower Danube area, pierced by quite a few natural communication corridors. The small chain of depressions located in the Inner Curvature Carpathians act as a buffer zone surrounded by mountainous relief, representing a mandatory transit sector between Transylvania/Carpathian Basin/Central Europe and the Danube Mouths/Black Sea/Balkan Peninsula/Eastern Steppes. This geomorphological reality creates a border-like space, where control in strategic points is both a need and an opportunity for development, and where various cultural entities tend to mix.

The use of conspicuous hilly positions, promontories or mound like sites elevated above rivers and marshes, is attested in the Eastern Carpathians area since Eneolithic (Ariușd *Tyiszk-hegy*, Bixad *Vápavára*, Borosneu Mic *Borzvára*, Olteni *Leánykavár*, Păuleni Ciuc *Várdomb*, Leț *Várhegy*).[25] Ramparts, ditches and palisades were documented for only few of these, like at Ariușd[26] – the most important site in the region or Malnaș Băi[27]. Nevertheless, the existence of light structure fencings cannot be completely excluded not even for the rest of the known sites.[28] During the latter Copper Age and Early Bronze Age anthropic activity was documented in higher, steeper, and more inaccessible locations than before: Coțofeni finds at Leliceni *Locul Oprit* (Harghita)[29], Schneckenberg intense habitation at Leliceni *Muntele de Piatră* (Harghita)[30], Schneckenberg pottery at Augustin *Tipia Ormenișului*[31] or in secondary position at Teliu *Cetatea Mare*[32] (Brașov) – all three used and fortified also later, during Late Iron Age, however, the use of associated enclosures for these earlier periods remains yet unconfirmed.[33]

The important tell settlement site at Păuleni Ciuc Dâmbul Cetății in eastern Ciuc Depression was enclosed with what seems the earliest monumental rampart of the region, dated during Costișa-Ciomortan culture period, attributed to the transition to Middle Bronze Age, an enclosure associated with a complex ritual involving human burials/depositions and sets of entire and decorated ceramic vessels.[34]

Enclosures seem rather uncharacteristic for the Middle Bronze period South-Eastern Transylvania, even though Middle Bronze materials were found in numerous elevated locations: Merești *Dâmbul Pipașilor* (Harghita), Racoș *Piatra Detunată*,[35] Augustin *Tipia Ormenișului* (Brașov) and Covasna *Cetatea Zânelor*, of which the majority became fortified in later periods. Middle Bronze Age materials (Wietenberg) were found in the filling of ramparts of the hill-top sites from Lutoasa[36] and Turia[37] - both located in imposing elevated positions, in the north side of Tîrgu Secuiesc Depression, based on which their complex systems of enclosures and ditch-rampart barrages were dated (as well as what seems to be a stone wall in Lutoasa). Further excavation and radiocarbon analyses are nevertheless needed

[13] BALÁZS 1868.
[14] FERENCZ 1929; 1938, MACREA *et alii* 1951
[15] MACREA *et alii* 1951, Pl. V; FERENCZI 1938, 246, Fig. 5.
[16] SZÉKELY 2012.
[17] ALEXANDRESCU/POP 1989.
[18] ROMAN/DODD-OPRIȚESCU/JÁNOS 1992.
[19] CRIȘAN 2000.
[20] COSTEA *et alii* 2006.
[21] CAVRUC 1998; 2000.
[22] COSTEA 2004.
[23] ȘTEFAN 2015a; 2015b; 2015c; 2019.
[24] PUSKÁS 2016.
[25] SZTÁNCSUJ 2015.
[26] SZÉKELY 1981.
[27] LÁSZLÓ 1993.
[28] Recent excavations (2019, 2021) in Păuleni Ciuc Ciomortan by Valerii Kavruk, Dan Buzea and Jozsef Puskás, correlated with the geophysical survey made by the authors, suggest that a complex system of ditches enclosed the site during Eneolithic period.
[29] ROMAN/DODD-OPRIȚESCU/JÁNOS 1992, 173.
[30] ROMAN/DODD-OPRIȚESCU/JÁNOS 1992, 136-172.
[31] URSUȚIU 2006.
[32] ALEXANDRESCU/POP 1989 ; ȘTEFAN/ȘTEFAN/BUZEA 2019.
[33] High ground was certainly also used during EBA for tumuli (KAVRUK *et alii* 2017, 394-395).
[34] CAVRUC 2005.
[35] COSTEA *et alii* 2015, 67 considers the site fortified during an initial phase of the Middle Bronze Age; traces of wood and earth wall reinforced with stones were reported found exactly under the Hallstatt rampart. But in other places he says that the same stone construction was used also during Hallstatt period (COSTEA *et alii* 2015, 70), which for us seems confusing. The wood posts have not been radiocarbon dated.
[36] SZÉKELY 1981, 22.
[37] SZÉKELY 1976-1977, 53, 77; SZÉKELY 1980; SZÉKELY 1981, 22-26.

to verify this chronological assignation. A rampart with burnt soil and Wietenberg pottery from Sânzieni *Cece*[38] located at just 8 km to NW from Lutoasa, was recently dated by us in the Late Iron Age period[39], similarly to the rampart with burnt soil core in Teliu, Brașov county[40], an imposing hill-top site where numerous EBA pottery shards of Schneckenberg type were found in secondary position on slopes, suggesting a significant site leveling performed during later periods. The sequential use of hill-top sites in South-Eastern Transylvania, must have occurred in some cases with significant leveling and disruptions of earlier deposits and reincorporation of older materials in younger structures; this makes the dating of earthworks to remain overall problematic, an issue to require future, dedicated exploration.

The largest and most complex earthworks in South-Eastern Transylvania are those currently accepted to date within Hallstatt A2-B period: Racoș *Vărărie* (Brașov)[41], Racoș *Piatra Detunată*[42], Tușnad Băi (Harghita)[43], Cernat *Vârful Ascuțit* (Covasna)[44]. These are all hill-top sites of various typologies, but in general include massive ramparts, in cases double, like in Vărărie and Cernat, enclosing areas of varied relief. Important quantities of Gáva pottery were also found at Covasna *Cetatea Zânelor* and Augustin *Tipia Ormenișului*[45], both being hill-top sites fortified during the Late Iron Age. A similar date could be valid for the largest system of enclosures known in the region (15.3 ha) – at Turia *Padláb* (Covasna) – a site located however on a river terrace, without excavations made yet through the enclosures, known to contain also Coțofeni, Wietenberg and Late Iron Age materials.[46] The dry stone-wall enclosure from Olteni *Cetatea Comorii*[47] overlapping what was described as a vitrified rampart, was also associated with Gáva materials, but more research is again needed here to clarify this.

The most intense building activity in hill-top sites in South-Eastern Transylvania can be dated during the Late Iron Age (after the middle of 2nd c. BC since the early 1st c. AD) when dry stone walls built in local, little dressed stones proliferated. Stone walls were used for the delimitation of upper plateaus, usually of reduced sizes, but also for supporting artificially created terraces in stone and earth.[48] As our current analysis will further show, traditional enclosures like earth ramparts and ditches continued to be used in the region alongside stone architecture, especially the ramparts containing highly burnt soils (Teliu, Sânzieni) Late Iron Age finds were mentioned in the previous publications for over 40 hill-top locations in the inner depressions of the Curvature Carpathians[49], however the degree of research in these sites varies significantly and the association of each location with a wall securely dated within the Dacian period remains unconfirmed for some cases (*Tipia Racoșului*, Bixad, Sânzieni *Cece*, Olteni *Cetatea Fetei*, Boroșneu Mic, etc). The situation is complicated by the overlapping, in many places, of the Late Iron Age walls or ramparts by early Medieval forts and castles (Racu *Cetatea Păgânilor*, Jigodin II, Racoș *Tipia Racoșului*, Bixad *Vápavára*, Feldioara, Crizbav). The use in LIA walls of mortar binding was nevertheless attested in sites in South-Western Transylvania, around the centers in Orăștie Mountains' area[50], therefore the assignment to Medieval period of all walls made with mortar in South-East Transylvania solely on the ground of the employment of this type of binder, can be, at least conceptually, disputed.

Especially for the Late Iron Age, the traditional views interpret the fortified hill-top sites as predominantly elements of military networks incorporated in supra-regional state and pre-state formations[51], while specifically those in the south-eastern Transylvania were described as exponents of a rural world not included in the processes specific to Late Iron Age Temperate Europe of developing towards proto-urbanism.[52] We consider that all these former interpretations need to be challenged: the exclusive militarized function of hill-top sites, their relevance just as parts of Burebista/Decebalus states and the lack of development towards territorial and social growth.

During the 1st c. BC-1st c. AD some areas of South-Eastern Transylvania developed into real agglomerations of fortified hill-top sites. For example, around the Olt Gorge at Jigodin Băi (near Miercurea Ciuc, Harghita county) there are at least five sites – all spread along just 5 km of what could be an important transit corridor crossing Harghita Mountains.[53] They exhibit certain differentiations in functionality and occupation intensity suggesting the existing of complementarity and coordination in the terrain control and organization. The hand-made, dark polished pottery found in undisturbed layers in Jigodin III, hint that it might be one of the earliest fortified hill-top sites to emerge in the area, possibly during the 2nd c. BC. It is also one of the few hill-top sites fortified during Late Iron Age where later, Roman province materials were found.

Similar to Jigodin Băi area, on the Olt Gorge in Perșani Mountains, there are two major imposing elevated positions (*Tipia Ormenișului*, *Piatra Detunată*) – repeatedly occupied and intensely used during Bronze and Iron Ages, separated by just 1.5 km distance. A third one, located also in the nearby, is very probable (*Tipia Racoșului*).[54] The discovery at *Tipia Ormenișului*[55] of numerous deposits of entire artefacts, large and thick fireplaces and of large buildings with stone bases, including one with a circular plan, point to the significant role played by ceremonial activities performed in public places. This configuration fits in what can be considered a polycentric development of communities, around more than just one central place, also suggesting an increase in social aggregation processes occurred mainly around a ritual component, capitalized in some instances by authorities which enhanced the space with political and

[38] SZÉKELY 2003.
[39] See current catalogue.
[40] ȘTEFAN/ȘTEFAN/BUZEA 2019.
[41] ARDEU *et alii* 1997
[42] COSTEA, BĂLOS 1996; COSTEA *et alii* 2015.
[43] CAVRUC 2000, 242.
[44] CAVRUC 1998, 72, with bibliography
[45] URSUȚIU 2006
[46] Identified by PUSKÁS 2016, 232-233, with bibliography.
[47] SZÉKELY 1976-1977, 60-61.
[48] MĂRGINEANU-CÂRSTOIU/APOSTOL 2019.
[49] CRIȘAN 2000.
[50] PUȘCAȘ *et alii* 2019 with bibliography.
[51] CRIȘAN 2000.
[52] FLOREA 2011, 99-102.
[53] ȘTEFAN/ȘTEFAN/BUZEA 2015c
[54] COSTEA 2004, 112.
[55] COSTEA *et alii* 2006.

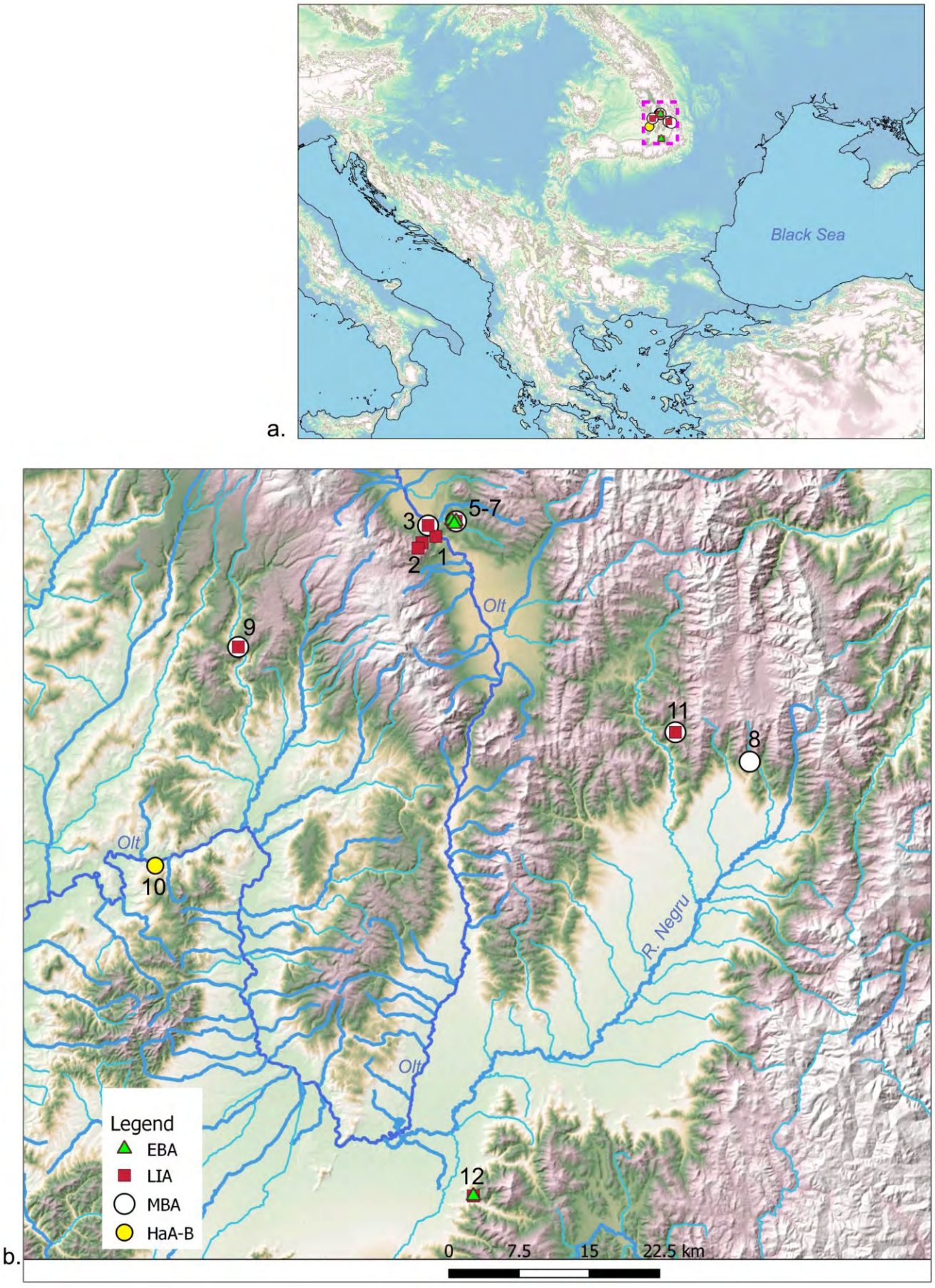

Fig. 1 a. The analysed area in a larger geographic setting; b. map of sites discussed in the catalogue: 1 – Jigodin I; 2 – Jigodin II; 3 – Jigodin III; 4 – Jigodin IV; 5 – Leliceni Mt. de Piatră; 6 – Leliceni L. Interzis; 7 – Leliceni P. Rotundă; 8 – Lutoasa; 9 – Merești D. Pipașilor; 10 – Racoș Vărărie; 11 – Sânzieni Cece; 12 – Teliu Cetatea Mare.

Table 1

SITE	En	CA	EBA	MBA	Ha A2-B	HaC	MIA	LIA	Me	Undated fortifications
Leliceni L. Oprit		*								D
Leliceni Mt. Piatră			*	*				*W		
Leliceni P. Rotundă			*							R
Teliu C. Mare	*		*	*		*	*	*R		
Merești D. Pipașilor				*				*		
Sânzieni Cece				*				*R	?	W
Lutoasa Ciuchian				*						W&D
Racoș Vărărie					*R&D					
Jigodin II								*W	?	D
Jigodin I								*W		D
Jigodin III				*				*W		
Jigodin IV								*		D&R

* = attested period, W=Wall, R=Rampart, D=Ditch

Table 2

SITE	**Total area, including earthworks. (sq. m.)**	**Area inside enclosure (sq. m.)**	**Max. Elev. (m)**	**Max. Elev Diff. (m)**
Racoș Vărărie	60700	50000	605	107
Teliu C. Mare	20000	6000	643	95
Jigodin I	10000	2300	710	55
Leliceni Mt. Piatră			714	34
Jigodin III	9700	4800	724	70
Leliceni L. Oprit	15000		727	54
Leliceni P. Rotundă	12000	9300	737	61
Merești D. Pipașilor	5500	1200	745	158
Sânzieni Cece	1600	620	767	90
Jigodin IV	1560	610	791	40
Lutoasa Ciuchian	6600	3800	844	187
Jigodin II	6340	1000	945	185

residential functions – in what seems rather an insufficiently acknowledged trademark of the communities inhabiting the Inner Curvature, two centuries before the Roman conquest of Dacia.

INTRODUCING THE CATALOGUE

The following catalogue of hill-top sites provides interpreted LiDAR data sets for twelve instances, already known from literature to bear Bronze and/or Iron Ages archaeological vestiges. The degree to which these sites were previously archaeologically explored varies significantly, therefore the current remote-sensing exploration fulfilled different objectives. Some of these sites had benefitted of more intense previous research, like Jigodin I and III - not only excavations, but were targets in our own earlier survey projects based on UAV surveys and aerial photogrammetry.[56] In these cases, LiDAR analysis completed the already available terrain models with those areas located under the canopy, significantly extending the data sets for the territories surrounding the enclosures. Following this, an integrated perception of the group of sites at Jigodin - Leliceni has been achieved as elements of the same landscape, better revealing the roads logic at micro-regional scale, and allowing a comparative perspective on sites' sizes and visible presence impact (Fig. 3, 6). The observations made earlier on UAV derived models were mostly confirmed, but also completed with new details (Fig. 2, 4, 5, 11).

Other sites, like Leliceni *Locul Oprit* and Leliceni *Pădurea Rotundă* were known from just brief mentions

[56] ȘTEFAN/ȘTEFAN/BUZEA 2015a.

of artefacts findings. In their cases, the LiDAR analysis concluded with the identification of unknown earthworks – ditches and ramparts (Fig. 19, 20). However, the chronology of these elements has still to be established. Two more terrain anomalies (Fig. 16) of the type Jigodin IV (small Late Iron Age fort or watchtower) were identified around Jigodin II, supporting the previously proposed hypothesis[57] that a system of strategic control existed in the region, but they need further archaeological drilling to be confirmed.

For hill-top sites like Jigodin II, Lutoasa, Sânzieni and Racoș *Vărărie*, benefitting of only little previous work and located under the canopy, thus unavailable to UAV prospection, the LiDAR based survey led to the assembling of the first real site plans (Fig. 2, 21b, 42), revealing the true size and shape of enclosures, highlighting also numerous unknown details, like terraces and additional unrecorded before earthworks, etc. The terrain analyses at Racoș *Vărărie*, Merești *Dâmbul Pipașilor* and Sânzieni *Cece* apparently highlighted the valued role of permanent springs which seemed that it might have influenced not only the configuration of enclosures (the one in *Vărărie* is obviously centered around one), but also the primary choice for site location.

One of the most significant potential contribution of our analysis is, in our view, brought in favor of nuancing the role of enclosures and hill-top sites, hinting, for some of them, like Merești *Dâmbul Pipașilor* or Teliu *Cetatea Mare*, towards connections with symbolic actions and ritual spaces reserved for collective activities. In this sense, the occurrence of same types of ritual deposits made along a cyclic occupation of the same elevated central places during Middle Bronze Age, Late Bronze Age and Late Iron Age, reveals itself as particularly relevant.

As detailed further for Sânzieni *Cece* and Teliu *Cetatea Mare*, we managed to obtain pertinent data (by means of magnetic survey, excavation and radiocarbon dating of relevant samples) that seem to support the idea that a predilection for enclosing hill-top sites with ramparts built with highly burnt soils (found in secondary position) manifested consistently in the region around the Augustan period. The characteristic of these sites is the frequent visitation attested by isolated materials, but the lack of consistent archaeological deposits. The closest connections should be made with the burnt structures found in the defense system of 2nd-1st c. BC *dava* from Cârlomănești (Buzău county), excavated by us, but mostly with the 4th c. BC enclosures known in the Romanian Plain.[58] These earlier enclosures using burnt materials were frequently associated with deposits of artefacts. Some of them, like Căscioarele *D'aia parte*, developed in the earliest residential centers of the Late Iron Age.

Overall, we emphasize the idea that many Prehistoric and Protohistoric earthworks or stone walls are not satisfactory dated, nor paired with clearly understood occupational levels inside the enclosures. More work needs to be done in the future in relating enclosures with other types of discoveries, at a territorial scale. In the current state of research, it seems that for the Late Bronze Ages, as for the Late Iron Age – when earthworks, walls and enclosures are attested in high-ground positions, intense activity was occurring on low ground, too.

[57] ȘTEFAN/ȘTEFAN/BUZEA 2015b.
[58] ȘTEFAN/ȘTEFAN 2019.

CATALOGUE OF ANALYSED SITES

1. Jigodin I, *Câmpul Morii*, Harghita County

RAN: 83366.05; recorded but localized in an incorrect position

Location: 46° 19' 40.9770" N, 25° 48' 38.2591" E

Forested: partially forested on slopes and overlayed by houses, gardens and communication antenna facilities on the plateau and access saddle.

Site type: promontory with only one steep slope (western), accessible on a saddle blocked by a large ditch; upper plateau enclosed with a stone wall; elevated directly above Olt river close to its gorge sector; occupied during two periods; consistent anthropic deposit with features, rich in materials, for the Late Iron Age; pit with a human skeleton inside the enclosure.

Chronology: early Iron Age (isolated materials); 2nd c. BC-1st c. AD (the older materials were found mixed in the most recent deposit, so a general site levelling around the Augustan period can be supposed, with the majority of materials coming from the 1st c. AD).

Identification: known & redocumented; the site was identified by Al. Ferenczi in the early 20th century. Excavations were made by M. Macrea in 1950 and P. Roman in 1980-1984. The most recent trenches were made by V. Crișan who excavated in 1986, 1988 and then again in 1998, 2000 and 2006. Much of her later work was related to rescuing materials out of the destroyed site layer during the unauthorized works related to GSM antennas installation. The recovered material – all dated in the Late Iron Age - was rich. Entire or fragmentary vessels were mentioned (hand-made and wheel-made), slag, fragments of fireplaces, an iron spear head, animal bones. Three rectangular surface dwellings built on a structure of posts were researched along time, the largest of them (3.70 x 7.40 m) having an absidal wall. A fireplace surrounded by numerous pottery fragments was found in the nearby. The anthropic deposit measured between 0.20-0.70 m, being thicker in the centre of the plateau. Large pits interpreted as for a palisade (not very credible) were found by P. Roman on the eastern and north-eastern slopes. An agglomeration of materials, many of which were related to metal working, was found close to the southern wall and was interpreted as a workshop. The stone wall excavated by Crișan, on the southern side, measured 2.5 m in width, while the one on the north-western side had 1.80 m. She said that a ditch excavated in the stone in front of the wall was visible only in the north-western sector of the enclosure. The LiDAR analysis points though, that a ditch existed on the entire southern side, too, on a route which extended beyond the stone wall towards the eastern slope bottom (an argument for an earlier date?).

Initial Issues: the site is currently overlapped by houses, gardens and more than half of the upper plateau was destroyed by communication antenna related amenities.

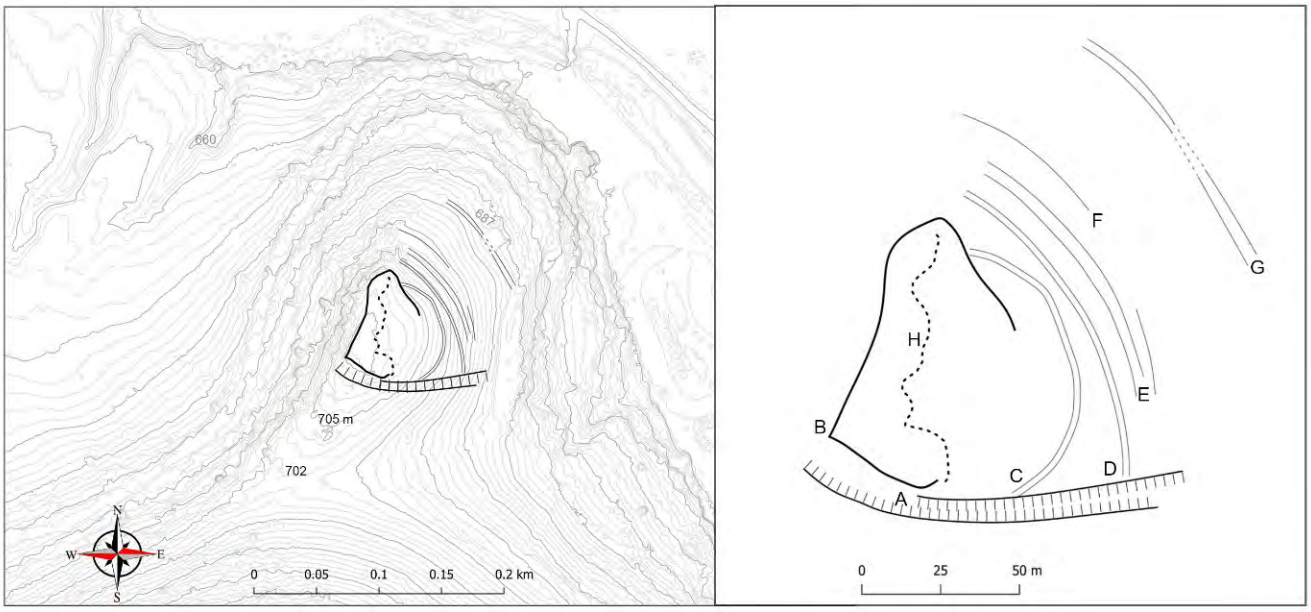

Fig. 2. Jigodin I plan based on LiDAR DEM, elevation contours at 1 m interval. A – ditch; B – elevated anomaly corresponding probably to the wall; C-G – linear slightly elevated anomalies with a flatter area towards top (terraces?); H – limit of the area affected by excavators.

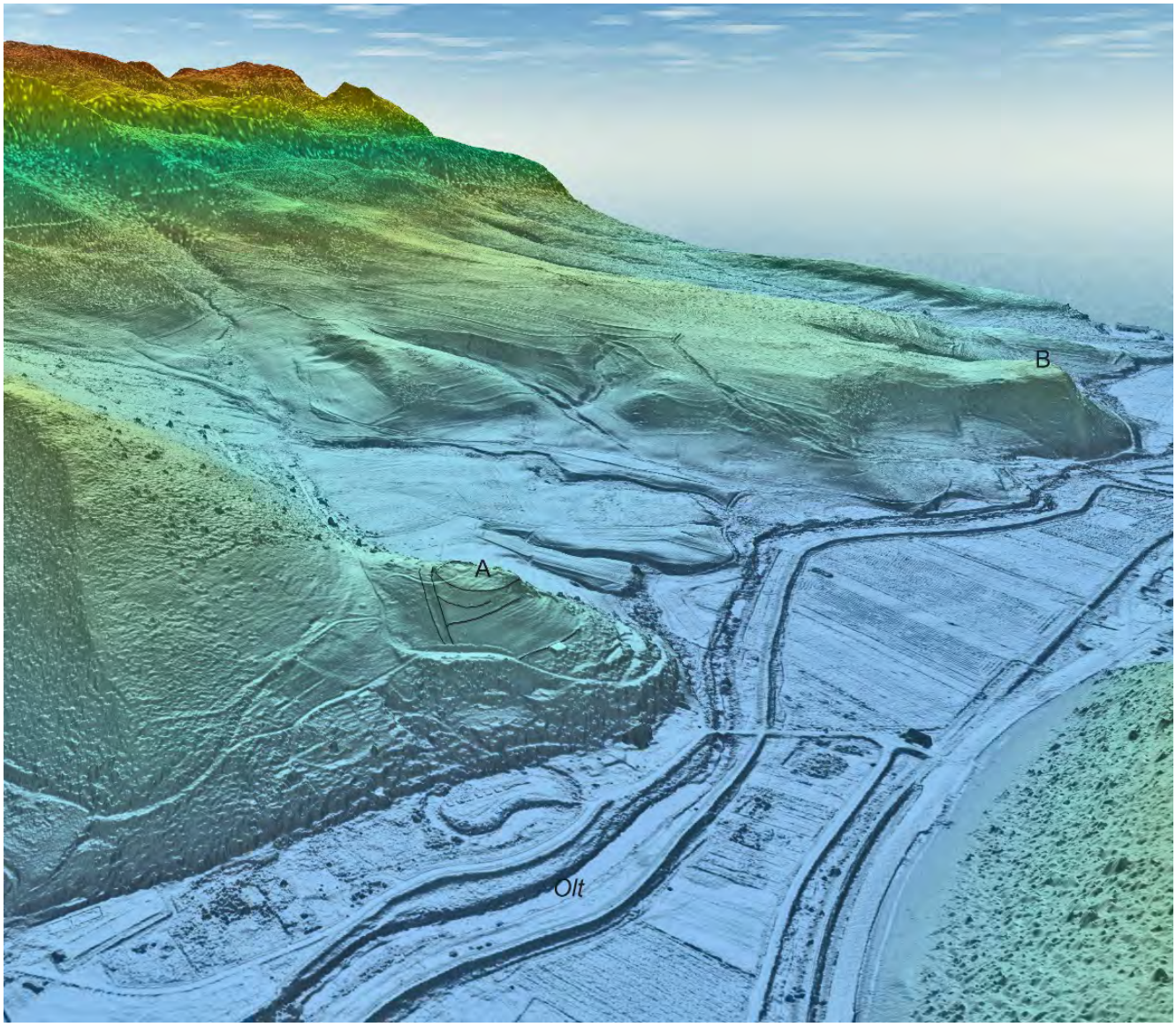

Fig. 3. Jigodin I (A) and III (B) seen on the LiDAR DEM viewed from the south-east.

Total site surface, including fortification elements	1 ha
Total surface of upper plateau	2300 sq. m
Total length of the enclosures	Southern ditch 125 m Wall on the plateau ca. 200 m
Maximum elevation	710 m
Maximum elevation difference with surrounding terrain	+55 m above the river Olt to the north + 41 m above the lowlands to the west +10 m above the saddle to south-west
Maximum slopes	11° north 15° east 22° west 3.8° south
Distance to water	200-300 m – Olt river

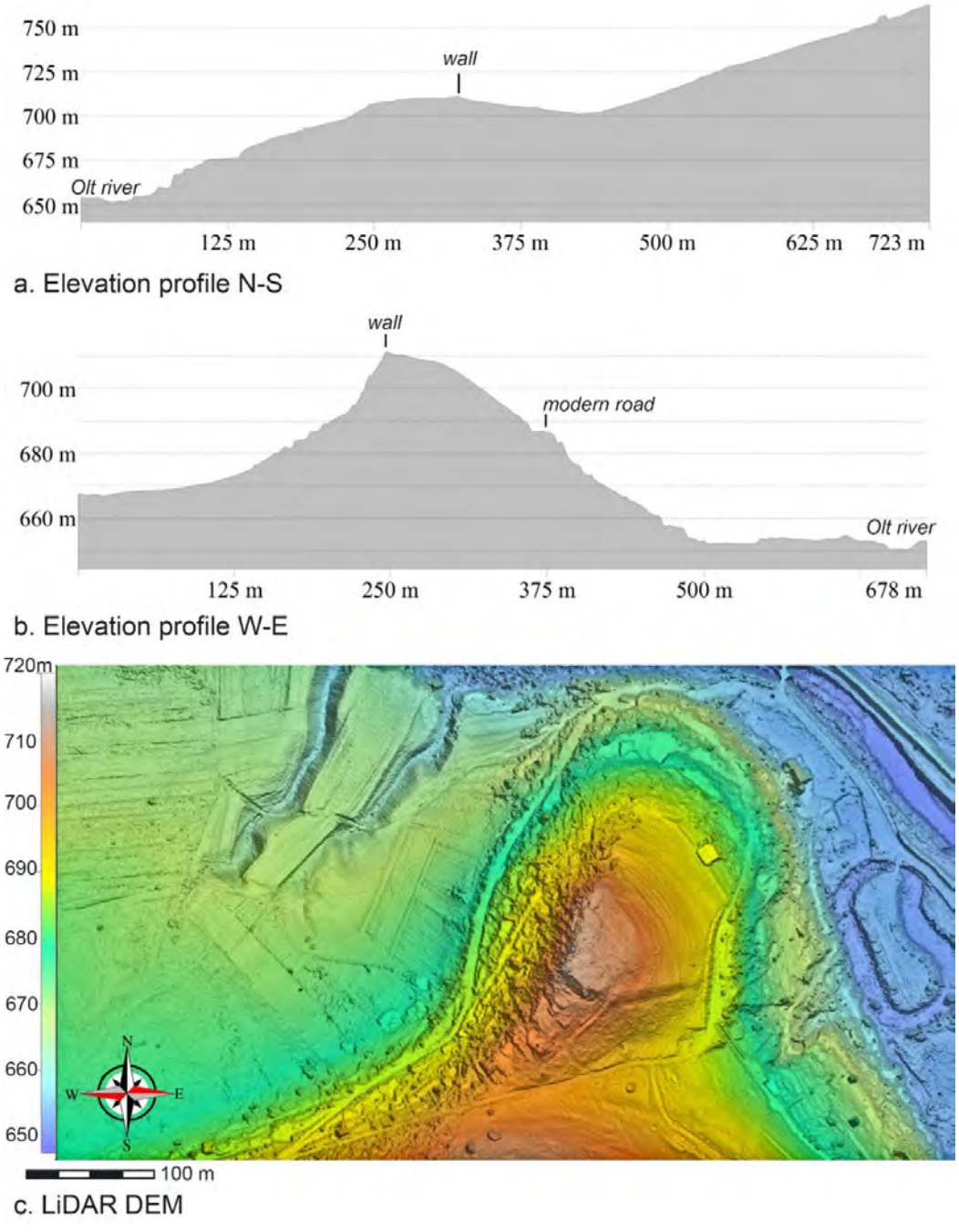

Fig. 4. Jigodin I, general elevation profiles calculated on the LiDAR DEM.

Relief: small oval promontory branched out of the Harghita Mountains, bordered on two sides by river Olt. It has gentle slopes on three sides (the southern one being basically a saddle). To the south and north the surrounding hills are higher. The site at *Câmpul Morii* offers visibility along the Olt valley. A wide river-terrace, non-floodable, stretches at its western foot. Surveys should be done here in the future in search for an open settlement.

Connection with a major communication mountain corridor: the site is part of the large group of fortified sites of early Bronze Age, Late Iron Age and Medieval period sites, that gathers on both sides of the Olt Gorge at Miercurea Ciuc – as a central sector of the transit corridor traversing the river and its former wetlands, and from there further, across Harghita Mountains.

LiDAR contribution: Even if a DSM model was obtained for this site, via UAV based photogrammetry, even since 2015, the LiDAR model offered a much cleaner perspective of the micro-topography. The large southern ditch, detected for the first time with UAV, was clearly visible. In addition to this, we noticed a series of elevated anomalies that could be related with stone enclosure(s), both on the plateau and lower on the slope.

Bibliography: FERENCZI 1938, 240-244; MACREA *et alii* 1951, 308; CRIȘAN 2000: 45-48; ȘTEFAN/ȘTEFAN/BUZEA 2015c.

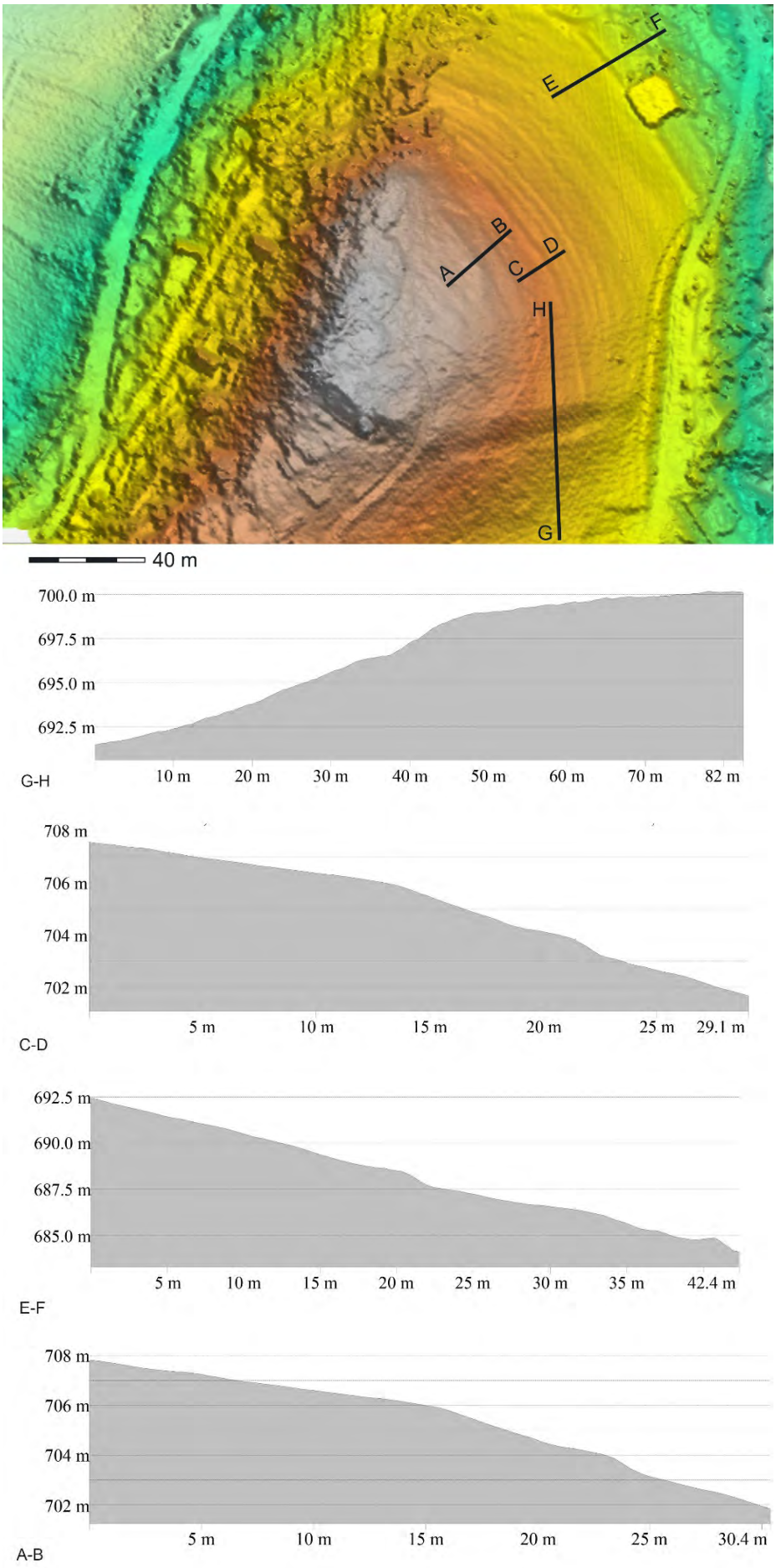

Fig. 5. Jigodin I, detailed elevation profiles calculated on the LiDAR DEM.

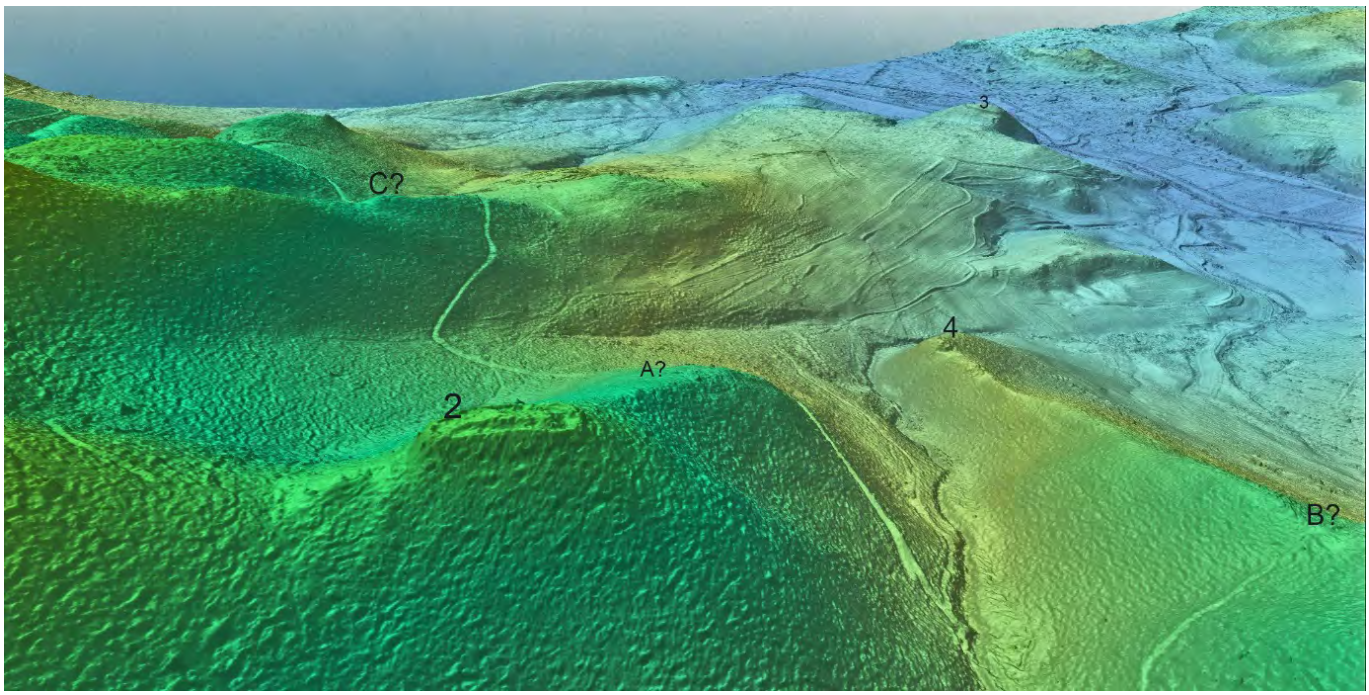

Fig. 6. 3D perspective of the terrain model in the Jigodin area; view towards north; 2 – Jigodin II, 3 – Jigodin III, 4 – Jigodin IV; A-C – LiDAR anomalies.

2. Jigodin II, *Dealul Cetății/Harom tető*, Harghita County

RAN: 83366.04, recorded, almost correctly localized.

Location: 46°19'1.38"N, 25°47'10.60"E

Forested: densely forested, evergreen

Site type: small hill-top site located on a rocky peak elevated in the vicinity of an important north-east – south-west ridge road, enjoying wide visibility coverage over Ciuc Depression; fortified with a stone wall enclosure doubled on the interior by a ditch excavated in the rock-bed; two more parallel barrage ditches cut a narrow access saddle towards west; no data about stratigraphy or structures; the thickness of the anthropic deposit is unknown, but cannot be significant on the plateau as the natural bedrock is visible on the surface; used in three different periods (?);

Chronology: Late Iron Age (2nd c. BC – 1st c. AD) – numerous pottery fragments seen by us at the base of the wall, partially disrupted by a falling tree, in a survey made in 2015; others, of the same date, were published from earlier surveys[59]; a Medieval shard (13th-14th century) was reported found in a treasure hunters pit on site by I. Jánovits.[60]

Identification: known & redocumented. The site has been known since the late 19th century (Orban), surveyed by Alexandru Ferenczi in the 1930s[61], Viorica Crișan in 1986[62], I. Jánovits in the 1990s and by M. M. Ștefan, Dan Ștefan and Dan Buzea in 2015.[63] A trial trench was made by Mihai Macrea in 1950.[64] Two idealized sketch plans were made before 1950. Almost nothing is known about the site except that it delivered, according to Macrea, Late Iron Age materials: hand-made pottery, fragments of adobe walls, slag, stone sharpeners, spindle-whorls and iron tools.

Initial Issues: unclear topography, no exact site plan, remote access, forested, never systematically researched; unclear chronology, especially of the wall (it is not clear if the wall has or has not a later phase with mortar).

Relief: the site occupies a small oval plateau, orientated almost east-west, on top of one of the four sub-hills (the most eastern one, *Harom/Dealul Cetății*) – branched like the fingers of a hand - out of the main massif – *Pădurea Bradului* (1079 m). *Harom* hill, elevated at 945 m, rises with 290 m above the Olt valley located at 2.25 km to northeast. The hill has a main ridge orientated northeast-southwest, on which the fortified plateau and the barrage ditches stand, and a second one, steeper and shorter, towards southeast, above a stream. If a main road should be searched in the nearby, this would had passed on the ridges further west, not on the one where the site is located. The site is located on a promontory (connected with the higher neighbouring terrain through a narrow saddle), but which looked like a small mountain massive, even if not in the classical conical shape.

Connection with a major communication mountain corridor: Several ridge pathways climb from Olt valley towards south and go further towards Brăduț, in the northern Baraolt Depression. The main circulation at Jigodin was a north-east – south-west one, over Harghita Mountains. There are at least four other fortified sites of similar or close dates (Jigodin I, Jigodin III, Jigodin IV, Leliceni) in just 5-6 km radius nearby, on both sides of the Olt narrow valley.

Site aspect: the stone enclosure and the debris of its elevation, fallen apparently just on the exterior, represent a massive, elevated anomaly, clearly observable on the LiDAR terrain model. Its width varies greatly - between 5.5 m to 9 m wide. The thickest value is on the shorth, western

[59] FERENCZI 1938, 249.
[60] JÁNOVITS 1999, 123.
[61] FERENCZI 1938, 249.
[62] CRIȘAN 2000, 48.
[63] ȘTEFAN/ȘTEFAN/BUZEA 2015b; 2015c.
[64] MACREA *et alii* 1951.

Total site surface, including fortification elements	6340 sq. m
Total surface of the inner space of the upper plateaus enclosed by ramparts	1000 sq. m
Total length of the enclosures	207 m long wall enclosure Ditch 3 ca. 40 m long Ditch 2 ca. 30 m long
Maximum elevation	945.4 m
Maximum elevation difference with surrounding terrain	+185 m above the northern terrain + 93 m above the southern valley -129 m under the western terrain (highest summit – *Pădurea Bradului*)
Maximum slopes	24° southern and northern slopes 15-17° north-eastern and south-western slopes
Distance to water	Roadeș stream flows around the hill on its south-eastern side

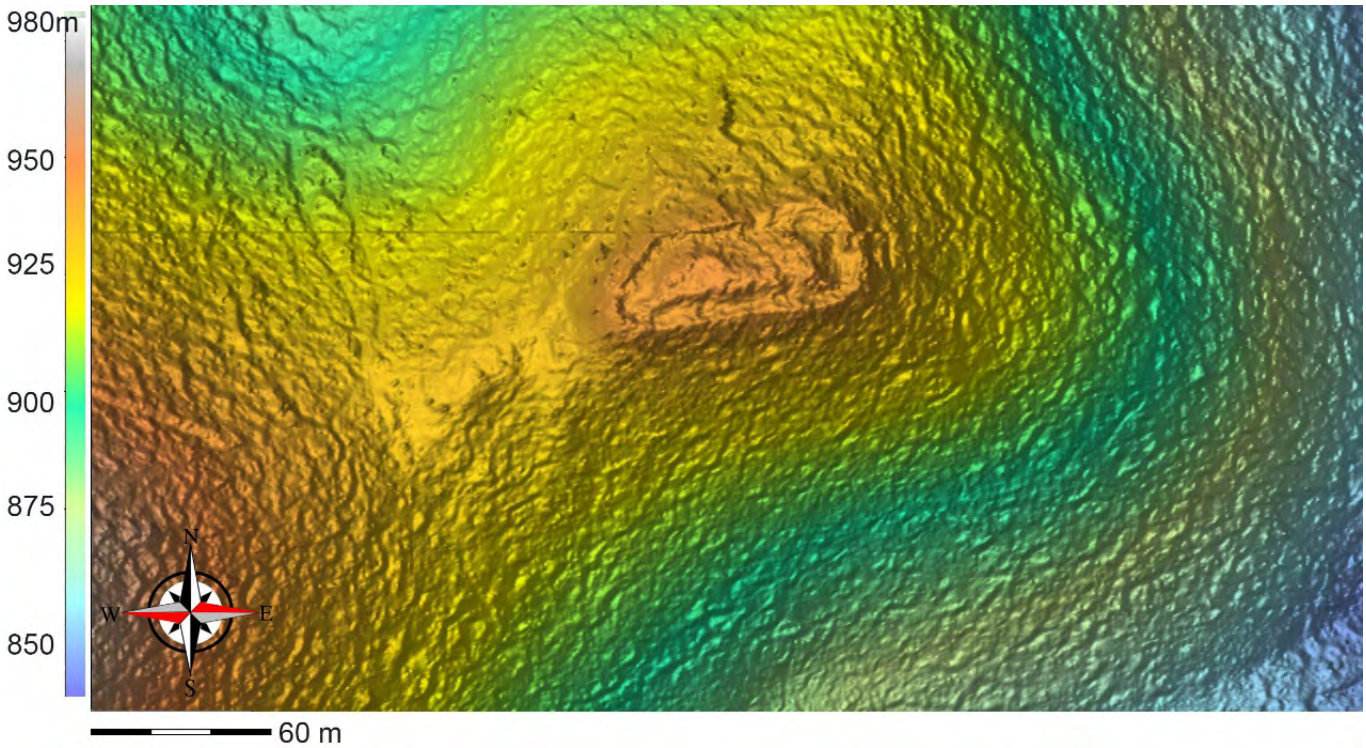

Fig. 7. Jigodin II, LiDAR DEM, top view.

side, where it reaches 10 m (a gate/bastion?). The enclosed shape is almost oval with rounded turns (30 x 86 m), with the exception of the north-western corner which makes an angle. On the interior, the wall is doubled by a continuous ditch, with rounded bottom (4.5 - 6 m wide). The elevation difference between preserved wall summit and ditch bottom is ca. 50 cm but can reach 0.80 m (north-western sector). The stone enclosure presents an interruption (ca. 5 m wide?) on the northern side, corresponding with the main north-eastern ridge route. The inner plateau measures just 1700 sq. m (ca. 53 x 13 m). Two large ditches on the access saddle:

LiDAR contribution: In the case of Jigodin II, airborne LiDAR, even if not of the ideal quality, was essential in obtaining, for the first time in more than a century, a clear site plan, including of the fortification elements and micro-topography. Two more barrage ditches were evidenced on the connection saddle. Several other anomalies were observed in the nearby, especially on the main ridges climbing from north-east or on *Farago* Hill. They remain for the moment unclear and require further field verification. A future trench at the base of the wall seems mandatory, as its chronology clearly rises uncertainties.

Bibliography: FERENCZI 1938, 249; JÁNOVITS 1999, 123; ȘTEFAN/ȘTEFAN/BUZEA 2015b; 2015c.

Ditch	Length	Width	Depth
2	ca. 30 m	ca. 14 m	-1.20 m with central rampart
3	ca. 40 m	ca. 16 m	-1.6 m with middle rampart

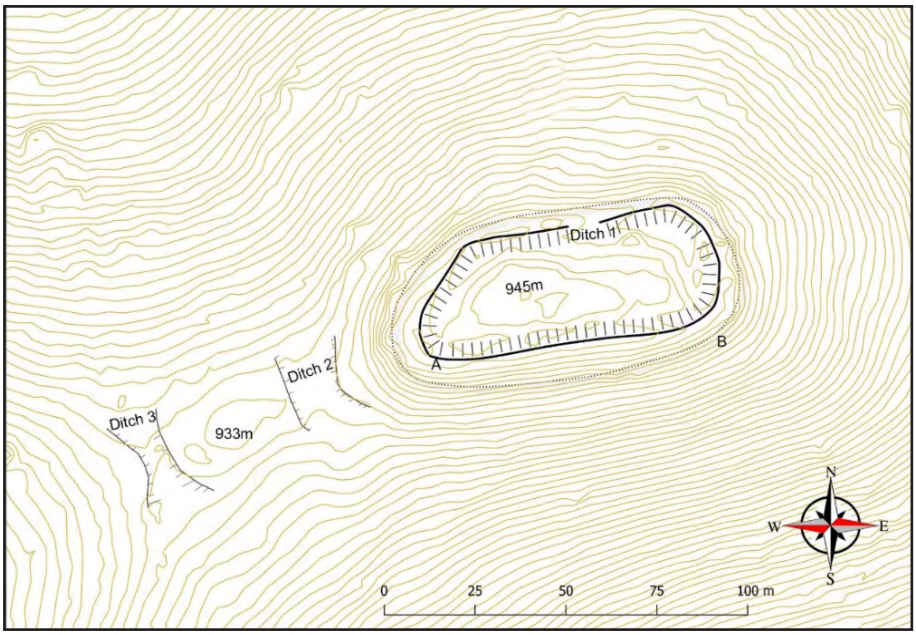

Fig. 8. Jigodin II, site plan based on LiDAR DEM; terrain contours at 1 m interval; A – stone wall; B – base of the fallen wall stone debris (and of a previous earth rampart?).

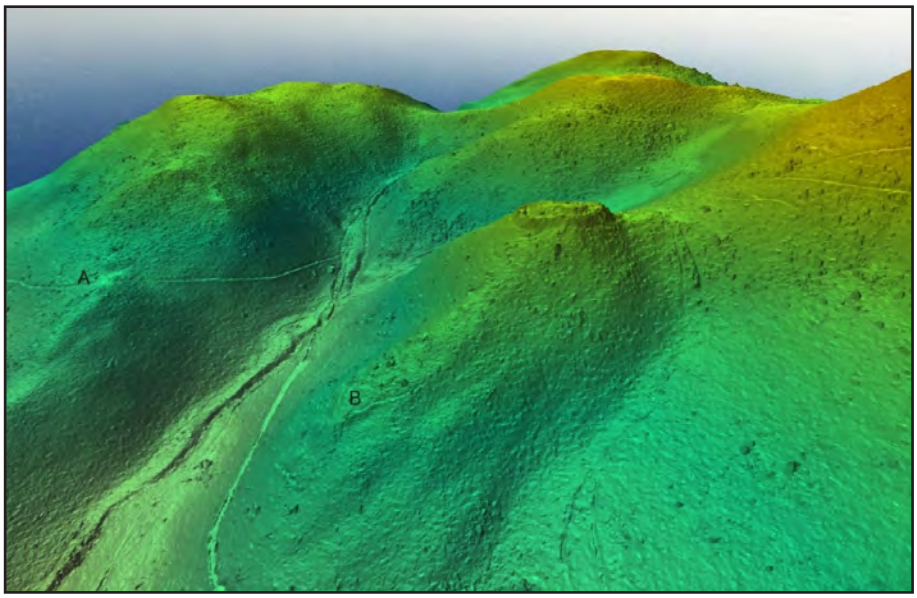

Fig. 9. Jigodin II, 3D perspective of the LiDAR DEM, view towards south.

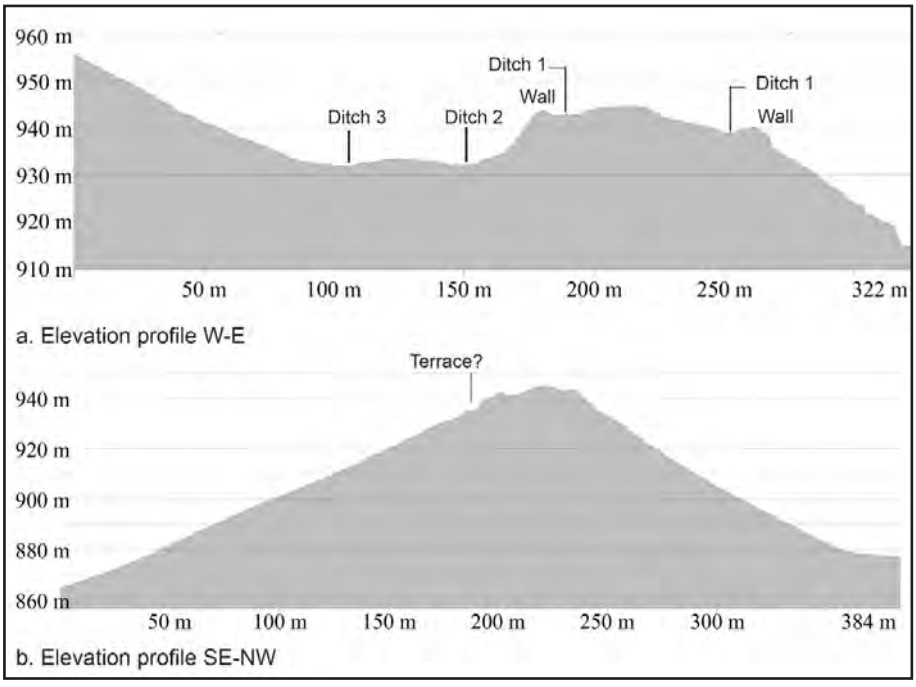

Fig. 10. Jigodin II, general elevation profiles calculated on the LiDAR DEM.

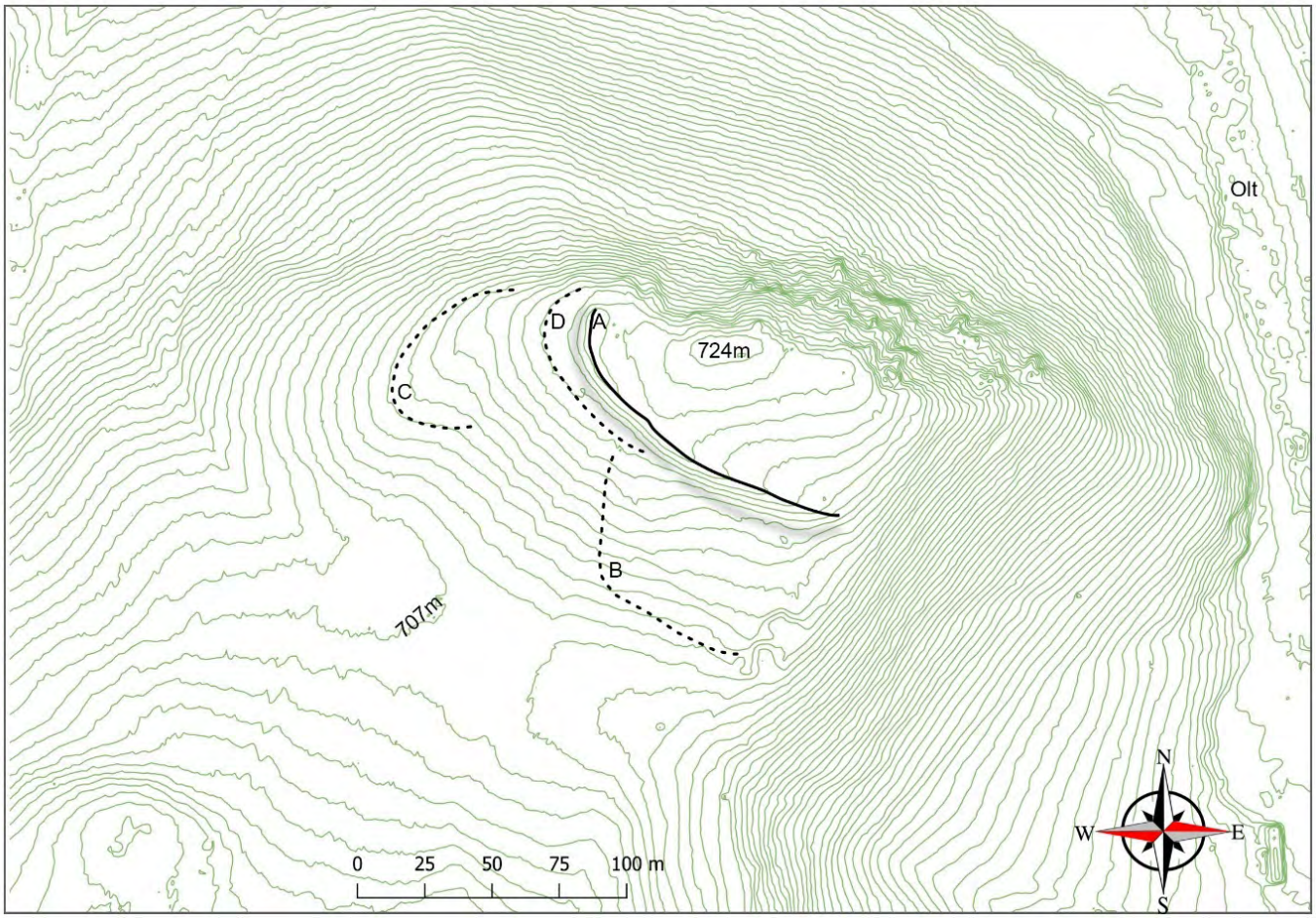

Fig. 11. Jigodin III, site plan based on the LiDAR DEM; elevation contours at 1 m; A – rampart; B-D – possible anthropic terraces.

3. Jigodin III, *Dealul Cetățuii/Vârful Cetății Mici/Kisvárteto*, Harghita County

RAN: 83366.03; recorded and correctly localized.

Location: 46° 20' 18.0027" N, 25° 48' 00.3582" E

Forested: no, with the exception of a sector of the steep northern slope

Site type: hill-top site located at the high end of a promontory branched out of Harghita Mountains, on a volcanic hill individualized on all sides by slopes; preeminent position, with high visibility factor, elevated right above Olt river in front of a historical ford; continued towards south by a ridge road; a partial enclosure of impressive proportions blocks access from the south; some terracing activities; long sequence of use; consistent anthropic deposit for the Late Iron Age.

Chronology: Middle Bronze Age **(**Wietenberg pottery found between the stones assembling the wall, together with Late Iron Age ones); late Iron Age (2nd c. BC-1st c. AD) – anthropic deposit (0.30-0.60 m thick) organized in two layers with corresponding archaeological features; late 2nd-early 3rd c. AD (two features previously interpreted as dwellings with Roman coins – they could be nevertheless ritual assemblages).

Identification: known & redocumented; The site has been known since the second part of the 19th century.[65] Excavations were made by M. Macrea and Z. Székely in 1950[66] and V. Crișan in 1996.[67] Newer surface surveys were carried outby M. M. Ștefan, Dan Ștefan and Dan Buzea in 2015. Two superimposed anthropic deposits with corresponding fortification phases were identified by Crișan in 1996. The first, dated by her 2nd – 1st c. BC, comprised a dwelling and an earth rampart with wood palisade, the second, dated 1st c BC-1st c. BC, was related with a stone wall, 3 m wide and 7.5 m high (difference with the exterior slope) and with two more dwellings with fireplaces. An intense burned area was reported by Crișan at the base of the wall (a situation she interpreted as the first phase of the fortification from the 2nd c. BC) - we wander if it was not also the case of an earlier rampart with burnt core like in the cases of Teliu and Cece. Equally challenging seems the finding of two features dated with early 3rd. c. AD coins, interpreted as surface dwellings. They had fireplaces, and, for one of them, traces of a clay floor were reported. The two features consisted in fact, mainly, of agglomerations of materials, including pottery fragments, animal bones, fragments of burnt adobe walls, and of burnt wood beams. To this, in dwelling one, a dagger, a knife, a spur and a silver coin should be added, and another coin in the other 'dwelling'. This combination of materials is rather rich for an ordinary dwelling. A ritual context cannot be ruled out, even if fireplaces were present. Similar dwellings were reported for the Late Iron Age (with fireplaces, burnt

[65] ORBÁN, CSÍK-SZÉK (VII. Al-Csík).

[66] MACREA *et alii* 1951, 307-308.

[67] CRIȘAN 2000, 49-50

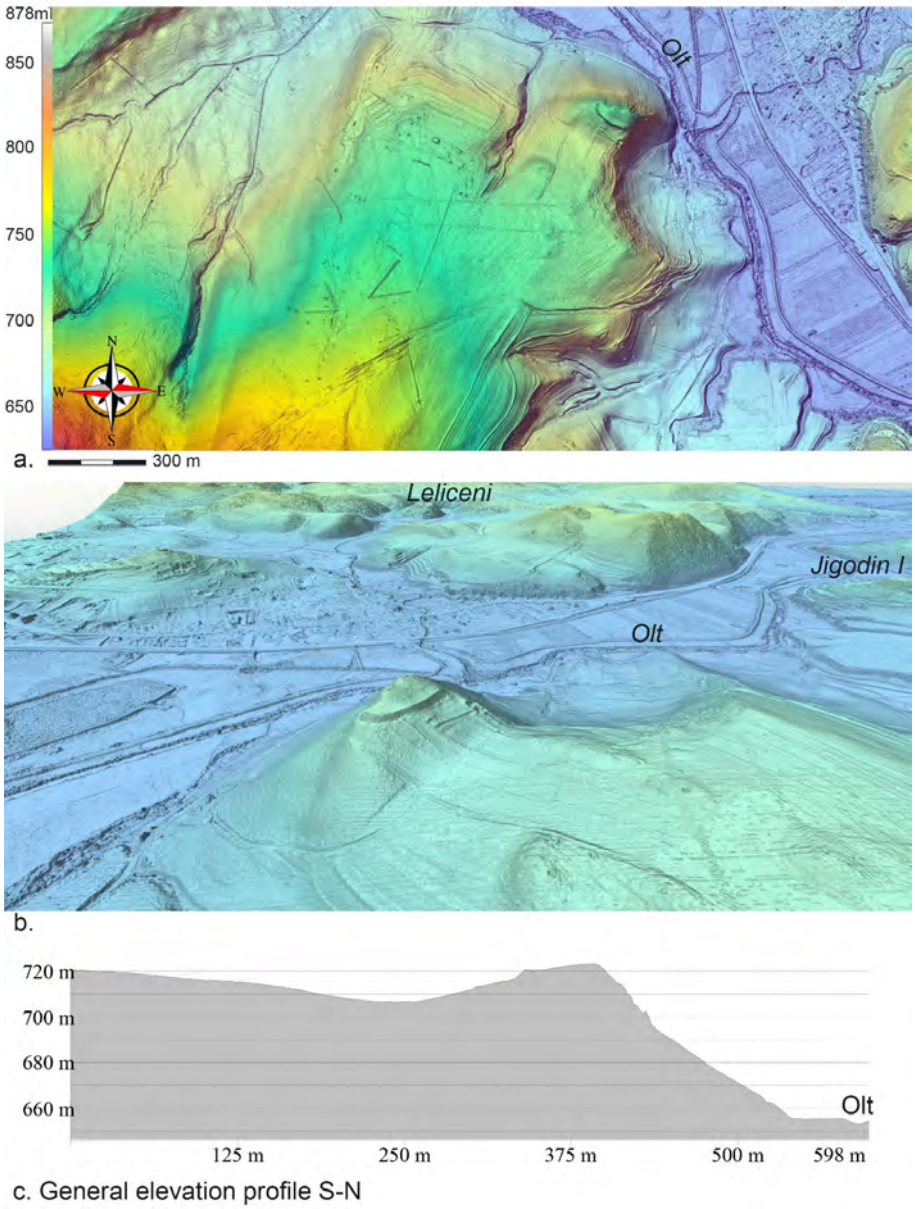

Fig. 12. Jigodin III; a - LiDAR DEM; b – 3D perspective towards north-east; c – general elevation profile of the site calculated on the LiDAR DEM, on the south-north direction.

adobe walls and fragments of pottery, whetstones, spindle-whorls – again a common inventory set for the ritual deposits also).

Initial Issues: after our own previous research based on UAVs, the hypothesis of a larger site was proposed, one that included extra-*muros* anthropic amenities. Thus, establishing the true site size was one issue.

Relief: a volcanic outcrop elevated above Olt river, on its left/southern shore, in front of a large wetland (now artificially drained) formed at the confluence with *Pârâul Fânațelor* – a stream which collects the waters of several other creeks flowing on the northern side of Ciuc Depression. It is connected through a saddle with Harghita Mountains towards south. However, near the site hill, the saddle is lowered, fact that emphasizes the impression of the fortified summit to be individualized by slopes on all directions.

Connection with a major communication mountain corridor: the site is located in front of a ford over Olt, in the beginning of a ridge route, perhaps the most important of the many pathways going south or south-west into Harghita Mountains.

Site aspect: the enclosed plateau is orientated NNW-SSE; on the inside it measures max. 120 x 53 m. The collapsed stone wall, on the southern slope, created a consistent anomaly similar to a rampart, 5-6 m wide. A

Total site surface, including fortification elements	7300 sq. m Plus probably at least 2400 sq, m on terraces
Total surface of the inner space of the upper plateaus enclosed by ramparts	4800 sq. m
Total length of the enclosure	133 m
Enclosure width (as LiDAR anomaly)	5-6 m
Enclosure height (as LiDAR anomaly)	0.40-0.50 m – with the interior +3.2 m with the exterior slope
Maximum elevation	724 m
Maximum elevation difference with surrounding terrain	+60-70 m – north +16 m - south
Slopes	21° north 20° to east 13° to west 8.7° to south
Distance to water	Between 250-300 m (there is a stream to west and the Olt river flowing at east and north)

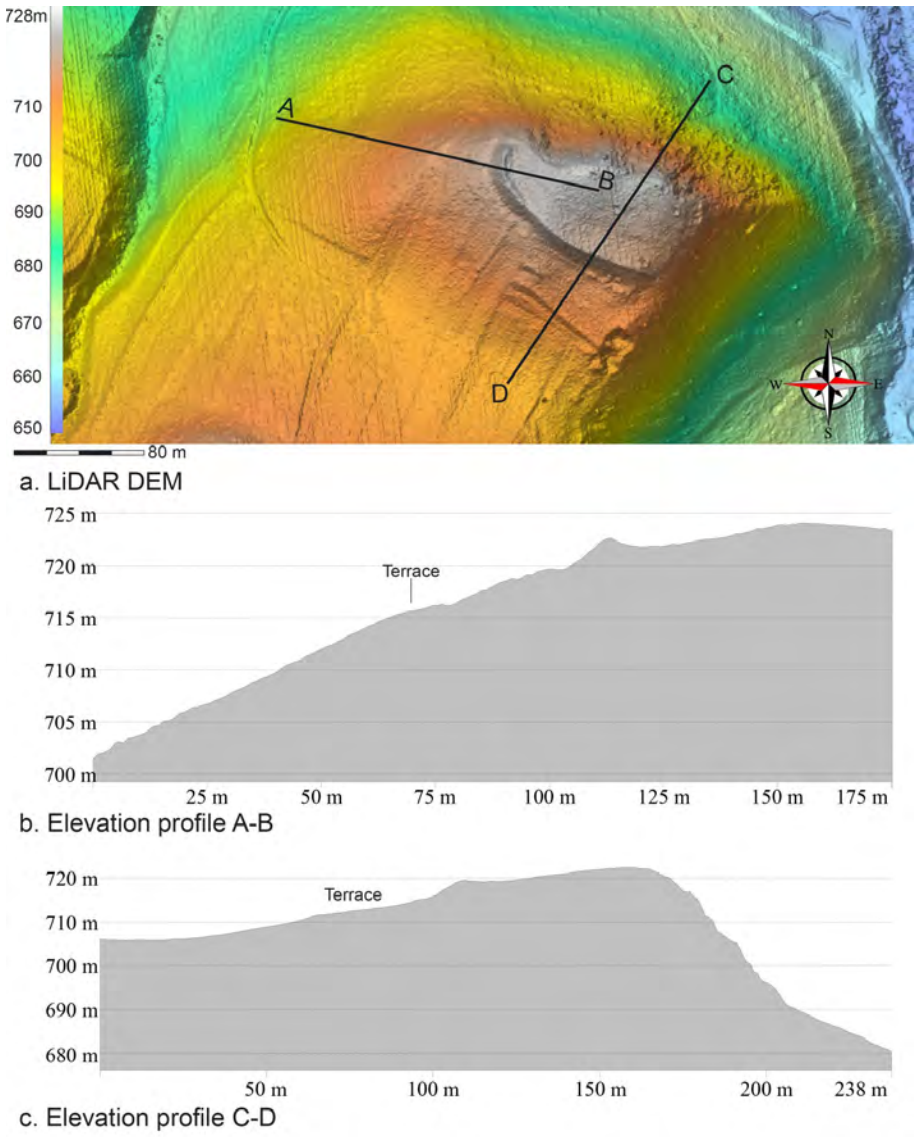

Fig. 13. Jigodin III. LiDAR DEM and elevation profiles.

ditch (3 m wide) can be observed at the base of this anomaly and of the slope, in the north-western sector of the site.

LiDAR contribution: Because the site is not covered in forests, detailed terrain models for it have been previously obtained in low altitude aerial surveys (2015). The current LiDAR based terrain model extended nevertheless the perspective around the already analysed data. The relief morphology shown in this way does not seem to suggest that the site was much larger towards north, even if some stone extraction activity at the upper part of the slope can be supposed. No terraces or anthropic amenities could be observed either on the northern or eastern slopes. The horizontal elevated line anomaly located outside the enclosure, on the southern slope, which was observed in previous UAV models, too, may be rather part of the agricultural levelling and marking activities of a more recent age, not necessarily linked with an ancient activity. But the area is flatter and could have been used as a site terrace. A clear levelling resulting in shaping an artificial terrace can be observed in the north-western side[68] – perhaps connected with the ancient access route.

[68] Terrace 2 in ȘTEFAN/ȘTEFAN/BUZEA 2015c.

Bibliography: MACREA *et alii* 1951, 307-308; CRIȘAN 2000, 50; ȘTEFAN/ȘTEFAN/BUZEA 2015c.

4. Jigodin IV, Harghita County

RAN: not recorded in RAN.

Location: 46° 19' 19.4851" N, 25° 47' 30.4011" E

Forested: forested

Site type: small fortification located in an elevated position on the route of a secondary pathway; never excavated; possibly part of a larger road control system based on forts and towers which include also Jigodin II.

Chronology: Late Iron Age (1st c. BC – 1st c. AD) – pottery fragments.

Identification: known & redocumented; the site was identified by M. M. Ștefan, Dan Ștefan and Dan Buzea in 2015, during a field survey.[69] A small scaled, but correct topographic plan was then made, evidencing the circular, mound-like aspect of the relief in the area of the supposed site and the presence of a ditch and rampart blocking the access from the saddle extending further south to higher terrain. From a deep pit left by former treasure hunters, in the central part of the site, we collected numerous fragments of Late Iron Age vessels, both hand and wheel made, typical for the 1st c. BC – 1st c. AD.

Initial Issues: as the spot was never excavated, the stratigraphy, entire sequence of use or complete nature of the fortification elements remain unclear. The main hypothesis proposed by us then, regarding the role of this

Total site surface, including ditch	1560 sq. m
Total surface of the upper plateau and northern terrace	610 sq. m
Total length of the ditch	56 m
Maximum elevation	791 m
Maximum elevation difference with surrounding terrain	+40 m with Roadeș stream
Maximum slopes	28° towards east 13° towards west 10° towards north-east – access ridge
Distance to water	About 290 m on the most suited path to Roadeș

[69] ȘTEFAN/ȘTEFAN/BUZEA 2015b.

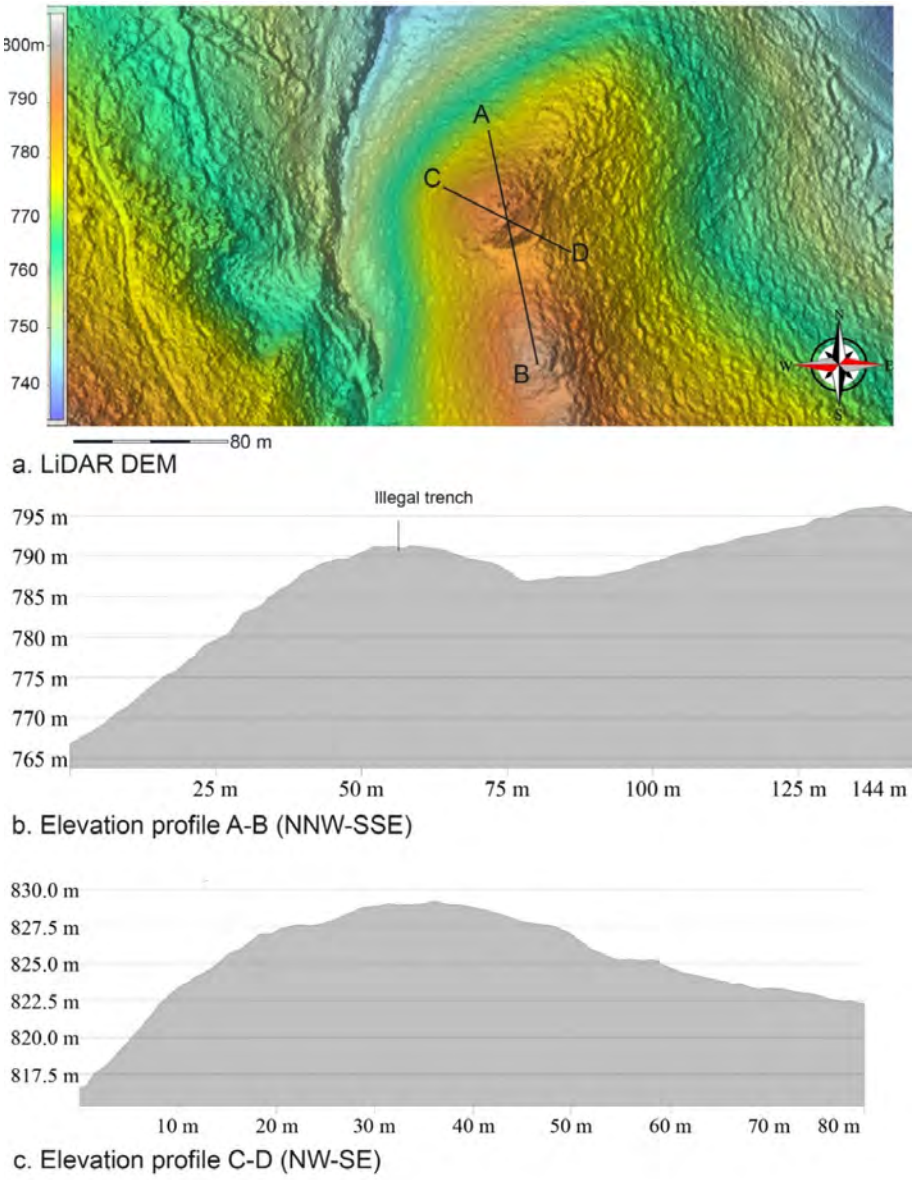

Fig. 14. Jigodin IV, LiDAR DEM and elevation profiles.

site, was that it functioned, taking in consideration its small size, position on a ridge route and proximity to the larger, but probably contemporaneous Jigodin II (with which shares complementary visibility coverage), as a guarding outpost, similar to a watchtower, for a garrison dispersed in the territory. This hypothesis opened the possibility of having more than one outpost in this system, something potentially verifiable with a LiDAR analysis.

Relief: rocky outcrop elevated like a small circular mound on the route of a long and narrow ridge climbing from lower lands of Ciuc Depression towards south, into *Farago* Hill. This ridge is parallel with the one on which Jigodin II is located, being separated of it by a deep valley with steep slopes. There are less than 800 m in straight line between Jigodin II and Jigodin IV, with the second of the two located closer to the Olt.

Connection with a major communication mountain corridor: The site is situated on a secondary access route, on a ridge pathway encircling Jigodin II on its east side. Overall, it can be fitted in the larger corridor assembled of many such pathways, ensuring circulation across Harghita Mountains, between Ciuc and Baraolt Depressions.

Site aspect: the LiDAR analysis emphasizes a dome-like relief formation, 40 m in diameter, bordered on three sides by a ditch, ca. 56 m long, 7 m wide. Behind the ditch, the dome has a narrow terrace, 7 m wide, elevated with ca. 2.5 m above the ditch bottom. A very small rampart was observed in the field outside the ditch, but unclear if also on the LiDAR model. The top plateau measures no more than 13 (north-south) x 20 m (east-west).

LiDAR contribution: The LiDAR terrain model evidenced well the general topography of the micro-region, allowing a relevant corelation between the numerous Late Iron Age fortified sites of the area. In particular it evidenced the longer outline of the surrounding ditch, hinting to the possibility of having a small terrace on the northern site side. A similar dome-like structure, with a ditch and exterior rampart towards north, was observed at ca. 480 m further on the ridge, to the north. It corresponds with a position visited in 2015 where dressed stones were observed on the surface. More detailed field surveyed are needed in order to clarify the nature, anthropic or not, of this anomaly.

Bibliography: ȘTEFAN/ȘTEFAN/BUZEA 2015b; 2015c.

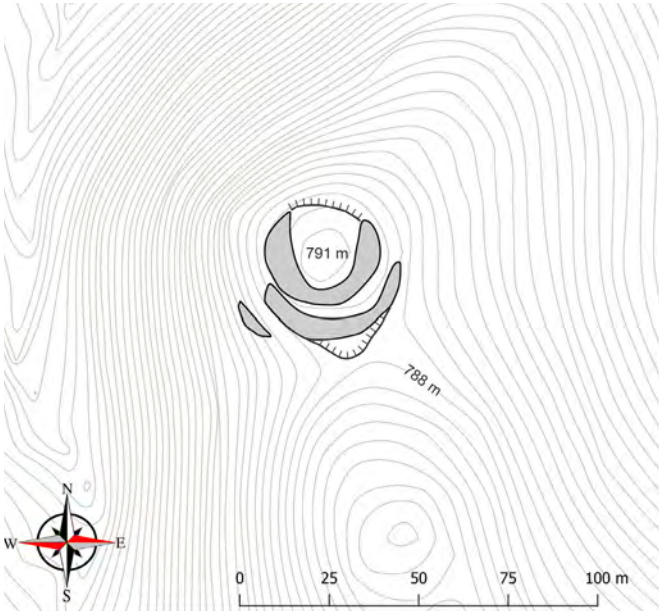

Fig. 15. Jigodin IV, site plan based on LiDAR DEM analysis; terraces with solid grey and ditches with hashed line; elevation contours at 1 m interval.

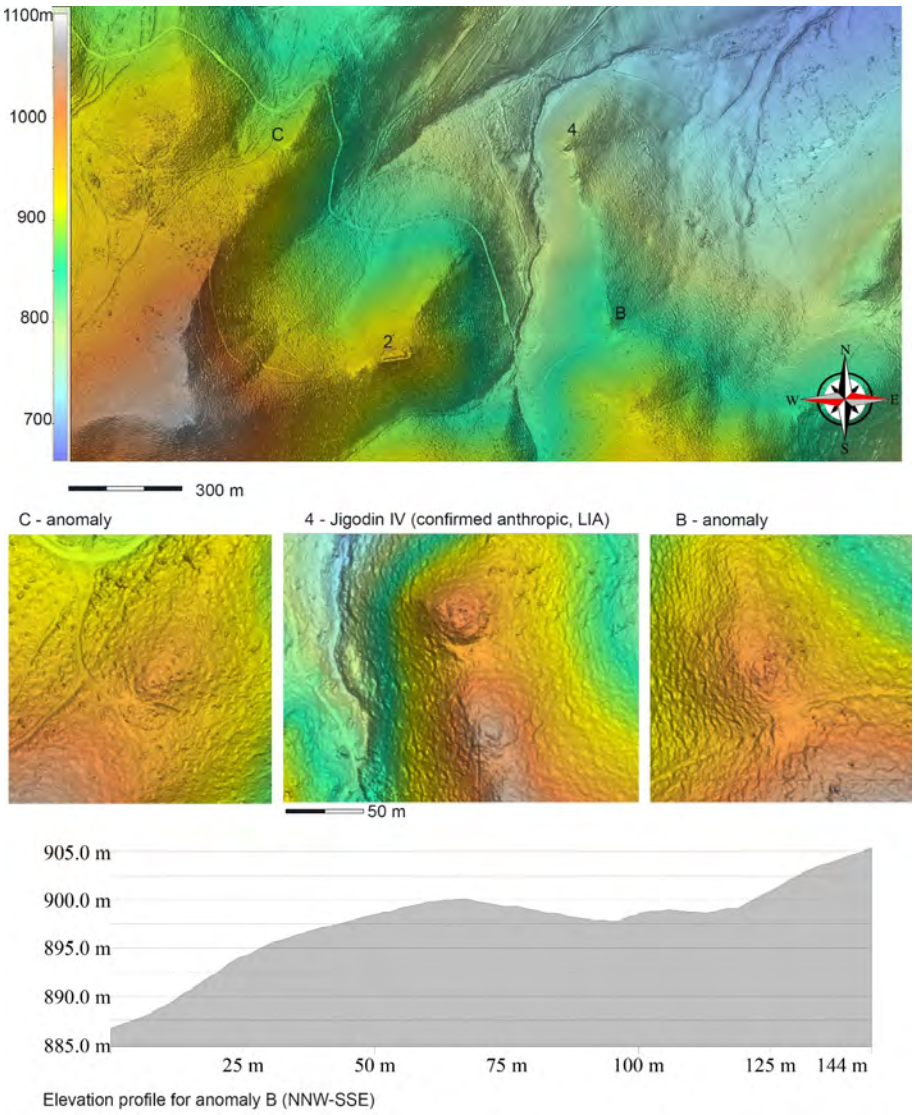

Fig. 16. LiDAR DEM in Jigodin II (2) and IV (4) area; other terrain anomalies similar to Jigodin IV (B, C).

5. Leliceni, *Muntele de Piatră/Köhegy*, Harghita County

RAN: 85724.06; Leliceni *Muntele de Piatră* is recorded in RAN in a position halfway between the site at *Locul Oprit* and the one at *Muntele de Piatră*.

Location: 46° 20' 32.3946" N, 25° 50' 18.3371" E

Forested: unforested, but almost completely destroyed by a stone quarry

Site type: hill-top site with a long period of use, in some periods fortified with a stone and earth enclosure; narrow and elongated promontory, part of a mountain-like hill (*Dealul Pietrei*), positioned in a hidden location surrounded by mainly higher hills.

Chronology & finds: Coțofeni finds (features interpreted as dwellings); Early Bronze Age (Schneckenberg culture, Jigodin aspect) – a consistent deposit accumulated in three layers, rich in materials (especially metallurgical related – moulds, but also stone axes and knives blades), dwellings with fireplaces were reported for this phase; isolated Wietenberg and Early Iron Age materials; Late Iron Age (1nd c. BC – 1st c. AD) – period for which a wall is supposed with a stone base and upper part made of wood and earth (hand and wheel-made pottery, an iron fibula, a stone grinder).

Identification: known & redocumented; excavations were made here beginning with 1969 by Janos Pál și Horváth Csaba, on the occasion of the quarry opening, being later continued by a team working under the supervision of Petre Roman. A pit assigned to the Late Iron Age was researched by D. Buzea in 2007. It had a slightly tronconic profile, 1.20 m in diameter at the base, 1 m in depth, and contained on the bottom a layer of ash and charcoals covered intentionally with a layer of stones. It delivered two spindle-whorls.[70] Even if the pit was interpreted by its excavators as container of domestic waste, the carefully made filling structure might betray a different functionality, belonging to the depositional sphere.

Initial Issues: the upper plateau of the site and its entire southern slope were destroyed by the mentioned quarry, but numerous prehistoric finds were reported in the site's surroundings, especially towards west, without enough clear contextualisation or established spatial corelation.

Relief: *Köhegy* is the eastern summit of a narrow mountain-like hill, stretching for about 1 km long on a west-east alignment, between two secondary streams, 2nd degree affluents of Olt river. The western summit, located at the opposing end of *Dealul Pietrei* hill, named *Locul Oprit*, is the larger and higher one. Coțofeni and early Bronze finds were reported as coming from here, too. A narrow rocky saddle (20 to 10 m wide), 500 m long, links the two summits. As the plateau on *Muntele de Piatră* was destroyed by the quarry, little can be now added. The plateau had three steep slopes, except the saddle towards north-west. The rockbed was close to surface.

Total site surface, including fortification elements	The site cannot be measured on LiDAR anymore
Maximum preserved elevation	714 m
Maximum elevation difference with surrounding terrain	+34 m with Pârâul Mare valley to the south +23 m with Pârâul Mic valley to the north
Maximum slopes	11-14°
Distance to water	ca. 200 m

[70] KAVRUK *et alii* 2008.

Connection with a major communication mountain corridor: the site is part of the large group of fortified sites of Early Bronze Age, Late Iron Age and Medieval period sites, that gathers around todays Miercurea Ciuc – as a central point for the transit corridor traversing the Olt and its former wetlands through Harghita Mountains.

LiDAR contribution: the actual place of the *Muntele de Piatră* site was too destroyed by a stone to quarry to allow any relevant observations on the LiDAR model, nevertheless, the data showed clear corelations in terms of relief morphology and presence of additional fortification elements on the western saddle, hinting that the prehistoric site could have had a larger size, also including *Locul Oprit* summit.

Bibliography: ROMAN/DODD-OPRIȚESCU/JÁNOS 1992, 133-172; KAVRUK *et alii* 2008.

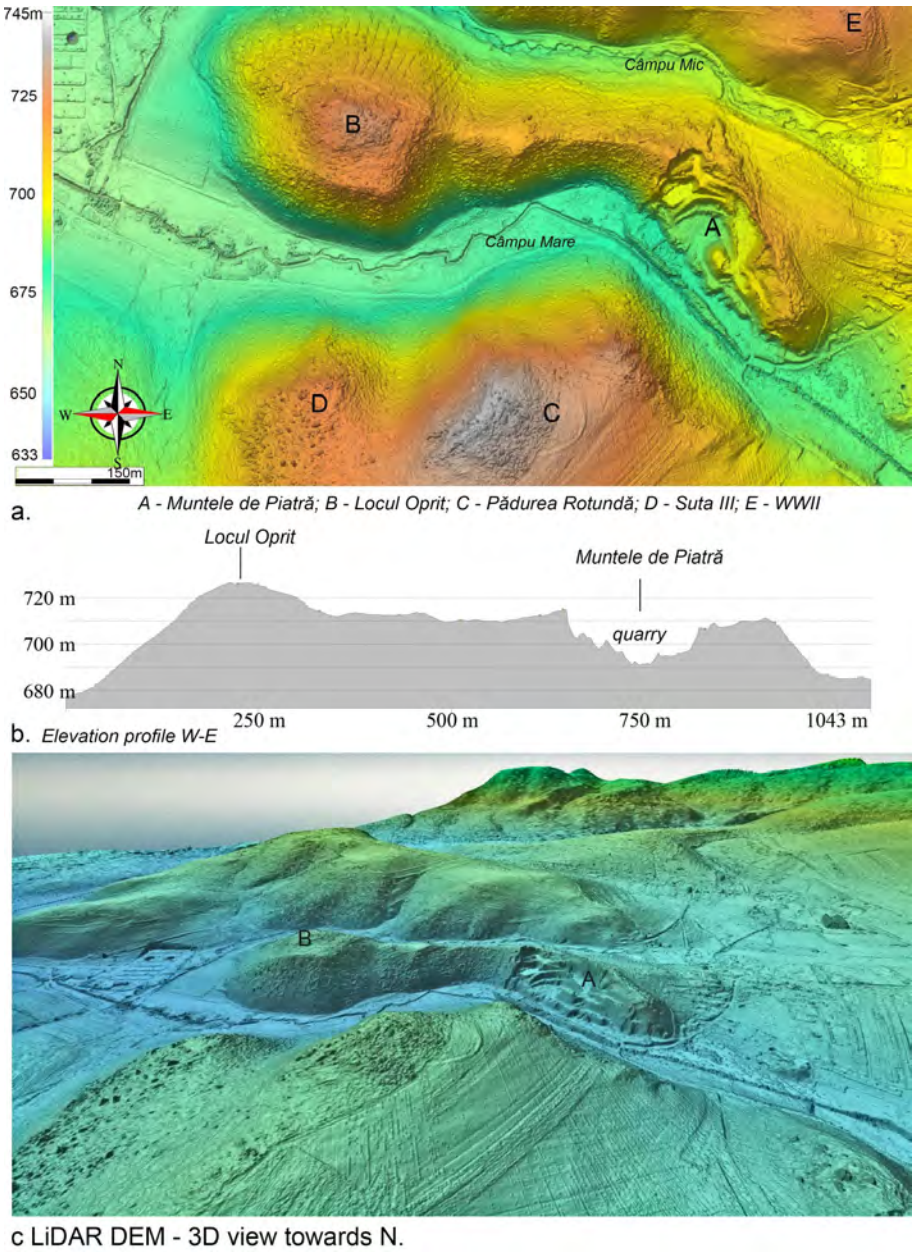

Fig. 17. Leliceni area.

6. Leliceni, *Locul Oprit/ Tilalmas tető*, Harghita County

RAN: not recorded.

Location: 46° 20' 35.8650" N, 25° 49' 56.3254" E

Forested: light forest mixed with bushes

Site type: hill-top site located at the end of a promontory accessed on a narrow saddle cut by at least one barrage ditch as evidenced by LiDAR; possibly one large anthropically modified terrace; faint archaeological deposit both on the plateau and terrace; no mentioned features, used in three different periods.

Chronology: Coțofeni, isolated Early Bronze Age (Schneckenberg culture, Jigodin aspect) on the plateau; the same mix plus some Hallstatt period pottery fragments found in the same discontinuous layer identified on the southern terrace

Identification: known & redocumented; C. Horváth and P. Roman made some trial trenches in 1971, 1974 and 1978, on the plateau and southern terrace.

Initial Issues: unclear type of site, unclear sequence of use, size, topography or intensity of habitation; not clear if there were any fortification elements.

Relief: *Locul Oprit* is the western summit of a narrow mountain-like hill, *Muntele de Piatră*, stretching for about 1 km long on a west-east alignment, between two secondary streams, 2nd degree affluents of Olt river. The general position is hidden, between higher surrounding hills. It has two steep slopes towards south and west and a third one gentler towards north.

Connection with a major communication mountain corridor: the site is part of the large group of fortified sites of Early Bronze Age, Late Iron Age and Medieval period

Total site surface, including fortification elements	The size is not clear, if it included the terrace the area would be about 1.5 ha
Maximum elevation	727 m
Maximum elevation difference with surrounding terrain	+54 m above Pârâul Mare +45 m above Pârâul Mic
Maximum slopes	32° towards south 14° towards north
Distance to water	180 m to Pârâul Mic on a walkable path

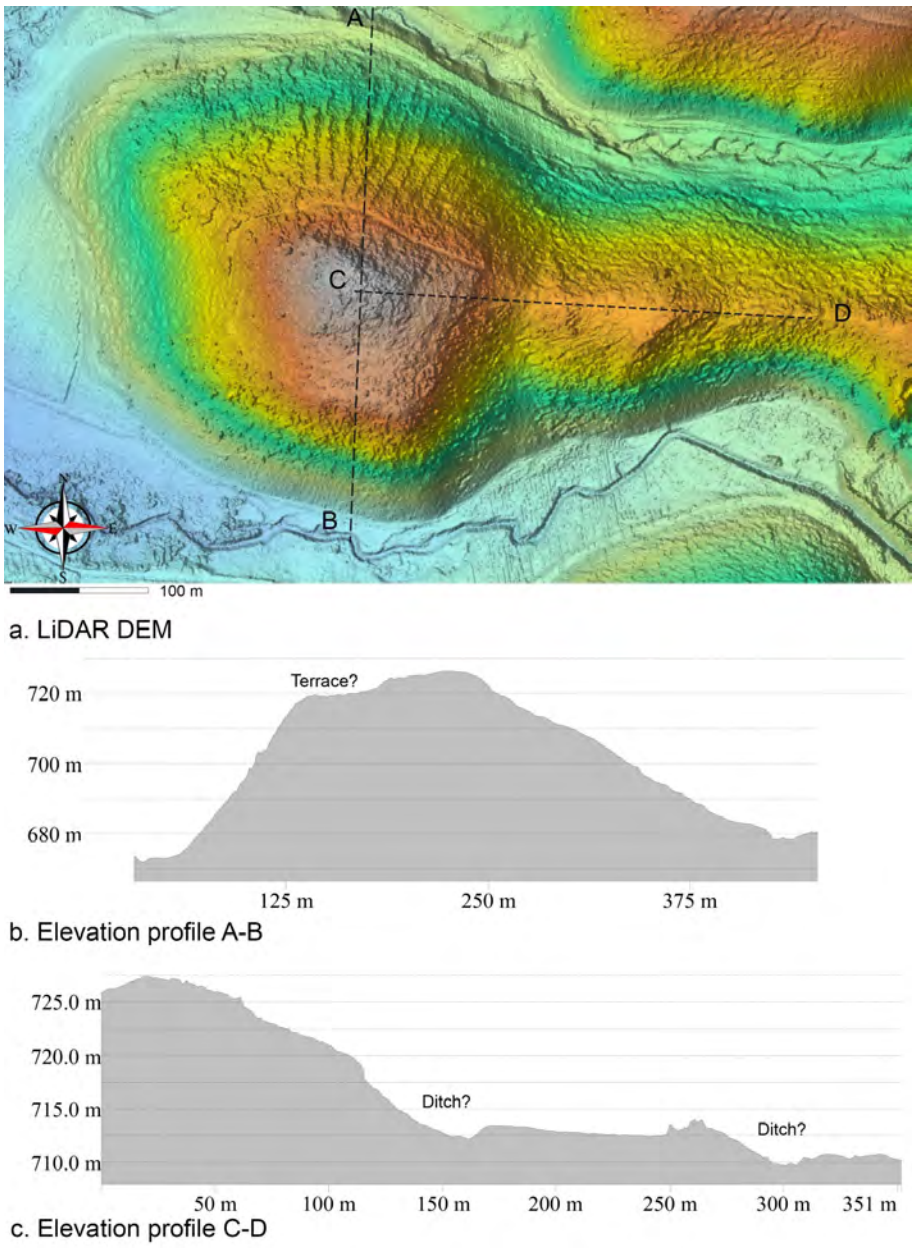

Fig. 18. Leliceni, Locul Oprit.

sites, that gathers around Miercurea Ciuc – as a central point for the transit corridor traversing the Olt and its former wetlands through Harghita Mountains.

Site aspect: A large flatter area can be observed surrounding a main plateau on its southern and eastern sides, like a terrace, 40 to 30 m wide. A modern road was cut on the northern slope encircling the hill.

LiDAR contribution: A large ditch-like anomaly can be observed cutting on a north-south outline the access ridge. It was certainly enlarged in time by waters which eventually flowed down on the slopes. Now it measures ca. 26 m in width, it has a rounded bottom a difference about 1.7 m with the terrain on the east, which is slightly elevated, like a rampart. A second similar ditch-like anomaly, 15 m wide, can be noticed both on the model visualisation and in the elevation profiles, at 114 m east of the first. Behind this ditch the terrain seems again slightly elevated, like a rampart. The LiDAR model for the northern slope shows a group of vertical parallel ridges descending all the way to Pârâul Mic. The origin for this anomalies is unclear – geologic, a modern/ancient intervention?

Bibliography: ROMAN/DODD-OPRIȚESCU/JÁNOS 1992, 173.

7. Leliceni, *Pădurea Rotundă/ Kerek Erdö*, Harghita County

RAN: 85724.06; recorded, localized correctly

Location: 46° 20' 23.0094" N, 25° 50' 09.2935" E

Forested: almost entirely forested, the southern and eastern sectors are overlapped by agricultural fields.

Site type: hill-top site on a rocky outcrop elevated above a small stream (*Câmpul Mare/Borviz*), enclosed on three sides with a semicircular rampart with interior ditch (?); apparently fitted with an artificial terrace; in close vicinity of at least another fortified Early Bronze Age site.

Chronology: generally assigned to Bronze Age (two atypical fragments were found in WWII trenches in the area of the site by István Jánovits, during surface surveys made in Ciuc Depression during1995-1998).

Identification: the site entered the archaeological repertories just through some surface finds. It was never excavated nor investigated in any way. It is labelled in RAN as an open settlement. Significant and clear earthworks of prehistoric aspect were evidenced through LiDAR analysis, but their chronology remains

Total site surface, including fortification elements	1.2 ha Plus 1740 sq. m – exterior terrace – needs confirmation
Total surface of the inner space of the upper plateaus enclosed by ramparts	ca. 9300 sq. m
Total length of the enclosures	200 m
Rampart height	+ 40 cm, affected by agriculture
Rampart width	6-7 m
Maximum elevation	737 m
Maximum elevation difference with surrounding terrain	+61 m above the stream
Maximum slopes	19-21°
Distance to water	Around 200 m on a suited walkable path

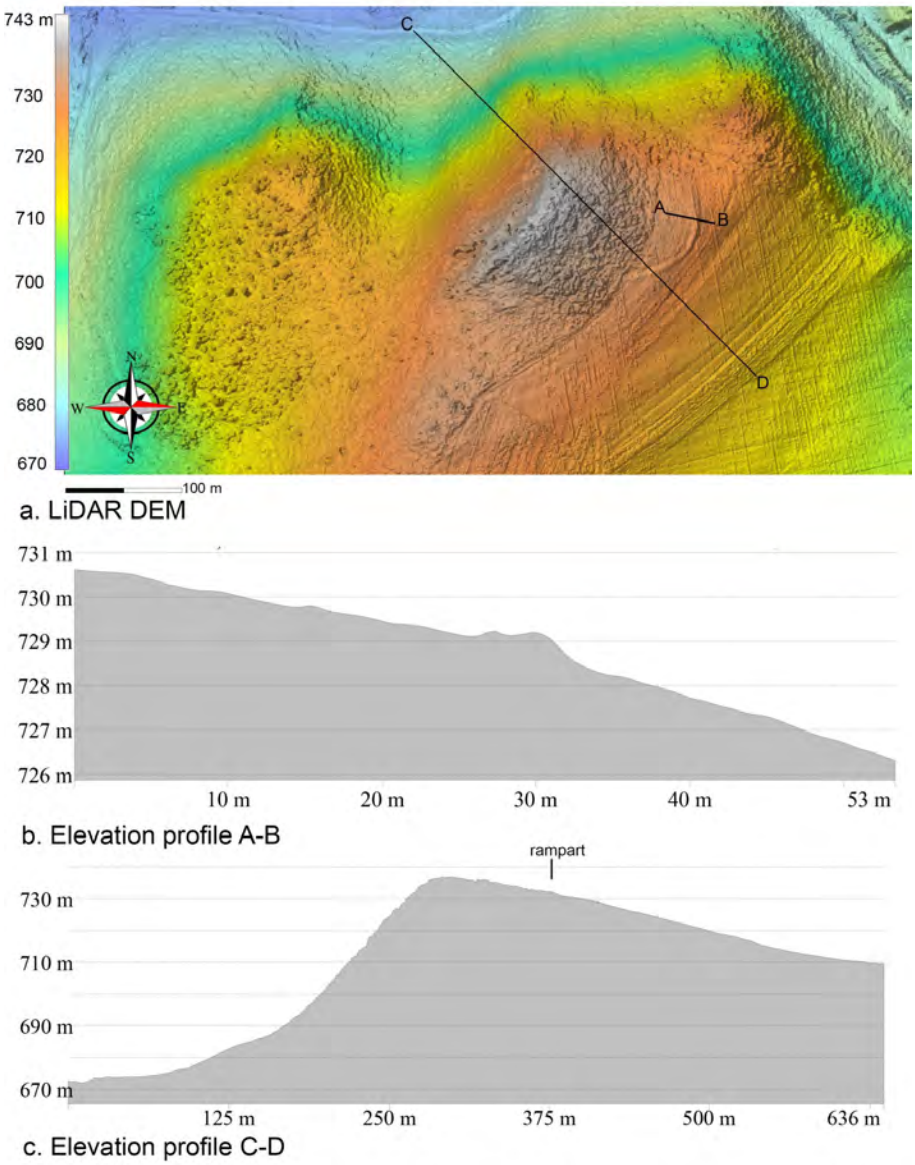

Fig. 19. Leliceni Pădurea Rotundă, features of the general relief.

unknown. The authors have not field verified this anomaly, yet.

Initial Issues: previously it was unclear if the location was indeed an archaeological site; unclear type of site or size; unknown topography or chronology.

Relief: rocky promontory with the steep side orientated north, towards a small stream, right opposite the better known Early Bronze Age site from Leliceni *Muntele de Piatră*. Towards south the relief descends in a wide saddle. Located in close proximity of streams.

Connection with a major communication mountain corridor: the site is part of the large group of fortified sites of Bronze, Iron and Medieval sites that amasses around Miercurea Ciuc – as a central point on routes traversing the Olt and its former wetlands through Harghita Mountains.

Site aspect: the rampart has a semicircular outline, with what appears to be an interior ditch, extending around the entire elevated promontory with both ends reaching the northern ravine. The enclosed space measures ca. 130 x 130 m. There are no visible traces of a gate, but the LiDAR model quality here can be improved. Future scanning with portable sensors for increased resolution will be certainly very useful. A flattened, also semicircular area, can be observed on the LiDAR model outside the rampart, in the south-western sector. This could be an artificial terrace, measuring ca. 90 m in length in 20 m in width.

LiDAR contribution: The fortification and terrace were observed for the first time on LiDAR data rising thus questions about the meaning of having two prehistoric fortified sites on opposite sides of a secondary stream.

Bibliography: JÁNOVITS 1999, 122; CAVRUC 2000, 192.

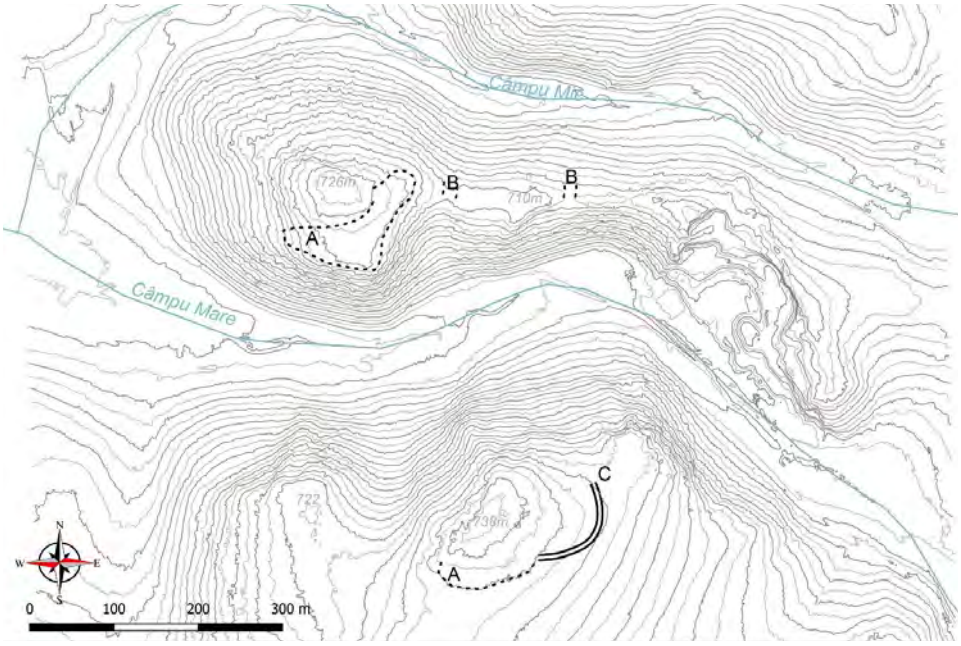

Fig. 20. Leliceni area. Elevation contours based on LiDAR DEM, represented at 2 m interval; A – terraces (?); B – ditches (?); C – rampart.

8. Lutoasa, *Dealul Cetății/ Várhegy/Cetatea Ciuchian*, Covasna County

RAN: 64489.01, recorded, but not localized.

Location: 46° 6'52.61"N, 26°14'25.83"E

Forested: heavily forested

Site type: hill-top site with three steep slopes and one access saddle; enclosed with a dry stone wall enclosure, supplementary blocked on the access saddle by two more ramparts and three ditches; single occupation sequence (?); the occupation intensity was not specified by its former excavators but based on their indirect statements it was low.

Chronology: the single type of materials found on the site (apparently not in coherent contexts/features) were fragments of Middle Bronze Age Wietenberg pottery – reported as identified at the base of the enclosure wall and between the wall stones. This does not necessary date the fortification but stands rather as a *post quem* reference for it. A fragment of a rotary stone grinder of unknown date was also reported as found on site.

Initial Issues: unlocalized in RAN; lack of any new excavations in the last 45 years; unknown overall chronology, especially for the fortification elements; lack of a clear site plan; unclear occupation density. Is this indeed a Bronze Age stone wall?

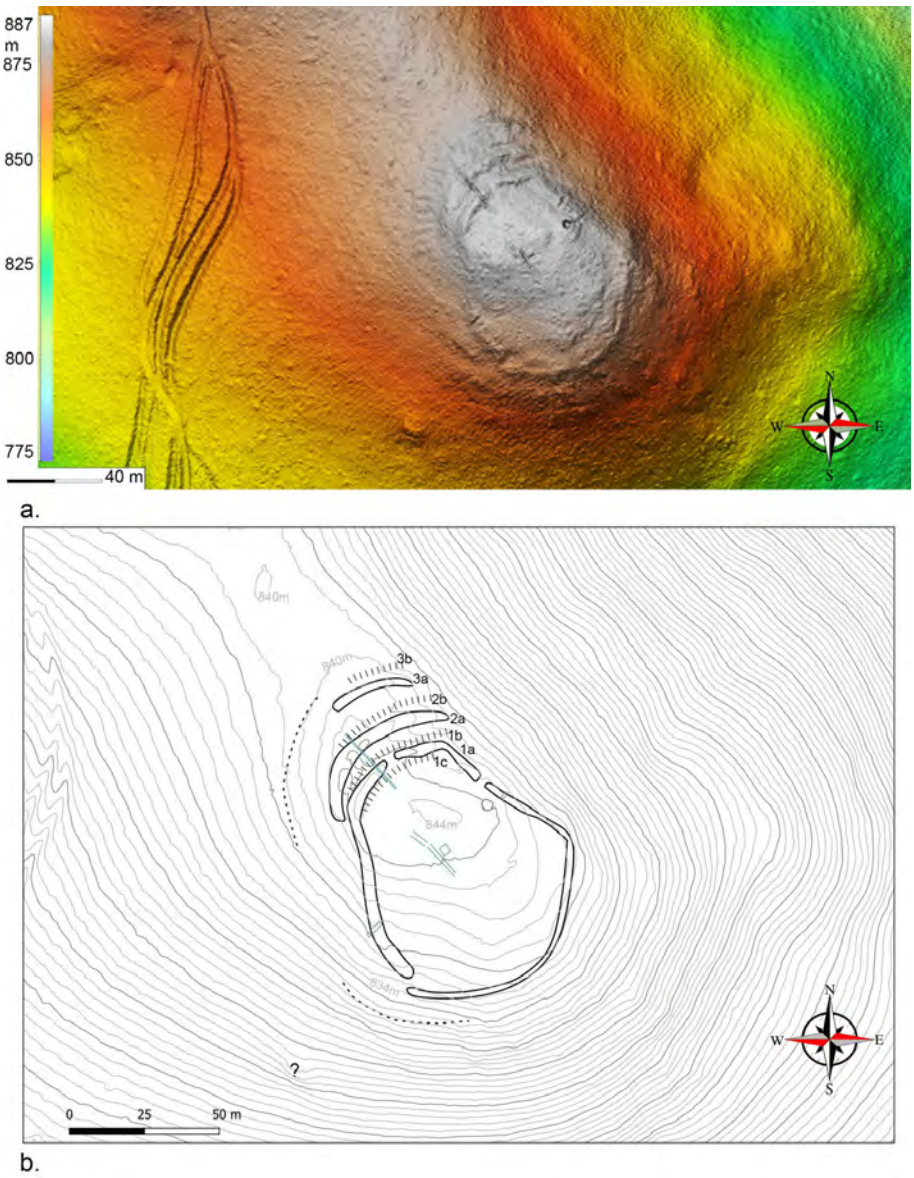

Fig. 21. Lutoasa: a - LiDAR DEM combining multiple shaded view angles; b – elevation contours at 1 m interval based on LiDAR DEM and interpretation of anomalies: ramparts (1a, 2a, 3a), ditches (1b, 1c, 2b, 3b), possible terrace limit (dashed line); with blue – traces of the 1978 excavations of Z. Székely.

Identification: Lost & Found. The site was previously excavated on two occasions: in 1950 by a team of archaeologists investigating the frontiers of Roman Dacia[71] and in 1978 by Székely Zoltan who excavated in three sectors (fortifications and inside the enclosure) a total of 85 sq. m.[72] A sketch for the site was then made. The very short published reports do not mention occupation layers, elements of stratigraphy or archaeological features. The site is currently in the attention of our colleagues Valerii Kavruk and Jozsef Puskás who intend to restart excavations in the near future.

Connection with a major communication mountain corridor: The closest located major mountain corridor is Oituz Pass, at 13 km in straight line towards SE, with the ridges that go around the pass, on higher terrain, being located even closer. *Chiuchian* guards the beginning of a ridge road, one of the several ensuring the transit between Târgu Secuiesc Depression and the north (Cărpineni Depression, Cașin Depression and Ciuc Depression). There are several other fortified sites in the nearby, the closest, at only 1.7 km to NE, being the medieval tower from Lemnia. If we

Total site surface, including fortification elements	0.66 ha
Total surface of the inner space of the upper plateaus enclosed by ramparts	0.38 ha
Total length of the enclosures	Ca. 380 m
Maximum elevation	844 m
Maximum elevation difference with surrounding terrain	157 m with the south 187 with the west
Maximum slopes	23°-25°
Distance to water	Between 300 and 600 m in straight line (there are three main sources in the nearby)

[71] MACREA *et alii* 1951
[72] SZÉKELY 1981, 22.

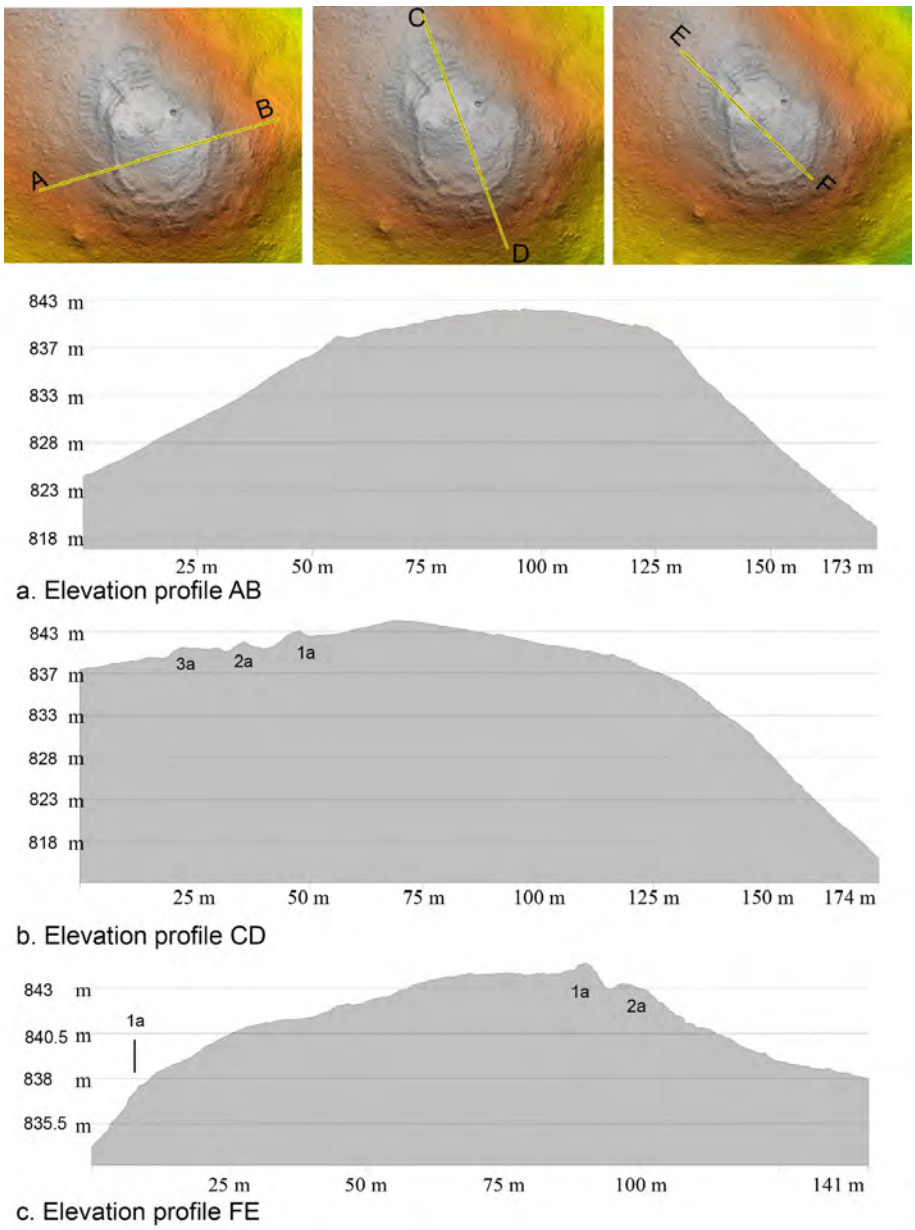

Fig. 22. Lutoasa, elevation profiles calculated on the LiDAR DEM.

follow the ridge north, at less than 2 km distance from *Chiuchian* we can find on the 1970s Map the toponym *Culmea Căruței* (The ridge of the chart) which reveals the resilience in recent memory of its use as a good road, suitable for merchandise transport.

Relief: a pyramidal hill massif of commanding stature (ca 1 km wide at the base) rising between two narrow valleys (Lutoasa and Asolvani) connected through a narrow communication ridge-saddle with the higher relief towards north. Several streams spring from this hill, one from its southern base, in the central part.

Site aspect: the upper hill plateau is completely surrounded by an enclosure outlining a somewhat oval shape, orientated NNW-SSE, with its southern half wider and built with 4 m lower on the slopes. The inner resulting space, which is not flattened nor terraced, measures maximum 81 x 63 m. The corresponding LiDAR anomaly is rather faint for the southern and eastern margins, not observable in sections, only in top 2D visualisations. To the north of the enclosure, where the terrain descends into a saddle, the main enclosure is reinforced with two supplementary ramparts and three ditches with arched outlines. The length of these parallel barrages decrease as they extend to north. Thus, the northern side of the main enclosure measures ca 43 m. Rampart 2 is 59 m long, Rampart 3 39 m and Ditch 3 29 m. The LiDAR aspect of the area comprised between the second

Enclosure	Width	Height/Depth
Rampart 1 north	6 m	0 65/0.70 m
Rampart 1 south	2.5 m	0.3 m
Rampart 1 east	Not measurable	
Rampart 1 west	3.5 m	0.2 m
Gate north	3.5 m	-0.40-0.80 m
Gate SW	3.5 m	-0.90 m
Ditch 1	6 m	-1.7 m difference with the summit of Rampart 1
Rampart 2	5 m	-0.90 m difference with the summit of Rampart 1 +0.80 m difference with the bottoms of the two ditches
Ditch 2	2.80 m	-0.80 m difference with the summit of Rampart 2
Rampart 3	2.50 m	+0.90 m difference with bottom of Ditch 3
Ditch 3	2.50 m	

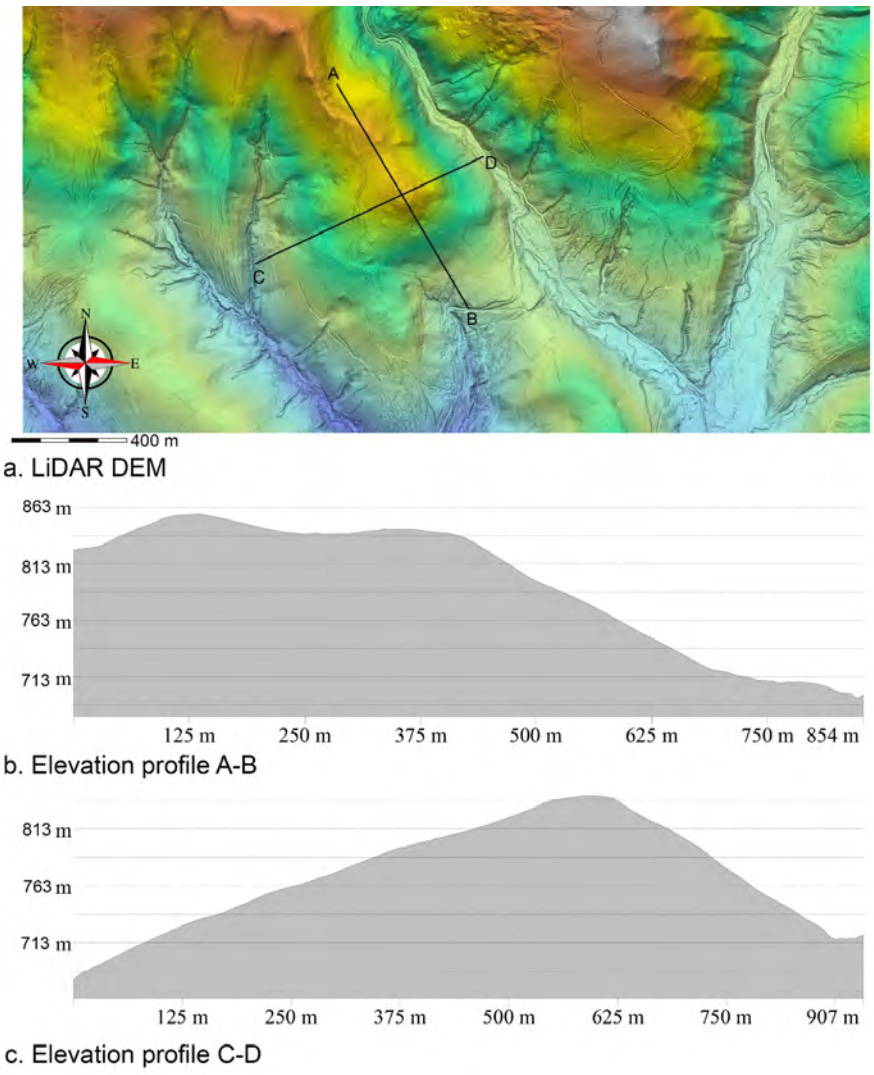

Fig. 23. Lutoasa, features of the general relief.

and third ditch, on the north-eastern side of the site, is quite puzzling as it appears divided in cassettes arranged radially in a regular grid. Further exploration is needed to understand the cause for this resulting anomaly.

The plateau enclosure has two interruptions in the corresponding LiDAR anomaly which could suggest the existence of gates – one in the central part of the northern side and one in the SW sector. Of course, more exploration is needed to clarify this.

The LiDAR terrain model implies that a sort of terracing, in continuation of the northern ramparts outlines, was done around the opposing site end, the southern one.

We notice that the spatial arrangement of defences and relation with surrounding relief is quite similar between *Ciuchian* and *Cece* (with the latter's wall of possibly Medieval date, see further).

Based on his 1978 excavations, Székely reported that the wall measured at base 2.5 m in width and was built of large boulders for the faces and crushed stones in the middle. He reported ditch 1 as 1,60 m in width at 60 cm in depth, while the second ditch was 1.40 m wide and 60 cm deep.

LiDAR contribution: the LiDAR survey helped in obtaining a clearer picture of the site's topography and morphology, making thus possible to transition from sketch to plan and 3D spatial documentation. Relations with the surrounding relief were evidenced like the proximity to ridge roads and streams. Guides for where to focus further investigations were obtained.

Bibliography: SZÉKELY 1981, 22.

9. Merești, *Dâmbul Pipașilor*, Harghita County

RAN: 85065.01, recorded, but not correctly localized.

Location: 46° 13' 24.0148" N, 25° 32' 24.0386" E

Forested: forested

Fig. 24. Merești Dâmbul Pipașilor, aerial panorama (2017).

Fig. 25. Mereşti Dâmbul Pipaşilor, aerial image (2017).

Site type: small hill-top site on an isolated rocky peak, significant slopes on all sides; localized in wild and remote landscape; anthropic terraces; used in a sequence of periods; deposits of entire vessels.

Chronology: Middle Bronze Age (Wietenberg culture) – no layer, just materials reused in later amenities and two pits, one containing a deposit of entire artefacts and animal bones, and the other containing a vessel filled with the cremated bones of an infans I; Late Iron Age (2nd c. BC – 1st c. AD) for which several structures were researched, some labelled as dwellings or workshops, characterized by the presence of fireplaces and of entire vessels; pits with entire vessels and other objects, a domestic kiln; isolated pottery fragments from 7th-8th c. AD and 11th-13th c. AD.

Identification: **Known & redocumented;** The site was systematically excavated by Viorica Crișan and collaborators since 1986, with interruptions, more intensely during 1993-1994 and 2001-2004. It was considered a Dacian settlement, fortified with a rampart topped by a palisade (the so called *Tartars' Ditch*). There is no monographic publication available, just brief reports[73], a sketch of the terraces plan[74] and one sketch plan of the finds made on terrace five.[75] The researched late Iron Age dwellings, especially on terrace 5 (the largest and lowest one, also the most intensely investigated – 108 sq. m of excavation) were reported as built in a sequence of three moments, at the terrain surface, out of wood beams and clay. They were also described as found highly burnt. This gives us ground to consider that the functional interpretation of the agglomerations of materials as dwellings was partially based on delimiting areas of burnt adobe fragments associated with fireplaces – a characteristic, though, which is not exclusively linked with the domestic sphere. The association, in the identified agglomerations of objects, of entire rotary grinders with stone sharpeners, miniature clay objects, spindle-whorls and entire vessels is frequently found in the Iron Age Balkan fields of pits type of ritual contexts.[76] The large quantity of animal bones mentioned for the site and the discovery in the feature labelled 'dwelling 2' of two iron cooking spikes[77] in associations with several iron knives and entire vessels indicate that feasting was practiced here, perhaps in ritual contexts. Crișan reported that Late Iron Age and Wietenberg finds were made in the area of the open saddle, towards east, until the *Tartars' Ditch*. This information rises the possibility to have a larger site, however its size cannot be properly assessed until new excavations or geophysical investigations will be made.

Finds: for Late Iron Age: silver Republican denarii (123 a. Chr., 83 a. Chr.); painted wheel made pottery; local kantharoi, wheel made dishes with high feet ('fruitbowls'), bronze mirrors, iron knives and pins, bronze and silver brooches, glass beads, a rotary grinder, clay gaming pieces, stone sharpeners, spindle whorls, miniature ceramic objects.

Initial Issues: unclear overall topography or relation with the surrounding relief; why here? Unclear if the site was fortified – at least not with the *Tartars' Ditch* which is very probably of Medieval date, even if in its construction soil containing older materials was used. The presence of the

[73] CRIȘAN 2000, 54-56; CRIȘAN/MOLNAR 1994; CRIȘAN/DĂRVAȘ/POPESCU 2001; CRIȘAN *et alii* 2003.
[74] CRIȘAN 2000, Pl. 9.1.
[75] CRIȘAN 2000, Pl. 10.
[76] ȘTEFAN *et alii* 2018a.
[77] CRIȘAN 2000, Pl. 100.

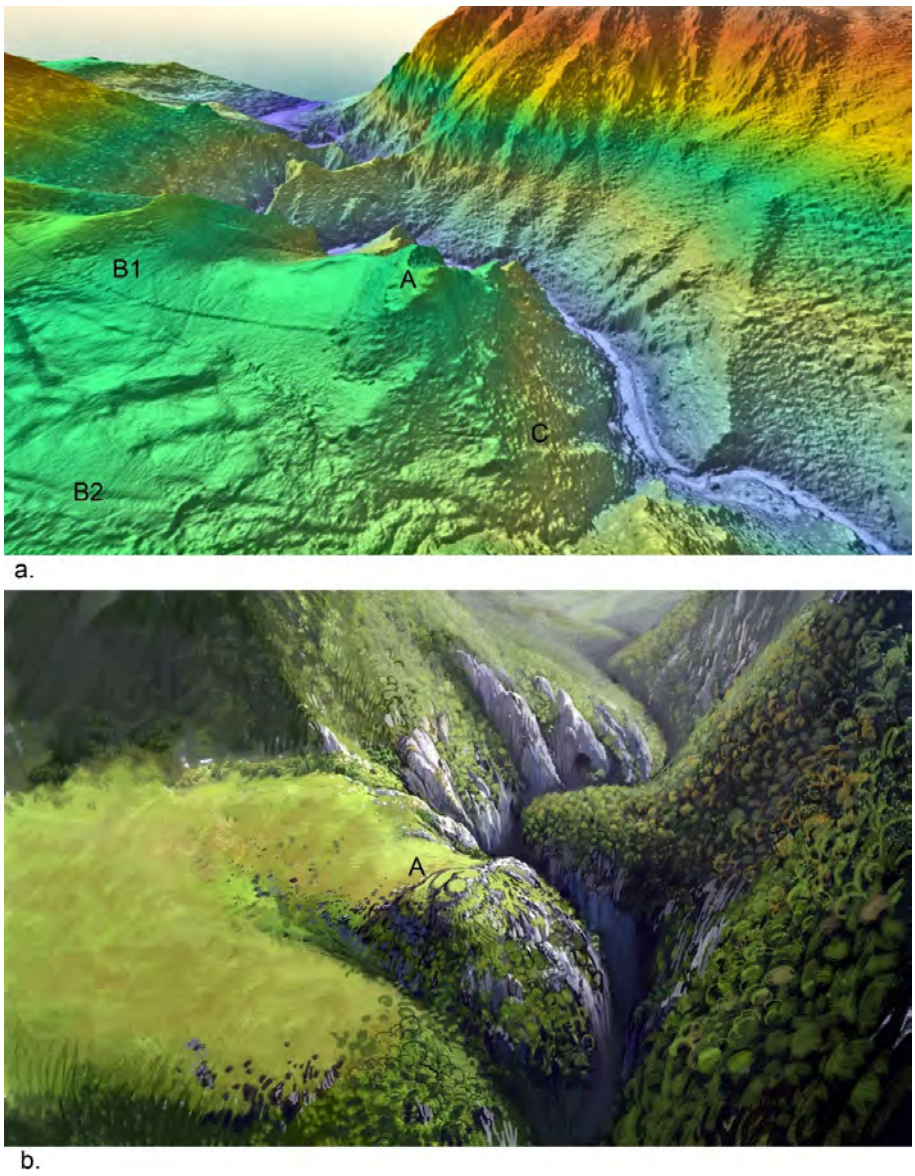

Fig. 26. Merești Dâmbul Pipașilor and Vîrghiș Gorge seen towards south; a – 3D perspective of the LiDAR DEM; b – artistic representation by Radu Oltean (2017). A – the terraced site; B1 – Tartars' Ditch; B2 – unclear if a valley or another ditch; C – possible anthropic access or terrace.

numerous reported entire vessels rather points to a strong emphasis on ritual activities – the type of site is thus unclear, closer to the type of Thracian mountain sanctuaries documented in the Rhodopi Mountains than to regular fortified settlements.

Relief: a rocky summit with rugged topography, rising above the narrow Vîrghiș Gorge, on the river's left side, with almost 158 m. The rocky monticule with limestone outcrops is elevated above the large pasture (*Poiana Pietrii*) stretching towards east, with just 30 m. If seen from the east, the site place resembles a tell mound. Its eastern slope was terraced, as were also sectors of the northern side. *Dâmbul Pipașilor* is clearly evidenced in the surrounding terrain, however is not the highest point. Higher mountain summits rise with ca. 180 m in close vicinity towards east, south-west and west. The landscape, as seen from the site, is clearly an impressive mountainous one, but somehow burdensome, with stone walls blocking large parts of the horizon. Two springs are located in the nearby towards east and south. The gorge is dotted by numerous caves, some impressive in size, visible from the site's plateau. Traces of anthropic activity, including contemporaneous with the site, were find inside these caves.

Connection with a major communication mountain corridor: The site cannot be directly linked with

Total site surface (elevated rocky massif)	5500 sq. m
Total surface of the terraces	ca. 1200 sq. m
Terrace 5 area	700 sq, m
Terrace 4 area	200 sq. m
Terrace 3 area	200 sq, m
Terrace 2 area	50 sq. m
Maximum elevation on site	745. 6 m
Maximum elevation difference with surrounding terrain	+158 m – with Vîrghiș +30 m – with the eastern saddle-pasture *Poiana Pietrii* -178 m – with *Malul de Sus* summit (east) -190 m with *Malul de Jos* summit (SW)
Maximum slopes	35° western slope 23° eastern slope 25° northern slope 30° southern slope
Distance to water	180 m till Vîrghiș but practically inaccessible from above. There is at least a spring on the plateau (*Poiana Pietrii*) towards east, somewhere at ca. 200 m distance and another one on the southern slope, at ca. 170 m.

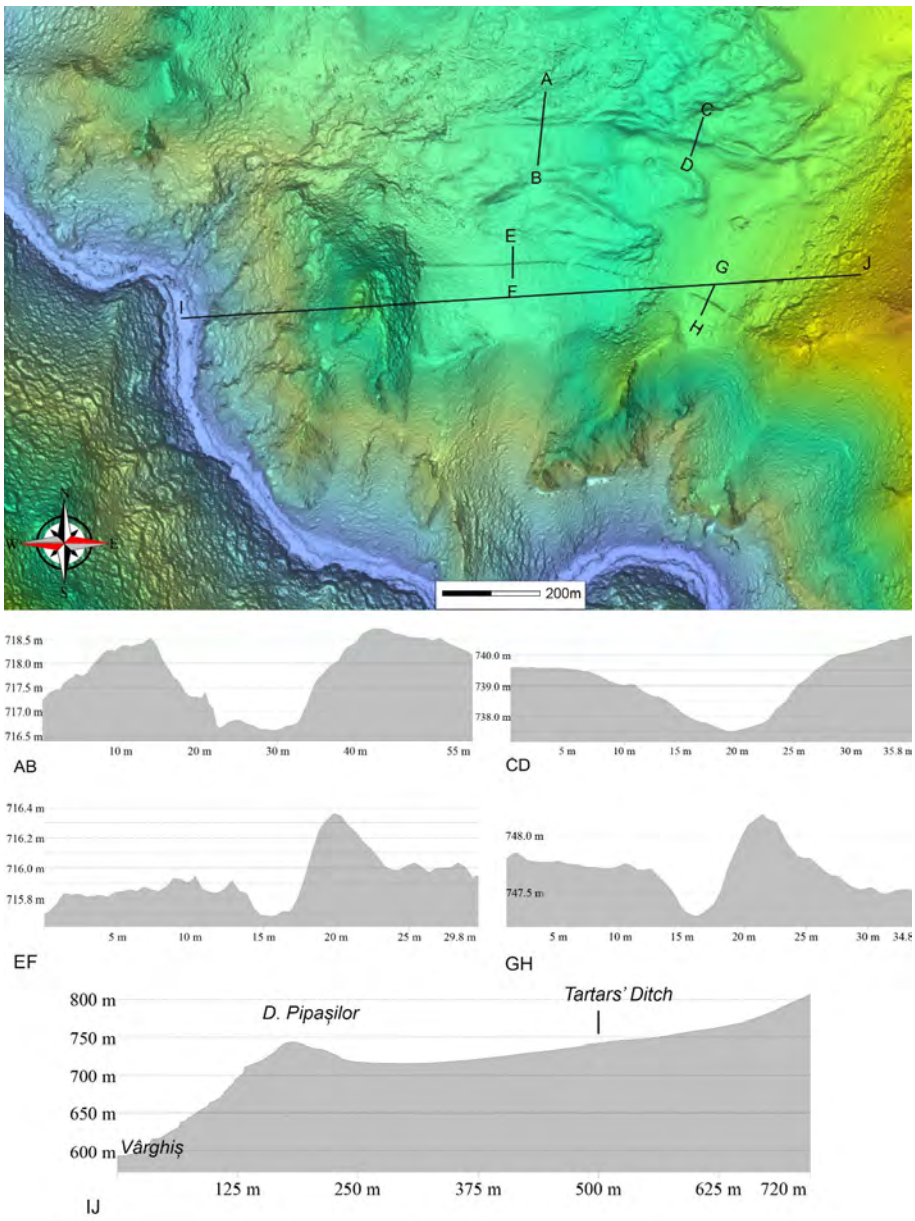

Fig. 27. Mereşti Dâmbul Pipaşilor, feautures of the general relief.

a particular major road. The presence in its immediate vicinity of two segments of linear fortifications which seem rather related with the large scale early Medieval system of ramparts crossing Perşani and Harghita Mountains[78] might suggest, though, that circulation along the high ridges was not improbable and that the closest transit route was a north-south one, between Odorheiu Secuiesc and Braşov, even if the exact role of *Dâmbul Pipaşilor* in this strategic logic seems unclear yet, maybe related to a crossing over Vîrghiş Gorge (?).

Site aspect: The site's anthropic modified morphology contains at least six artificial concentric terraces, some linked between them. According to published reports this terracing activity should be dated in the Late Iron Age. The upper plateau is very small (6 x 7 m). The largest terrace (no. 5) is located towards east. The fourth terrace is prolonged in a narrow tongue reaching the abyss above Vîrghiş. The altimetric sections calculated on the LiDAR derived terrain model might suggest that the entire eastern slope was in fact terraced, but not necessary in a continuous chain, but in spots. Of course, in order to test this hypothesis, a more precise LiDAR model is needed. According to Crişan, at least terrace five was reinforced on the interior, near the slope base, with a low wall of roughed stones linked with clay, 2 m wide.[79]

LiDAR contribution: the available airborne LIDAR for Vîrghiş Reserve was not specifically recorded for archaeological purposes; thus, its resolution was lower (4 points per meter) than of other data sets we had analysed. In addition, the rugged and forested terrain had inflicted its noisy fingerprint on the resulting terrain models. Even if not ideal in this case, the LIDAR data sets proved useful enough in allowing a detailed integration of the site in the general surroundings, revealing quite clearly the artificial micro-topography of the site's terraces.

Bibliography: CRIŞAN 2000, 54-56; CRIŞAN/MOLNAR 1994; CRIŞAN/DĂRVAŞ/POPESCU 2001; CRIŞAN *et alii* 2003.

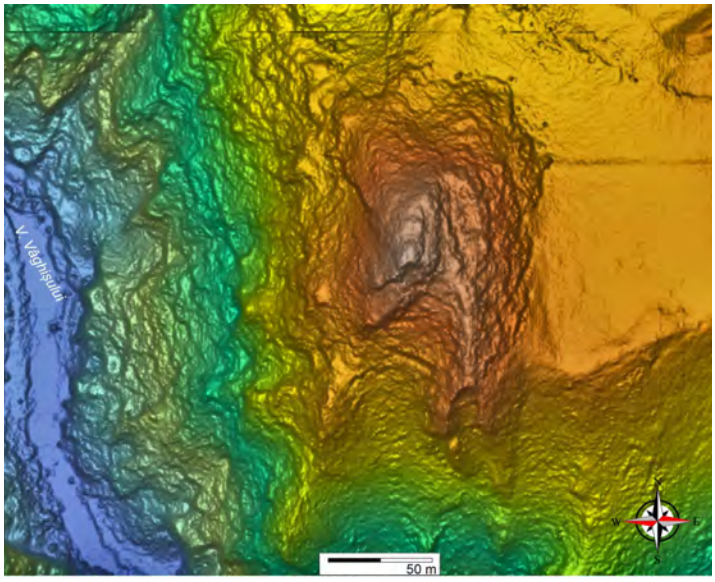

Fig. 28. Mereşti Dâmbul Pipaşilor, LiDAR DEM.

[78] SÓFALVI 2013.

[79] CRIŞAN 2000, 54.

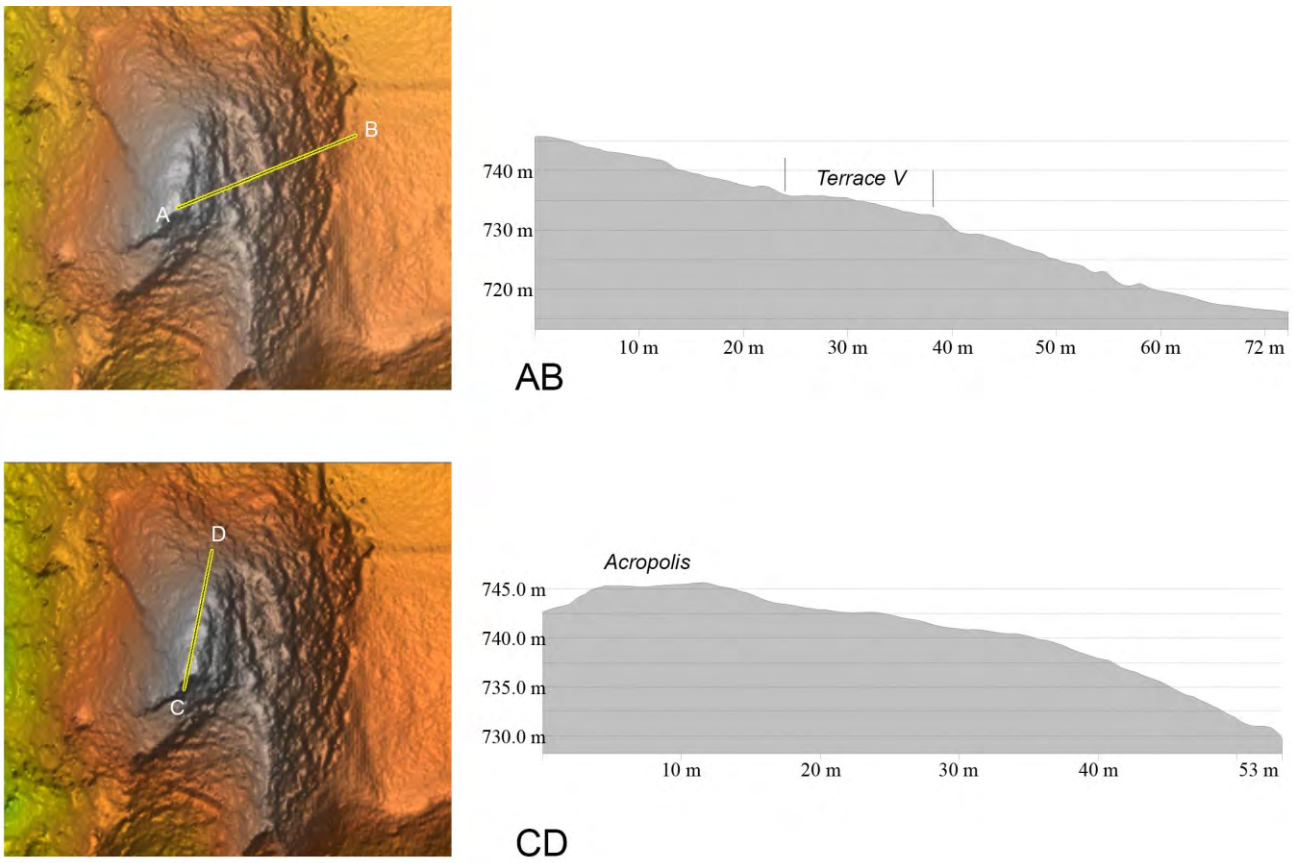

Fig. 29. Mereşti Dâmbul Pipaşilor, general elevation profiles calculated on the LiDAR DEM.

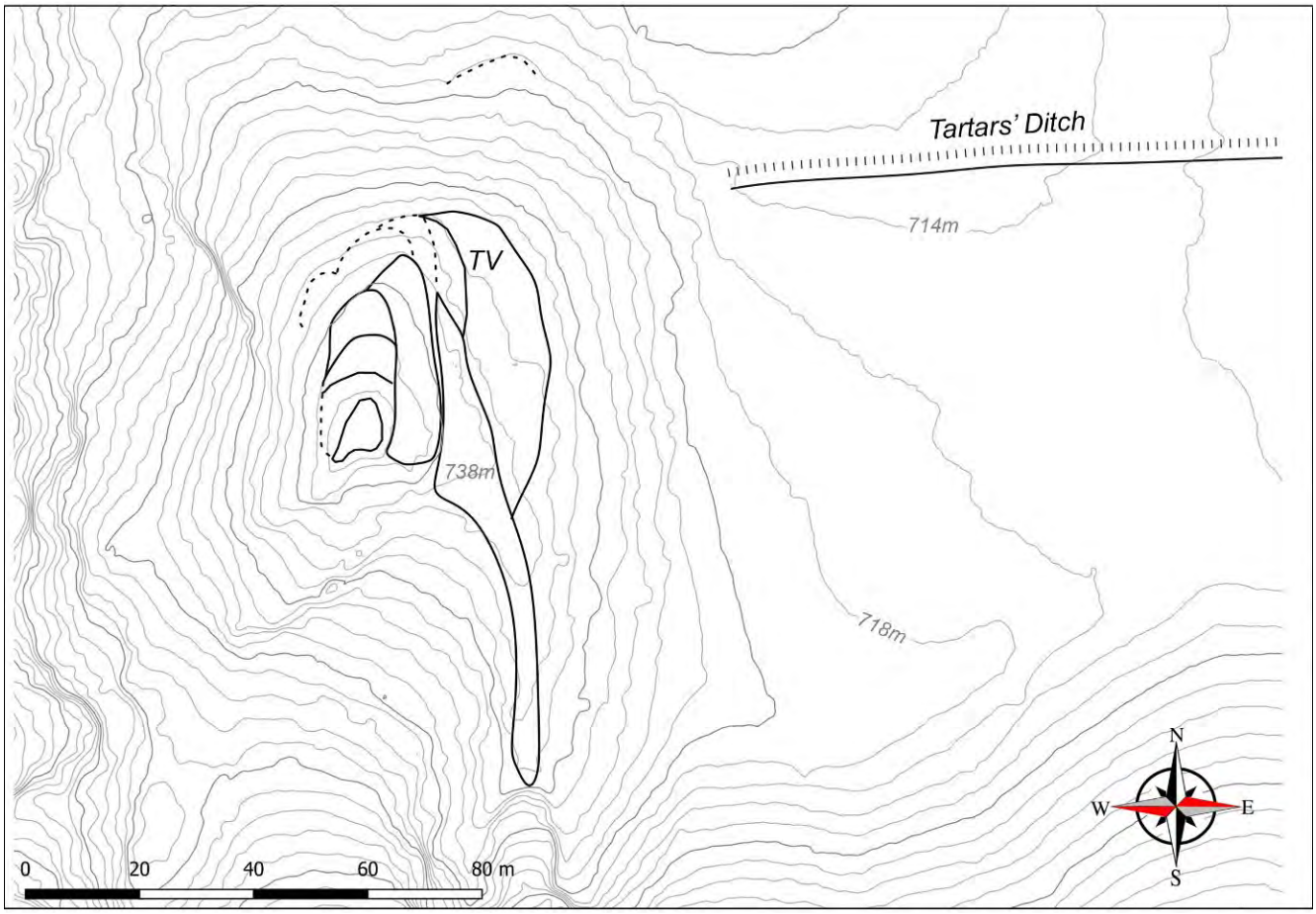

Fig. 30. Mereşti Dâmbul Pipaşilor. Elevation contours extracted based on DEM data at 2 m interval.

10. Racoș, *Dealul Vărăriei/Dealul Cornului/ Meszes*, Brașov County

RAN: 41710.01; yes, located correctly.

Location: 46° 00' 56.7727" N, 25° 25' 35.2877" E

Forested: fully forested

Site type: large hill-top site with imposing rampart-ditch defences fitted with what seem to be several 'access gates'; of a mixed layout combining elements typical for both an enclosure and a barrage fortification, fully integrating a complex natural terrain morphology; possible auxiliary anthropic terraces; the occupation density is unknown; not clearly connected with a direct major road.

Chronology: the site has been known previously but received only very limited archaeological attention; the material collected in two trenches (from 1981 and 1997), opened through the largest rampart, delivered what was interpreted as Hallstatt A2-B pottery (black pottery, grooved); other pottery was reported as 'from the end of

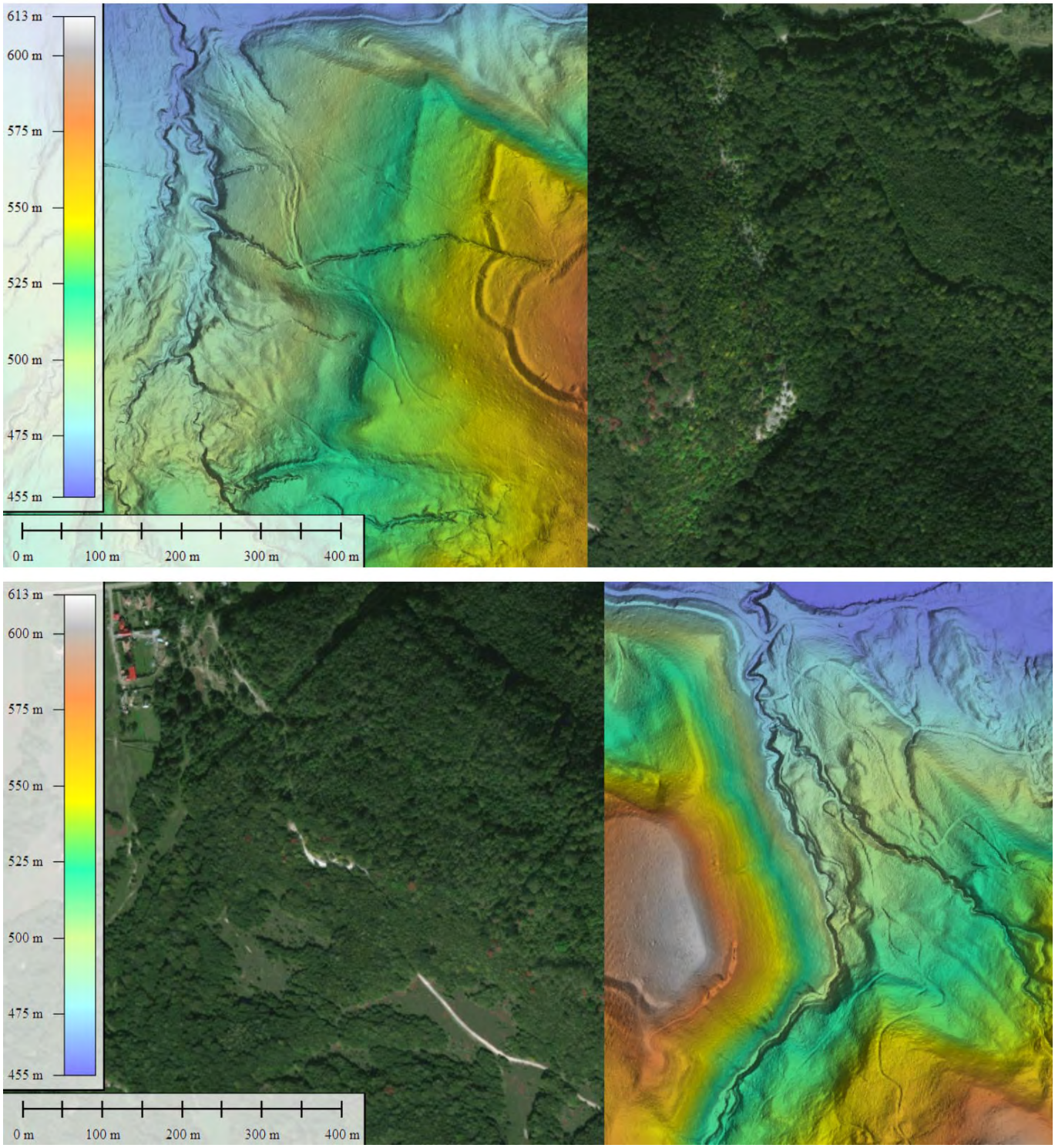

Fig. 31. Racoș, Vărărie, comparison between the forest coverage and the terrain underneath revealed by LIDAR based survey.

Total site surface, including fortification elements (A + B)	6.7 ha
Total surface enclosed in A, not considering fortification elements	3.6 ha
Total surface enclosed in B, not considering fortification elements	1.44 ha
Total length of the defence lines	At least 750 m
Maximum elevation on site	605 m
Maximum elevation difference with surrounding terrain	107 m
Maximum slopes	31°, 51°
Distance to water	Stream inside the site, flowing for 66 m Olt river – 500-400 m

this period'[80] (Hallstatt period? unclear). Costea reports than from the enclosure and adjacent terraces he collected 'Dacian' pottery.[81]

Initial Issues: unclear detailed chronology, lack of a site plan and no clear understanding of the earthworks morphology or of the overall topography, unclear site functionality.

Identification: Known & Redocumented. The site has been known and excavated since 1981 by Florea Costea and Ioan Glodariu as part of their early interest in the archaeology of the Olt Gorge area in Perșani Mountains. They opened trench SI in the southern sector of the rampart (the excavation has been now localized and measured with the help of LiDAR terrain models). They reported the finding of burnt wooden posts fallen inside the inner ditch and approximated the site surface as between 6 to 7 ha. In 1997, a team lead by Adriana Ardeu from the History Museum of Brașov, opened trench SII, in the north-western sector of the main enclosure. Her excavation, too, is visible on the new terrain models. She reported the identification of two dwellings with Hallstatt A2-B pottery, one on the exterior slope of the inner rampart and the other one - slightly deepened in the inner side of the same structure, without providing, though, any other revelatory excavation details. For the moment, we regard the interpretation of the mentioned features' as dwellings as quite problematic, at least until any other excavations or non-invasive investigations will be carried on in this site. A. Ardeu estimated the site's size to be 15 or even 20 ha (if taking in consideration natural ravines).

Connection with a major communication mountain corridor: The Olt Gorge in Perșani Mountains is considered one of the main exists towards west of the trans-mountainous roads coming from the extra Carpathian space. It gathers a significant group of major sites for the Bronze, Iron and Medieval Ages, nevertheless, main land traffic was probably done on those hilly ridges parallel with the Gorge, located at several kilometres distance to the north or south, and not exactly through the valley.

Relief: hill of a complex shape developed east-west on ca. 800 m between two left wing affluents of Olt river. It has one dominant and broad (ca. 200-220 m wide) slope, facing west (12° inclination), and two steep margins (eastern and northern), connected through a narrow saddle with the southern relief. The eastern end of the hill is higher, elevated abruptly above the neighbouring valley with 107 m. The Olt river flows ca. 400 m to the north of the most elevated part of the site. The relief morphology as revealed by LiDAR does not evidence the existence of an individualized plateau in the highest part of the hill nor terracing works along the main slope, but at least two terraces of possible anthropic origin can be recognized towards north and east of the main slope and system of earthworks.

Fortification elements: the massive earthworks, which can be observed quite clearly on the LiDAR terrain model, outline and protect, in combination with natural steep ravines, the most eastern and highest sector of the main hill slope. Artificial blockages were built on the western side in particular, but also on the southern and partially northern one, too. Between the highest point of *Vărăriei* Hill and the lowest positioned defence there is a 58 m elevation difference. The defence lines composed of ramparts and ditches stretch on a wavy outline, mainly on a north-south axis, as to fully block the access on the broad and slopping saddle. In its southern end the enclosure turns to east and follows the terrain till the steep slope above Cornu Valley. On this side, an opening in the rampart connects the enclosure with the only, geomorphologically speaking, possible ridge road leaving the site towards higher ground (to the south). The enclosed area, measuring 6.7 ha (maximum lengths 410 x 310 m) is divided through earthworks in two different areas: A – a roundish enclosure, outlined on three sides, delimiting the higher part of *Vărăriei* Hill and B – a north-south barrage branched towards west from enclosure A. However, a specific visualisation mode of the LIDAR terrain model – the one based on slope direction – emphasizes, in fact, that the outer defence line, on both A and B sectors, was built as one single segment and that the separation line between A and B was added distinctly as an internal barrage.

The western border for B and the southern sector of A consist both of two ramparts (no. 1 and 2) and one intermediary ditch (no. 2), with the smaller rampart located towards exterior, while for the other two sides of A (that is the internal dividing line of the site), only a rampart (no. 3) and an external ditch (no. 3) can be measured on the LiDAR terrain model. The width of this complex and imposing enclosure ranges from 30 to 17 m, with elevation differences of up to 9 m (in the actual terrain morphology). When studying the elevation profiles measured through the defence lines, we can notice, on several occasions, that a lowered area can be observed on the interior side of the larger rampart. If this was the indication for another ditch (no. 1), case in which the

[80] ARDEU *et alii* 1997.
[81] COSTEA 2004, 116.

Site sector	Enclosure element	Width	Height/ Depth
A	Rampart 3 N	5.8 m	+1.2 m
A	Ditch 3 N	8.5 m	-0.7 m -5 m difference with the summit of Rampart 3
A	Central Gate	16 m	
A	Rampart 3 W	7.5 m	+1.3 m
A	Ditch 3 W	8.3 m	-4 m difference with the summit of Rampart 3
A	Rampart 1 SW	12 m	+1 m
A	Ditch 1 SW	6-7 m	-0.90 m difference with the summit of Rampart 1
A	Ditch 2 SW	8.5 m	-6 m (difference with the summit of Rampart 1
A	Rampart 2 SW	9 m	+0.9 m
A	Rampart 1 S	9.5 m	+1.2 m
A	Ditch 2 S	6.5 m	-5.7 m difference with the summit of Rampart 1
A	Rampart 2 S	5.6 m	-0.4 m difference with bottom of Ditch 2
A	SW Gate	10 m	
A	S Gate	14 m	-1.7 m difference with summit of Rampart 1
B	Rampart 1 SW	7 m	+0.5 m
B	Ditch 2 SW	6.5 m	- 3 m difference with summit of Rampart 1
B	Rampart 2 SW	5.7 m	+ 0.2 m difference with the bottom of Ditch 2
B	Rampart 1 W	8.3 m	+0.5 m
B	Ditch 1 W	6-7 m	-0.30 m difference with summit of Rampart 1
B	Ditch 2 W	3 m	-4.5 m difference with summit of Rampart 1
B	Rampart 2 W	4.5 m	+0.25 m difference with the bottom of Ditch 2
B	NW Gate	10.5 m	-2.6 m

ditches should be regarded as interior or just a consequence of the significant profiling of the main rampart cannot be established without supplementary investigations.

In total, four openings in the defences can be recognized. Their morphology suggest they were intentionally built this way and could have functioned as gates. They ensure circulation between the two sectors of the enclosure and connection with the surrounding terrain.

Terraces: A narrow terrace was excavated on the hill's eastern slope, but it is not clear if it is a modern intervention. To the north of the main saddle and system of earthworks, *Vărăriei* Hill has a lower sector stretching till Olt river, similar with a natural terrace, separated from the higher part by a 40 m elevation drop (C sector). It is not entirely clear at this point, but some LiDAR views seem to suggest that this sector also had at least a natural higher edge if not the remains of another rampart. If sector C were indeed anthropically modified, the site would have covered in total 10.8 ha. This hypothesis, though, needs further prospection.

Stream: A stream emerges from the ground in a place which can be considered to be very close to the centre of the enclosed area, taken in large. Its valley descends towards west along the middle of the main hill slope. Its course was intentionally integrated within the site's morphology as the shape of the ramparts clearly demonstrates. The most western segment of the enclosure (B) was built with the rampart orientated upstream, changing direction in an angle like a pointed corner, precisely as to not be broken by the water, while the main gate of enclosure A (central gate) is located exactly near the spring, partially surrounding it. Through this gate and towards the spring passes a road connecting three of the four gates of the site – visible on LiDAR. These details make us advance the hypothesis that the presence of the stream was very significant in the developing of the fortified site at *Vărăriei* Hill.

LiDAR contribution: in this case the LiDAR analysis brought significant advance in initiating the understanding process of the site's plan and complex relation of the enclosure elements with the natural terrain, especially considering the limited previous research carried out this site, hampered specifically by the challenging forested environment. New elements have been evidenced like the four gates or the existence of multiple enclosed sectors inside the site, possible old roads and strong relation between the plan morphology and the presence of a stream. Several 'hot spots' were thus selected for further future investigations, namely magnetic survey, supplementary 3D scanning with a portable LiDAR for higher resolution and limited trial-trenches for collecting samples for radiocarbon dating.

Bibliography: ARDEU *et alii*. 1997; COSTEA 2004, 116.

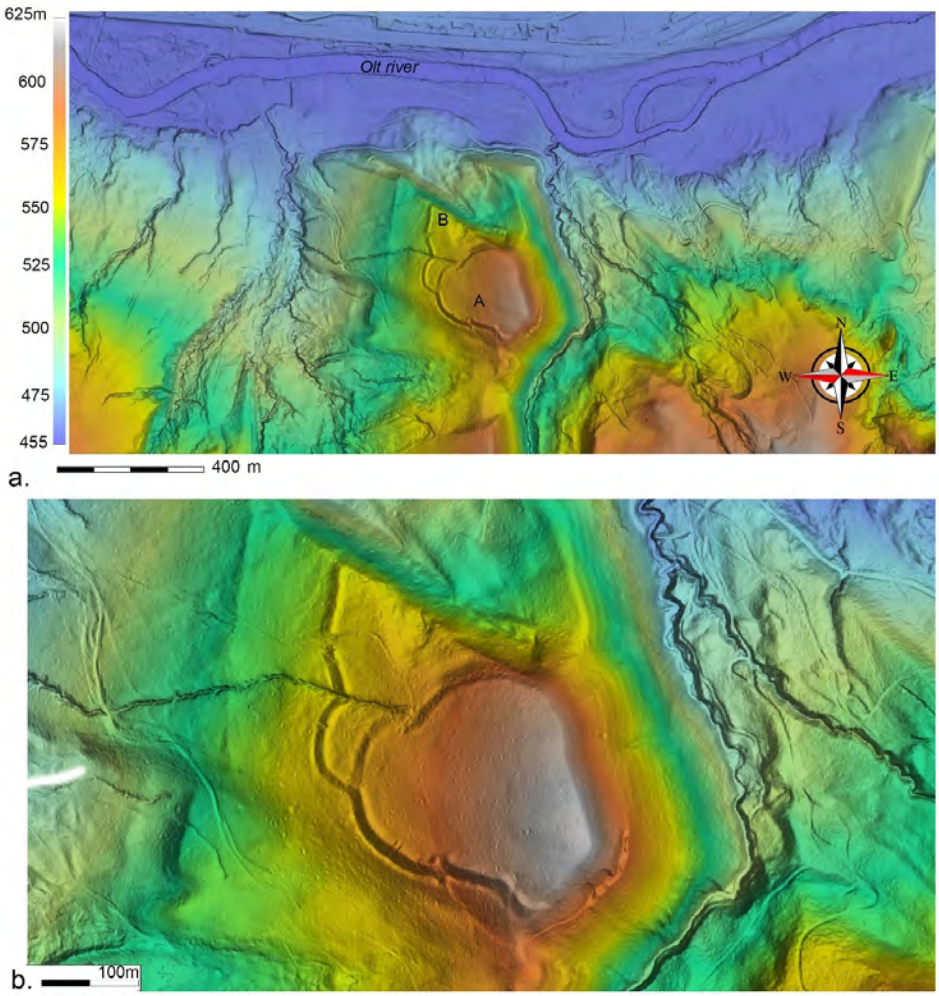

Fig. 32. Racoș, Vărărie, LiDAR DEM; A, B – site sectors.

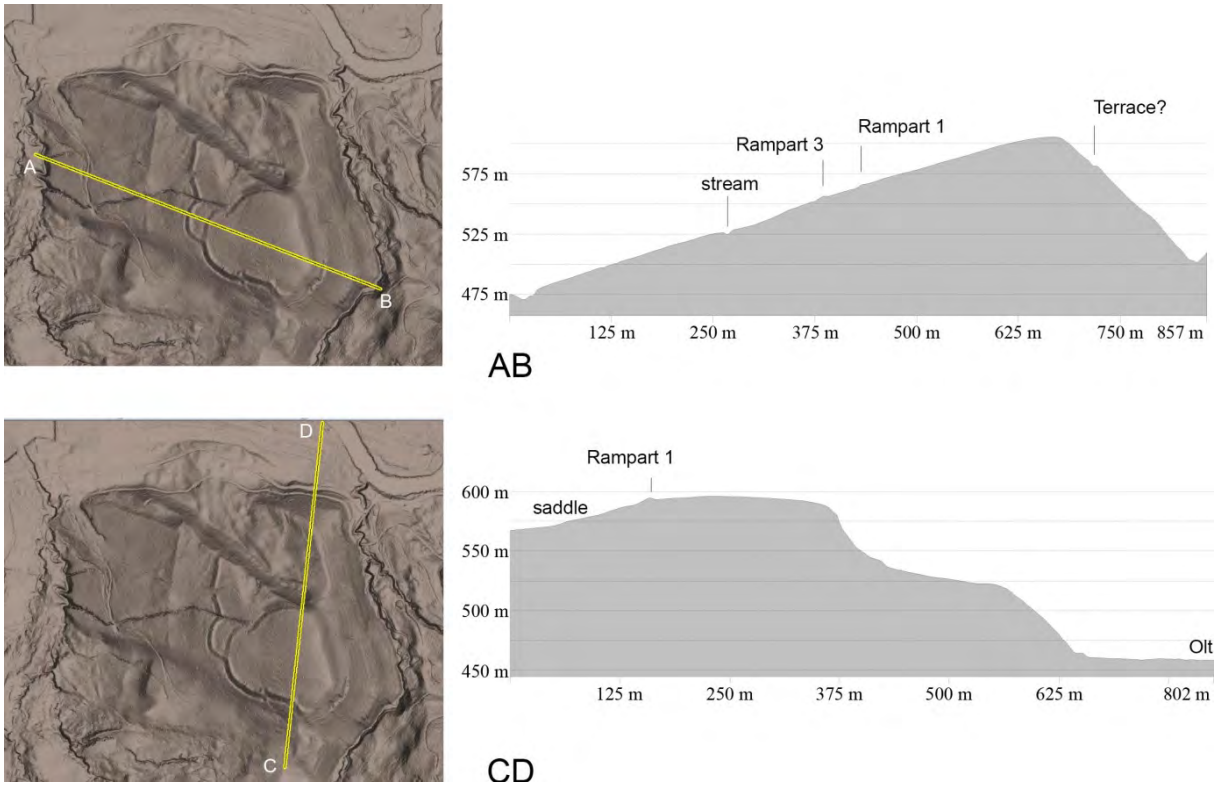

Fig. 33. Racoș, Vărărie, general elevation profiles calculated on the LiDAR DEM.

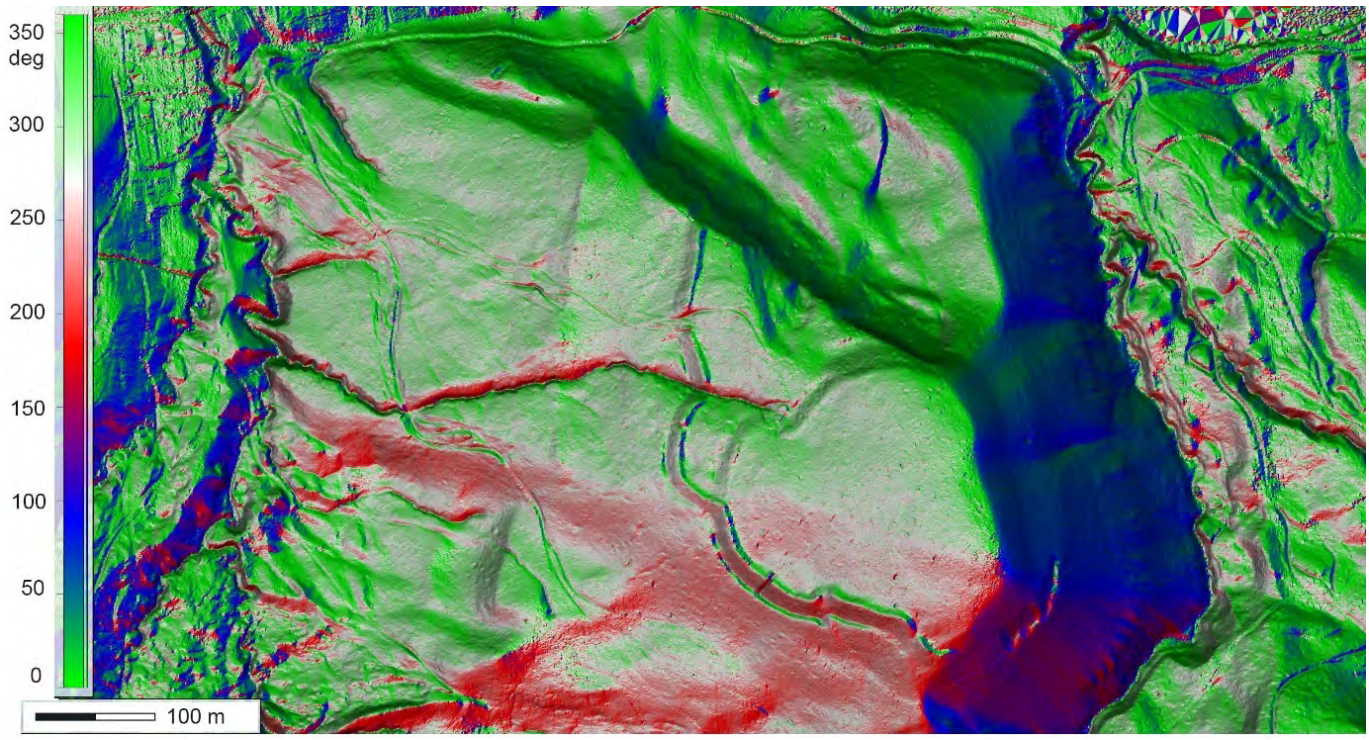

Fig. 34. Racoș, Vărărie, LiDAR DEM viewed according to slope orientation in order to highlight ridges and linear features.

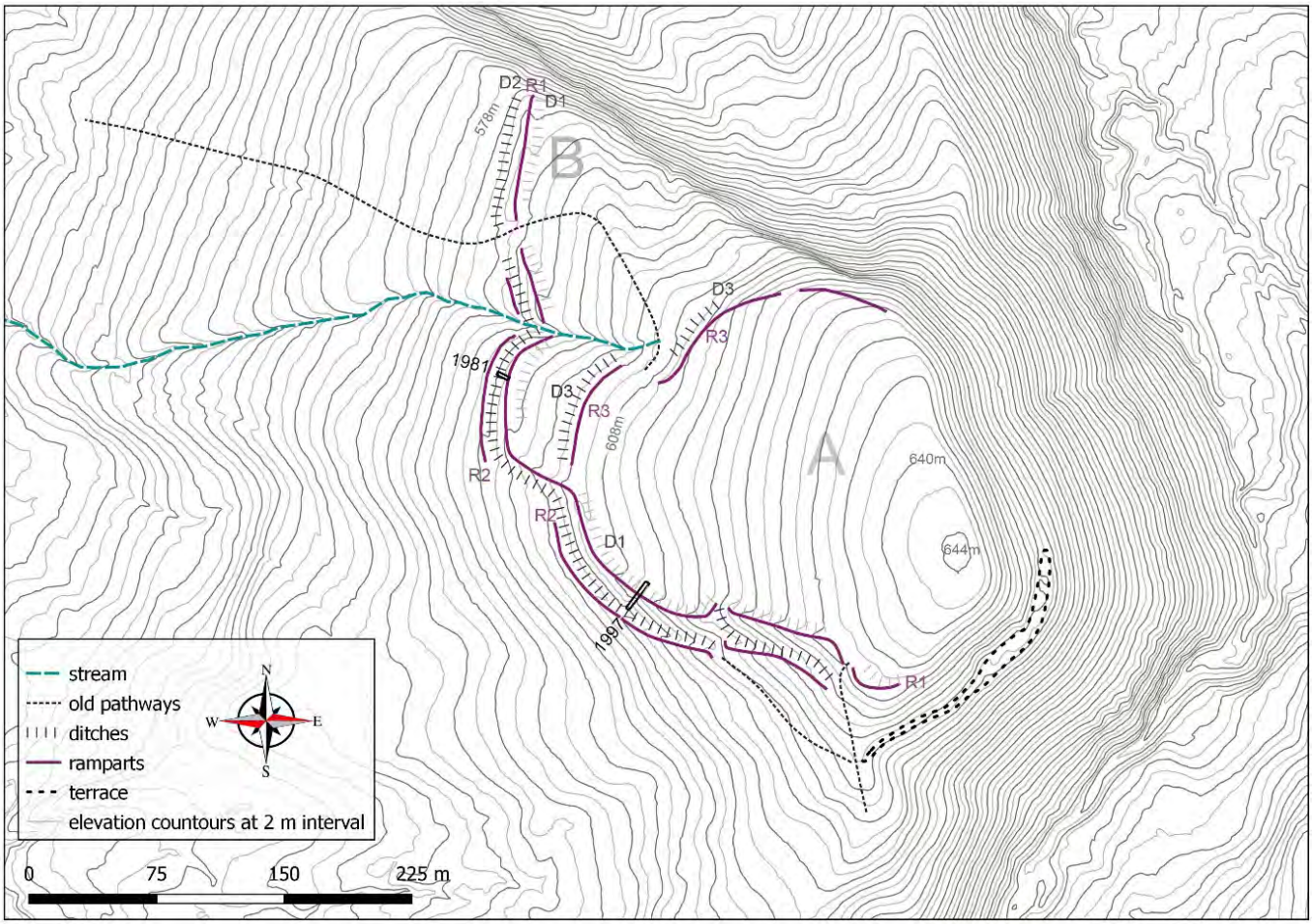

Fig. 35. Racoș, Vărărie, site plan based on the interpretation of the LiDAR data, elevation contours at 2 m interval.

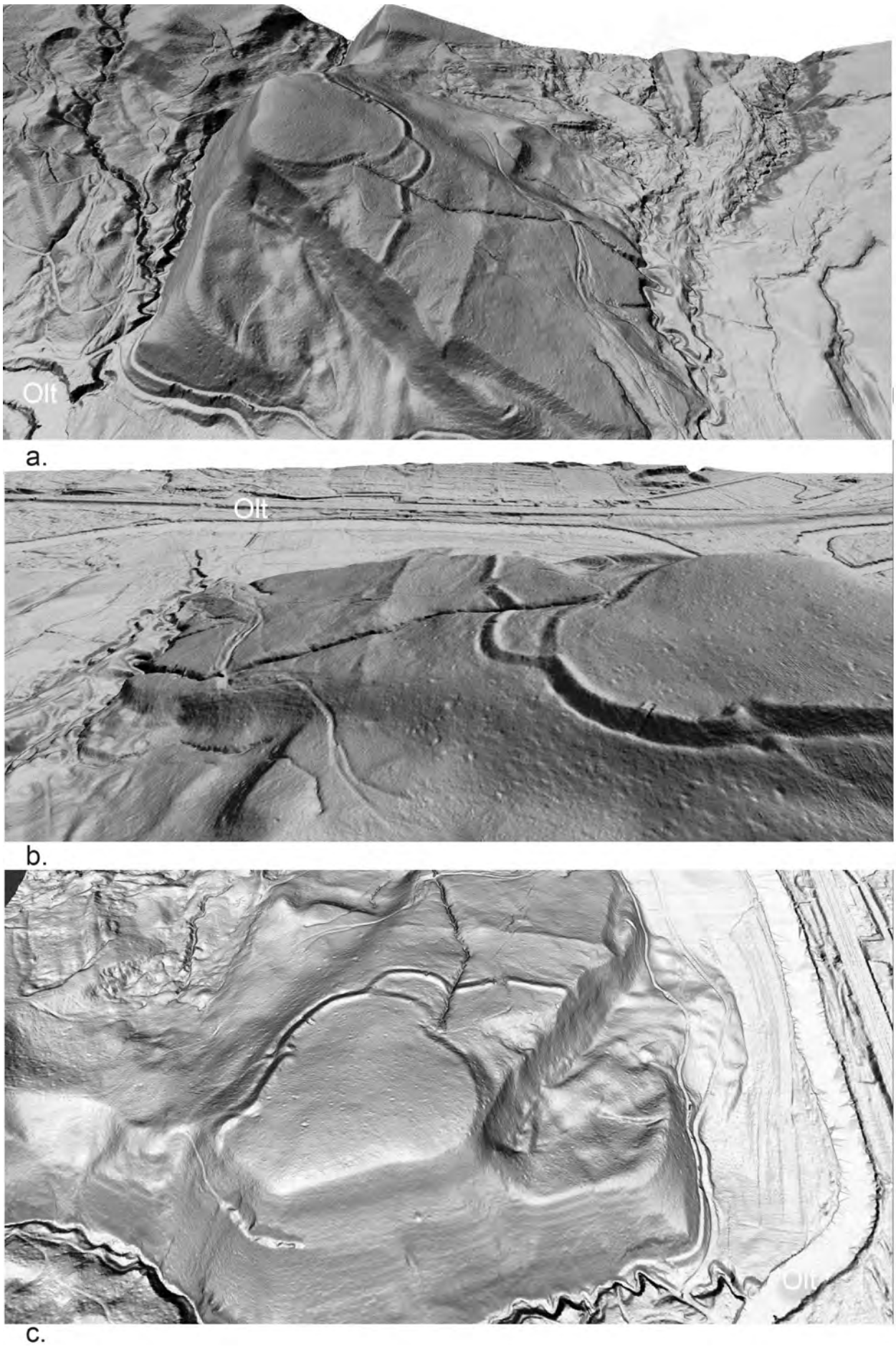

Fig. 36. Racoș, Vărărie – 3D views of the LIDAR DEM: a – towards south; b – towards north; c – towards west.

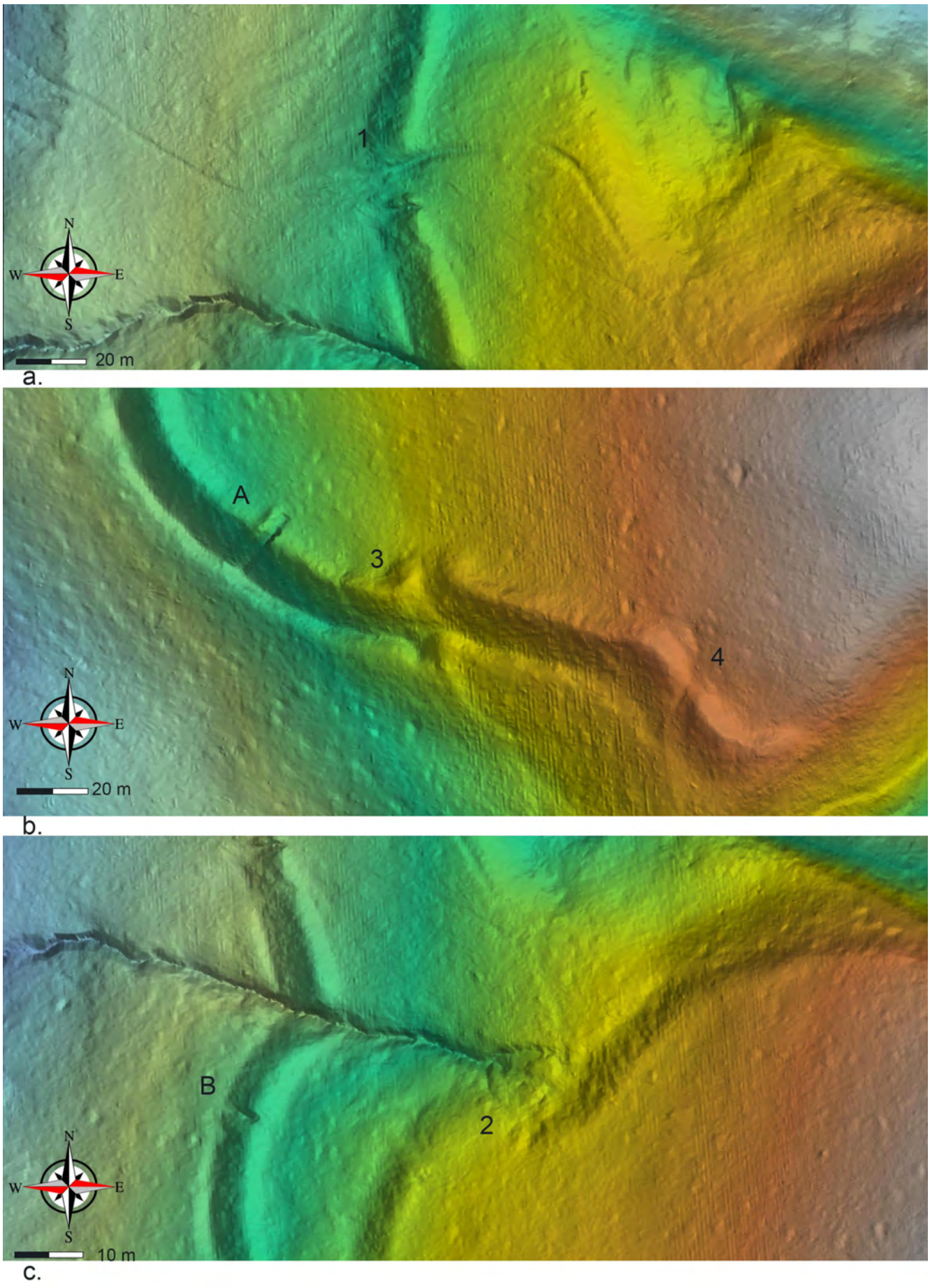

Fig. 37. Racoș, Vărărie – LiDAR DEM, details of the ramparts-ditches system and gates(1, 2, 3, 4); A – archaeological trench 1997; B – archaeological trench 1981.

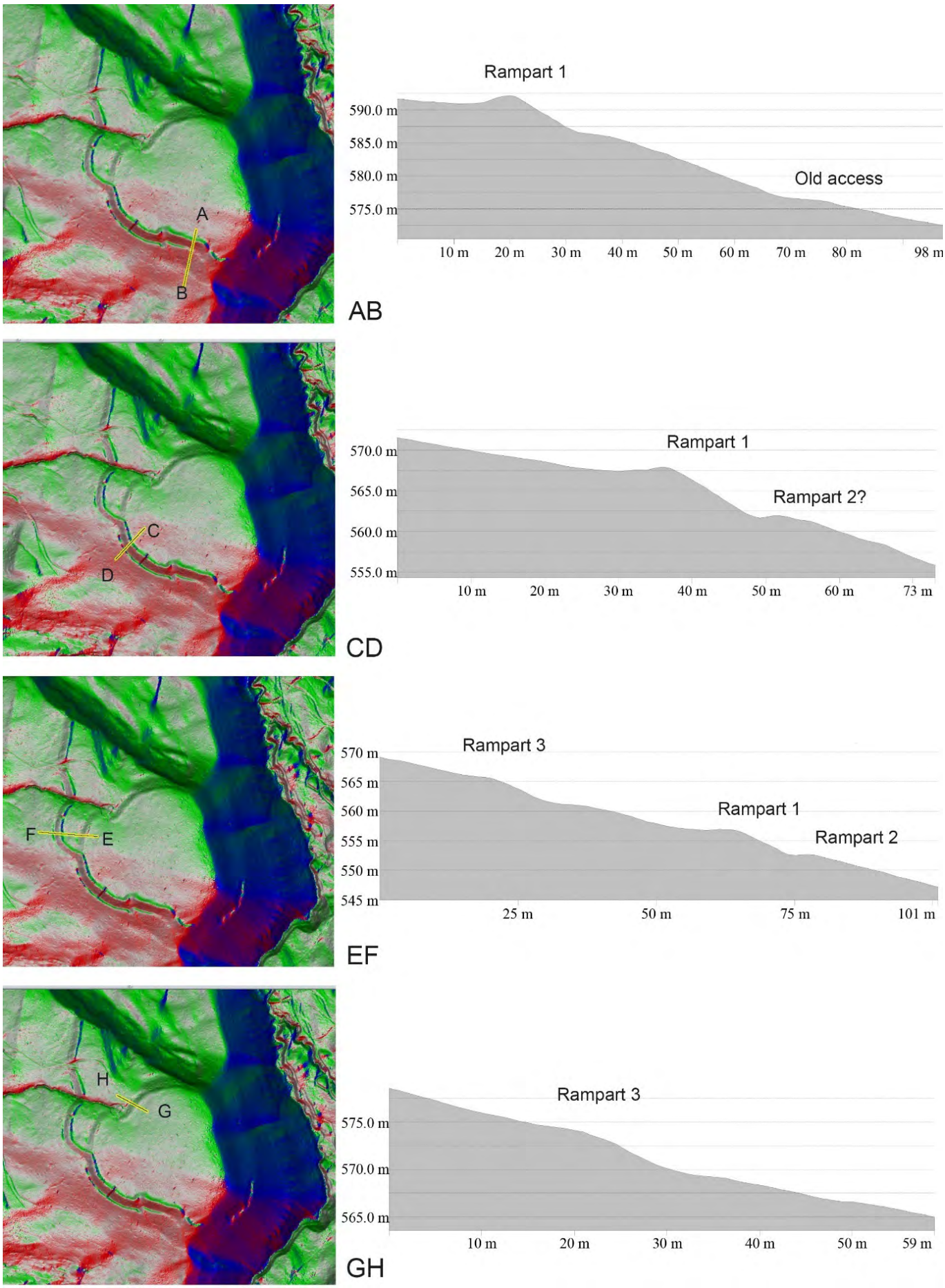

Fig. 38. Racoș, Vărărie, elevation profiles through the fortification lines.

11. Sânzieni/Valea Seacă, *Cece/Muchia Cetății/ Váréle/Cetatea din Valea Cașinului*, Covasna County

RAN: 64862.01; recorded but not localized

Location: 46° 08' 33.0403" N, 26° 08' 19.3521" E; on a rocky peak elevated on the right side of Pârâul Cetății/Várpatak valley, at 1.7 km upstream from the confluence with Cașin River.

Forested: fully forested

Site type: hill-top site enclosed with a stone wall; supplementary defence barrages on the access side - two more stone walls (?)/ramparts separated by three ditches; an earlier rampart with highly burnt soil under the main stone enclosure; faint anthropic deposit; at least two certain attested periods of use; located on a ridge road of secondary importance used to access in the inner Carpathian arch; open settlement at the foothill covering both periods of site use.

Chronology: 1st c. BC – 1st c. AD (fragmented hand and wheel made pottery; Augustan age silver fibula with rhombic shield found in the open settlement at the hill base, in a pit with burnt bottom, rich in ceramic materials; no features discovered yet on the plateau); Wietenberg pottery only on the plateau margins near the stone wall (probably as secondary material in an older rampart - earlier than the stone wall) and also in a deposit at the foothill, beneath the Late Iron Age one.

Initial Issues: ambiguous localisation; unlocalized in RAN; uncertain chronology of the fortification elements; no investigations in the last 45 years.

Identification: **Lost & Found**. The fortress was known since the late 19th century.[82] It was excavated only once, in 1975, by Székely Zoltan who cut the fortification elements in several points. His published excavation report[83] did not, unfortunately, allow an exact localisation of the site. He presented the site as being fortified with a wall and fitted with two terraces during Dacian king Burebista's time. For Székely, *Cece* resembled the morphology of Covasna *Cetatea Zânelor*. The area is remote, without proper roads and completely forested, while the available cartographic materials do not provide indications to correspond with the toponyms provided by Székely. During the summer of 2018, the authors, together their colleague Dan Buzea, undertook field surveys along Pârâul Cetății valley, in search of the site. The fortification was thus finally localized. A more applied exploration followed in August 2020.

During this occasion, the site was documented with portable LiDAR sensor and investigated with magnetic method, while one of the older trenches of Székely was cleaned in the area of the eastern stone wall. A sample of burnt wood was radiocarbon dated. Surprising was the fact that we noticed right away that the wall was clearly built with mortar binding - something Székely did not mention, on the contrary, he specifically said it hadn't any mortar, even if it seems hard to believe that he would not have noticed something so obvious. Of course, the presence of limestone binding raises the question of the wall chronology which might thus be Medieval, not Late Iron Age (even if such binding was not unheard of in the late Iron Age in Dacia). As well different emerged our opinion concerning the existence of terraces – as Székely labelled the space delimited by the supplementary barrages towards north. They were, as the elevation profiles show, just the ditches – part of the triple line of defences blocking the upper ridge (having similar widths and depths), no reason to call them terraces. Moreover, the information provided by Székely that the anthropic deposit measured 1 m is valid only for a very small area, stretching with no more than 2 m around the stone wall, and only on the interior side of the enclosure (in fact we noticed in Trench 2 a 1.5 m thick deposit, of which the top 0.55 m were represented by the destruction level of the upper part of the wall). Very probable, the lower part of this deposit (0.55 m in height, of which the lowest 20 cm are represented by burnt soil and rock) is an earlier rampart in which the wall was inserted. In our small trench, the curved arrangement of thin and alternating (as texture) layers belonging to the rampart structure was clearly visible. The magnetic investigation made inside the first enclosure showed that the rampart with burnt core enclosed, in fact, the entire plateau, at least on its southern, eastern and western sides. The contour of the highly magnetic anomaly can be observed at the interior margin of the stone wall. The stone wall was inserted in the plateau margin after it was slightly excavated. When the geophysical prospection will be extended towards north, adjacent to the more complicated defence system of the access saddle, we will try to clarify also rest of the burnt core rampart outline (that is to see if it has the same contour as the first enclosure or if it encircles the entire plateau, including the area of Ditch 3). Few Wietenberg shards were collected by us from the lower part of the rampart, in connection with the burnt soil, while late Iron Age appeared in its upper structure, including in the intermediary layer developed on top of the rampart and under the stone wall destruction level. A sample of burnt wood collected from the upper part of the rampart structure, at the interface with the foundation pit for the wall, delivered a date covering the Augustan period and the 1st century AD. Even if the position for this sample, at *Cece*, does not allow it to function more than a *post quem* chronological marker, the similarity with the date obtained for the same type of rampart, recently investigated at Teliu *Cetatea Mare* in Brașov County, for a sample this time collected from its base (dating the construction moment) might provide an indirect argument for dating it also during the last century of the Iron Age in Dacia.

Relief: rocky promontory, orientated north-south, with three very steep slopes, elevated on the right side of a mountain rapid (Pârâul Cetății/Várpatak), an affluent of Cașin River, in the mountains between Târgu Secuiesc Depression and Cașin Depression. Geological substrate is made of sandstone. The fortified cliff is connected with a rocky ridge going north in straight line for 1 km where it meets a larger east-west ridge. Across the site, over Várpatak river, the morphology of the relief suggests that circulation was possible there, as well, towards south on a connecting ridge till *Perko* Hill where another group of fortified sites of various ages is known. This seems to suggest that *Cece* fortification guarded a passing point over Várpatak. The

[82] ORBÁN, Háromszék, XVIII. Kézdi Sz.-Lélek és környéke.
[83] SZÉKELY 1980.

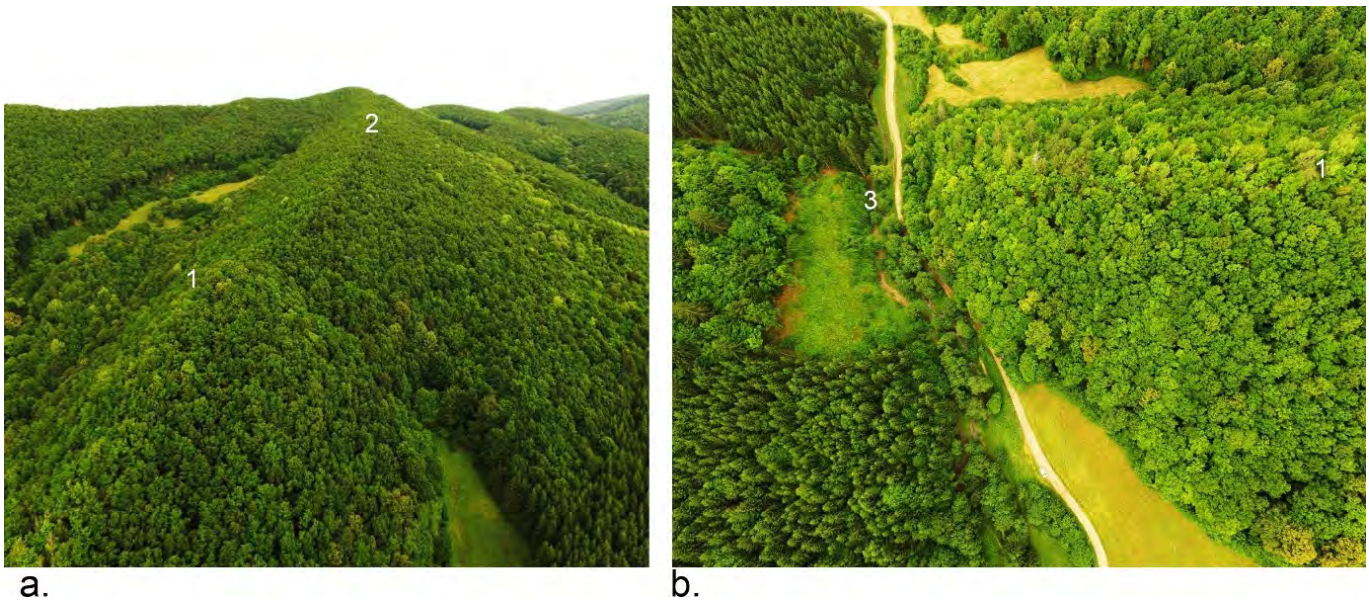

Fig. 39. Sânzieni-Cece, aerial views (2017): a – towards north; b – top view, west up; 1 – site; 2 – ridge road; 3 – V. Cetății stream.

only possible access from Várpatak up is from south-west across a narrow terrace (where Wietenberg and Late Iron age consistent deposits were mentioned by Székely) and then climbs quite abruptly towards the third and most exterior ditch, for ca. 300 m. On the way up, at ca. 25 m before reaching the access saddle cut by Ditch 3, an active spring, with mineral water, (borviz) can be seen.

Connection with a major communication mountain corridor: The site is located on the ridge road linking Târgu Secuiesc Depression with the north (with possible exits towards Ciuc Depression, Cașin Depression or Valea Uzului and the eastern extra-Carpathian space). This is a transit route of secondary significance, not directly related with a major mountain pass.

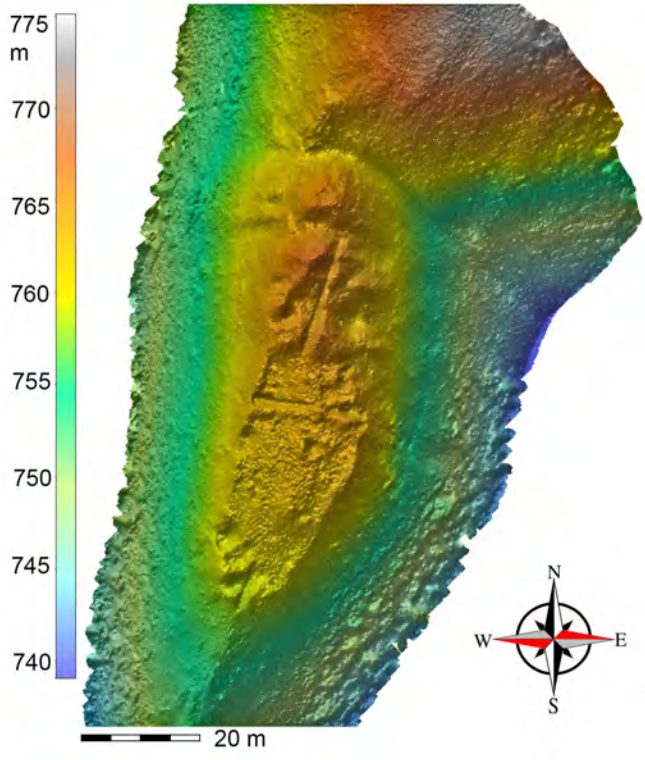

Fig. 40. Sânzieni-Cece, Portable LiDAR DEM; top view.

Site aspect and fortifications: a stone wall, reported to measure between 1.30-1.80 m in width, encloses the upper ridge of the cliff, outlining an elongated, slightly rhomboid shape which follows the terrain morphology orientated roughly on a north-south axis. The resulting enclosure measures (on the wall's exterior) a maximum of 52 x 20 m (thus larger than what Székely reported) and a minimum of 11.7 m in width – in the southern end. The wall is remarkably well preserved, still clearly elevated above the current ground with 20-30 cm. Due to natural terrain morphology, the eastern side of the plateau is in average with 0.80 m higher than the eastern one, while the northern side of the enclosure is with almost 7 m higher. The wall was inserted in the exact margin of the plateau by cutting the exterior side of an earlier deposit composed of three distinct layers accumulated over the native crumbled sandstone, slightly entering beneath the lowest one, in the yellow undisturbed loess, but mostly using this earlier sequence of layers as a lateral support for its lower half. The starting level for the pit has to be confirmed yet in another trench we are planning for the near future. In the current state of the documentation, it seems that the pit might start from a very high level, right under the destruction layer of the wall's upper part (-0.55 m).

Total site surface, including fortification elements	1600 sq. m
Total surface of the inner space of enclosure 1	620 sq. m
Total length of all the walls	Ca. 160 m
Maximum elevation	767 m
Maximum elevation difference with Várpatak	90 m
Maximum slopes	37°-40°
Distance to water (mineral spring)	26 m
Distance to water (mountain rapid)	300 m

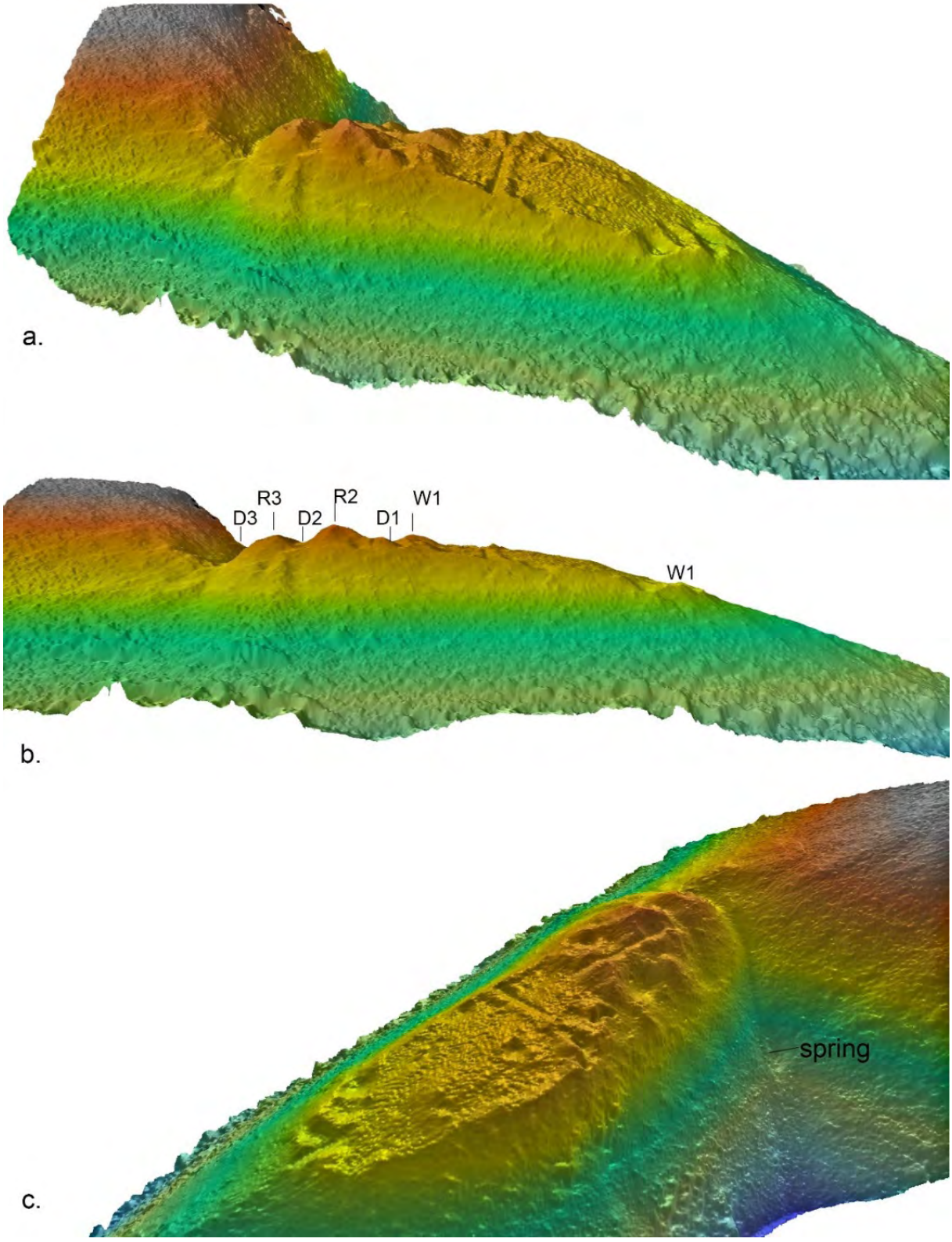

Fig. 41. Sânzieni-Cece, Portable LiDAR DEM; 3D views: a-b – towards east; c – towards west.

But this is not entirely certain due to the challenging forested environment (many disturbing roots) for stratigraphic observations. This high starting level would fit with the eventuality of dating the wall during the Medieval period, as the presence of mortar between the stone rows seem to suggest. However, only the dating of mortar samples could in fact elucidate beyond doubt its chronology, but this has yet to be done. No Medieval artefacts had been found or reported at *Cece* or in its vicinity.

The wall in our trial-trench 2, on the eastern side of the enclosure, is still preserved on 15 unequally dimensioned rows, reaching a total height of 1.63 m. It was assembled of flat sandstones, only roughly cut, but very well fitted at the faces, while the wall core was made of smashed stone and

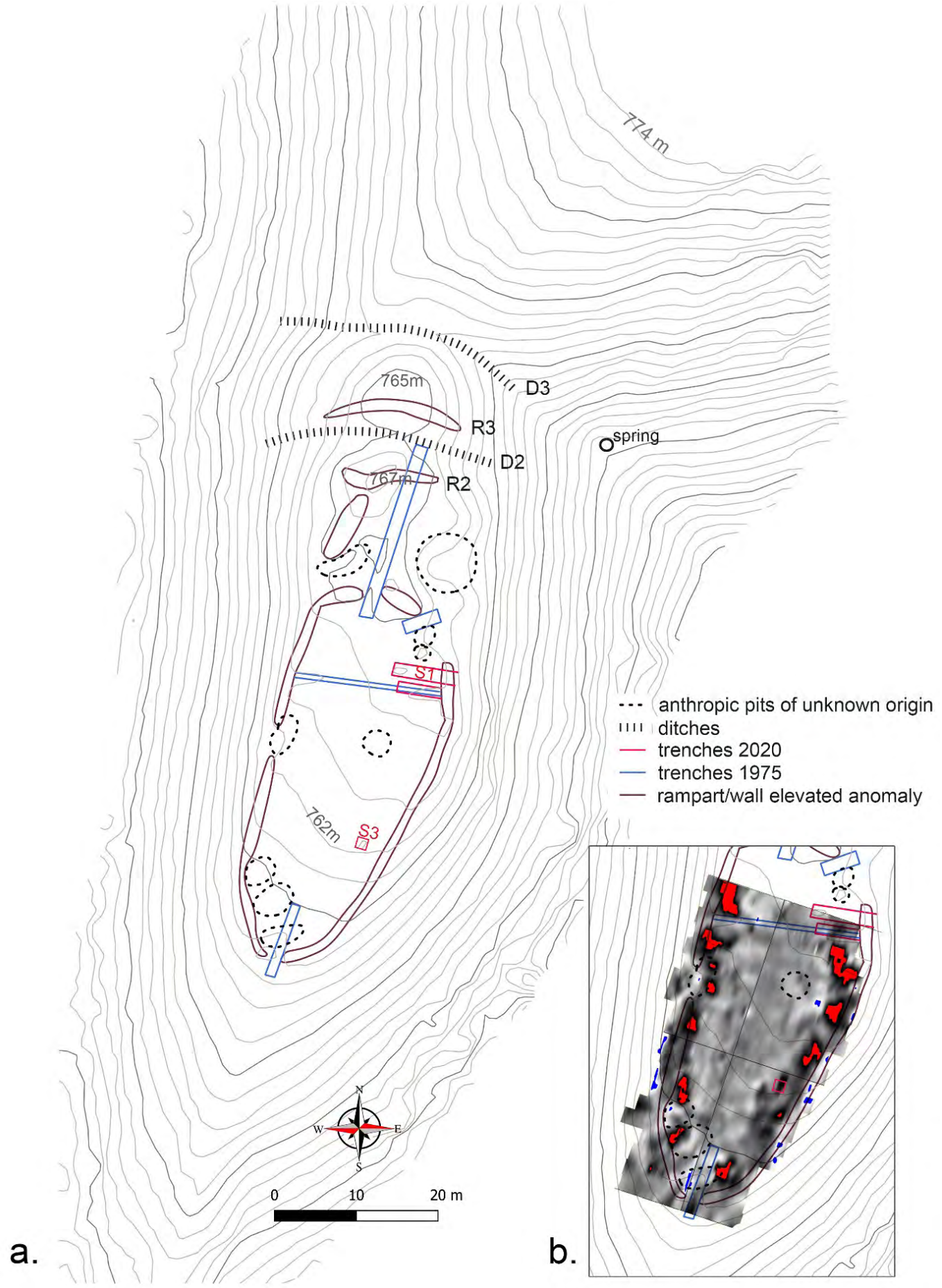

Fig. 42. Sânzieni-Cece, site plan based on the interpretation of LiDAR data, elevation contours at 1 m interval; b – magnetic plot (+/-25 nT/m variation interval).

Enclosures	Width	Height/Depth	Observations
Wall in enclosure 1 in trench 1 (eastern side)	1.60 m		The trench was just opened in its upper side, uncovering the level of the wall debris.
Wall in enclosure 1 (trial trench 2)	1.35	1.63 m	
Rampart in enclosure 1 (north side)	5.5 m	0.60-1.15 m	Measured the corresponding anomaly on LiDAR DEM
Ditch 1	4.3-5.5 m	-0.40-0.65 m	Measured the corresponding anomaly on LiDAR DEM
Rampart 2	9 m	2. 33 m	Measured the corresponding anomaly on LiDAR DEM
Ditch 2	3.8 m	-1.14/2.4 m	Measured the corresponding anomaly on LiDAR DEM, first value in relation with the summit of rampart 3 and the second with rampart 2.
Rampart 3	7.7 m	1.2 m	Measured the corresponding anomaly on LiDAR DEM
Ditch 3		-3.7 m	Measured the corresponding anomaly on LiDAR DEM in comparison with the summit of rampart 3

earth. The masonry seems the result of a single work stage and does not allow for the identification of phases, at least not in the sector we have researched. The general aspect of the wall resembles Covasna *Cetatea Zânelor* masonry style, with the exception of the mortar binding clearly visible between the stone rows at *Cece*. Fragments of mortar were noticed at the soil surface in the vicinity of the wall, even in areas not excavated yet, on the western side of the enclosure. Large fragments of metallic slag were identified in the upper part of the wall, between construction slabs, in trench 1/2020.

To the north, the enclosure is additionally reinforced with two more ramparts made of stone and earth, of massive proportions (they may be ruined stone walls). Two ditches are also visible, but very probably they were three. The ditch between enclosure 1 and 2 is unclear due to significant soil disturbance in its area. In total, with all the defences, the site stretches along 90 m. Except the most northern ditch and wall, the rest of the fortification elements (not recognized as being enclosures by Z. Székely) were cut through by Z. Székely, but their stratigraphy remained unpublished. Several other even older interventions pits affecting the walls can be observed on the entire site's surface.

LiDAR contribution: It allowed obtaining good quality documentation of the terrain morphology, progressing from the idealized sketch of Székely to a correctly spatially projected site plan. The portable LiDAR allowed a very good resolution of the terrain model, making possible the mapping of all the various disturbances present on the site's surface.

Magnetic Investigation: A surface of 786 sq. m was investigated on the southern plateau using the magnetic method. The interpolated plot, ranging in the interval +/-25 nT/m, evidences a large linear high magnetic anomaly (ca. 2-2.8 m wide), encircling the margins of the southern plateau. Its layout appears on places discontinuous, however, the site was affected by numerous recent anthropic disturbances (at least in the last century) which could have caused such results. This magnetic anomaly was verified in trench 2/2020. It corresponds with a rather small dimensioned rampart with a core of burnt soil, built directly on the native rock. The stone wall was fitted in its margin which was thus cut. Several circular pin-pointed magnetic anomalies can be observed on the plateau, as well. They will be in the future explored through excavations.

C14 sample[84]

Sample	Material	Data BP (error)	Date calBC 2σ
DeA-28255	charcoal	**1960 ± 25**	cal BC 34 – 15 (4.5%) cal AD 6 – 124 (90.9%)

Bibliography: ORBÁN, Háromszék, XVIII. Kézdi Sz.-Lélek és környéke; FERENCZI 1929, 244; SZÉKELY 1976-1977, 53, 77, fig. 2 (site plan); 1980; 1981. 22-26, fig. 4 (stratigraphy), 5 (fibula).

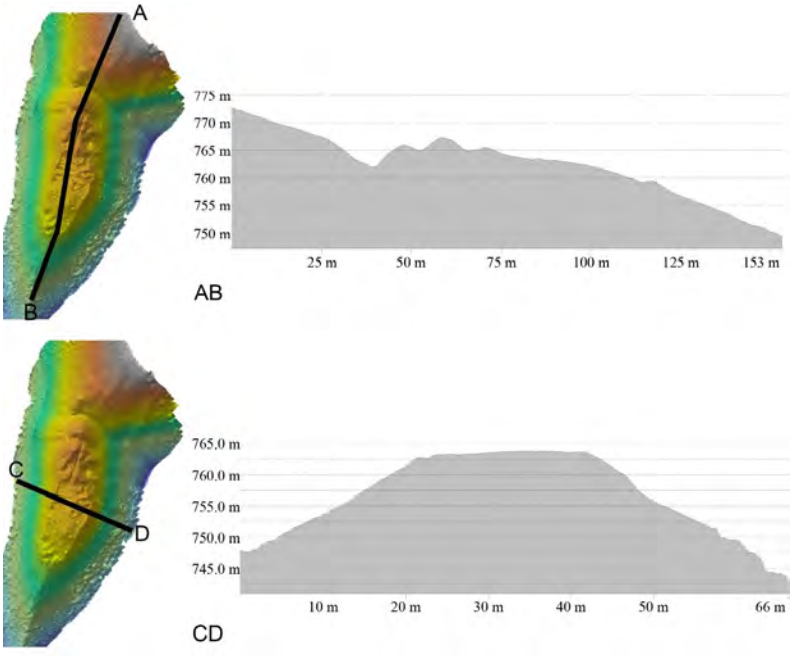

Fig. 43. Sânzieni-Cece, elevation profiles calculated on the LiDAR DEM.

[84] AMS 14^C age determination at Radiocarbon Laboratory from Isotoptech Zrt. Debrecen.

12. Teliu, *Cetatea Mare*, Brașov County

RAN: 42067.01 - recorded in RAN, but not in the correct position

Location: 45° 42' 03.1806" N, 25° 51' 43.3348" E

Forested: fully forested

Site type: hill-top site fortified with ditches and ramparts; faint anthropic deposit; repeatedly occupied; adjacent to a main ridge road; ramparts built with highly burnt soil.

Chronology: late 1st c. BC – 1st c. AD (the visible fortification elements and fragmented pottery in a layer deposit without pits/fireplaces/dwellings, etc.) superimposing a previous Hallstatt C-D rampart on the most southern plateau (according to C14 samples); consistent traces of Schneckenberg pottery (artefacts in secondary position, just on slopes, no features); isolated Wietenberg and Medieval pottery shards and one entire Eneolithic vessel, without context or corresponding deposit.

Identification: **Lost & Found**; known since the late 19th century[85], with important excavations in the 1960s and 1970s by A. D. Alexandrescu and I. I. Pop[86]; since then, though, the place got forested and the precise site's location remained ambiguous. The identification of the site location was possible only on LiDAR derived terrain models (during late 2018), field verified and confirmed in February 2019. New excavations in 2019 by the authors. A prior field visit in the area, in April 2015, even if supported by UAV explorations, did not provide conclusive results, due to the thick evergreen canopy and relief alteration through quarries.

Initial Issues: ambiguous localisation; uncertain chronology of the fortification elements; unclear type of site, especially in relation with the ramparts with burnt soil core; no investigations in the last 45 years.

Total site surface, including fortification elements	2 ha
Total surface of the inner space of the upper plateaus enclosed by ramparts	Ca. 6000 sqm
Total length of the enclosures	At least 670 m
Maximum elevation	643.2 m[87]
Maximum elevation difference with surrounding terrain	95 m
Maximum slopes	25°-28°
Distance to water	150 m

Relief: promontory with three steep slopes, elevated above the intersection of two waters, in the margin of Brașov depression.

Connection with a major communication mountain corridor: the site has to be connected with one of the exits of the Buzău Road through Întorsura Buzăului Depression, crossing *Pilișca* massive. Before the opening of the circulation along Teliu valley, in the beginning of the 20th century, people travelled on the west-east orientated ridge parallel with the valley. Traces of old roads visible on LiDAR data and historical cartographic materials support this interpretation.

Site aspect: an approximately 310 m long ridge, quite narrow (42-35 m), with surface rock outcrops; surrounded by ditches and ramparts with burnt soil core; divided internally through lines of ditches and ramparts (one double) in four sectors. Our recent integrated analysis[88], including LiDAR, excavation, geophysical and radiocarbon dating, suggested that this entire construction should be dated in the Augustan period and that the soil fired at very high temperature, found in the composition of almost all the ramparts, lays in secondary position and cannot be the result of an accidental burning of a palisade, but of an intentional construction programme.

LiDAR contribution:
The LiDAR based analysis helped us identify the site's precise location, opening the way for new pin-pointed field explorations (undertaken in August 2019): investigation with K-meter and magnetometer, trial trench through the fortification system of the southern plateau and C14 dating of burnt wood samples.[89] The LiDAR models exposed the

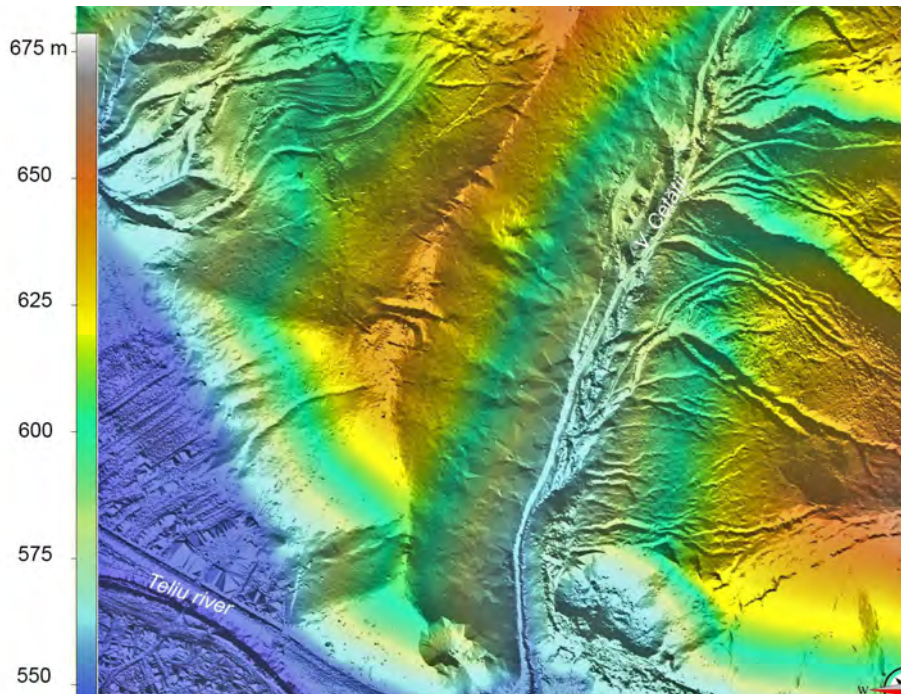

Fig. 44 .Teliu Cetatea Mare, LiDAR DEM.

[85] MARȚIAN 1921, Fig. 28.
[86] ALEXANADRESCU/POP 1989.
[87] 1 In our initial publication (ȘTEFAN/ȘTEFAN/BUZEA 2019) elevation was reported with 37 m higher as provided by the LiDAR data supplier; however here we reported elevations in reference system Black Sea 1975, compatible with the Romanian Topographic Maps dated 1970s.
[88] ȘTEFAN/ȘTEFAN/BUZEA 2019.
[89] ȘTEFAN/ȘTEFAN/BUZEA 2019.

Enclosures	Width	Height/ Depth	Burnt Soil	Obs.
Rampart 1	5-6 m	0.90 m	Yes, confirmed in magnetometry and excavations of Alexandrescu and Pop, as well as in ours. In secondary position, at the rampart base and oblique towards interior, covered by other rampart's layers.	A C14 sample (P12) taken from the construction level was dated broadly 2nd c. BC – early 1st. c. AD. A soil deposit containing 1st c. BC – 1st c. AD pottery, more specific for 1st c. AD (locally produced kantharoi, cooking jars with flared out rims and no handles), covers the interior of the rampart suggesting that some activities occurred after the rampart was built. Another sample from the burnt soil core was dated 4th-3rd centuries BC (P8).
Ditch 1	4 m	-0.45 m		Calculated on Alexandrescu & Pop profile. Outside Rampart 1.
Rampart 2	3-4.7 m	0.75 m	No	Calculated on Alexandrescu & Pop profile.
Ditch 2	7 m	-2.5 m		Calculated on Alexandrescu & Pop profile. Outside Rampart 2.
Rampart 2A - on slopes, beneath Rampart 1	3/3.5 m	0.4/0.65 m	Yes	On the exterior of a narrow terrace corresponding with Ditch 2 layout. Measured on Alexandrescu & Pop's profiles.
Rampart 3	6 m	0.25 m	Yes	Calculated on DEM.
Ditch 3	5 m	-0.65 m		Calculated on DEM.
Rampart 4	4.5 m	0.35 m	Yes	Calculated on DEM, no published profiles.
Ditch 4	3.5/4 m	-1.16 m		Calculated on DEM, no published profiles. Burnt soil from the destroyed rampart in its filling
Rampart 5			?	Not visible on DEM.
Ditch 5	5 m	0.35 m		Calculated on DEM.

complexity of the anthropic terrain modifications, leading to the assembling of a new site plan enhanced with additional, previously unknown elements (a fifth line of enclosure towards north, longitudinal connections on the slopes between the ditches visible on the upper ridge) and, thus, to show that the site surface was, in fact, double than previously thought and that the enclosures were encircling the entire site, lower, on its slopes, not just blocking a ridge access. Before the LiDAR based exploration, the site was believed to be composed just of a main plateau elevated above three steep slopes, surrounded with a rampart (and a ditch only towards north), continued on its fourth side with a ridge cut by three more short defence lines composed of ditches. Various visualisations models of the terrain model, especially PCA, have evidenced that below the main plateau, on the western slope there is a second enclosure similar to a levelled terrace derived from Ditch 2, while on the eastern slope, a similar anomaly seems derived from Ditch 1. These levelled areas measure 1.5 m in width. Corroborating this information with data known from the 1960-1970s excavations, we should understand that towards the exterior, these levelled linear anomalies on slopes were doubled by ramparts with burnt soil core. They could be terraces or just trails reserved for walking behind the enclosing ramparts. The situation appears similar for the next segment of the enclosure located on the ridge towards north, between ditches 2 and 4 – with linear anomalies visible very low on the slopes, beneath the ridge. The discontinuities in the most northern LiDAR anomaly corresponding with the continuation across the slopes of ditch 5 might be explained due to the fact that the slopes are quite steep and the forest thick and therefore the LiDAR resolution low (and erosion high).

The LiDAR analysis allowed, as well, a proper understanding of the surrounding relief's micro morphology revealing the logic of the roads' network and the relation of the site to this network. *Cetatea Mare* was not crossed by the main road, but developed adjacent to it, in a position with visibility focused more on the western lowlands than on the upper hilly ridge. In comparison, the neighbouring Medieval (most probably) fortification at *Cetatea Mică*, was located in the beginning of a ridge route climbing north – a variant branched from the main road following *Pilișca* Hill.

Magnetic Investigation: The most southern plateau of *Cetatea Mare* was almost completely investigated (by the authors, in 2019) with geophysical means. A surface of 2800 sq. m was surveyed with a Bartington gradiometer. The main results are the confirmation that the entire plateau was surrounded with a rampart, even if now the topography is less clear. The rampart was not located on the plateau margin, but with 2.5 m lower, on the slopes. The rampart had a core of highly burnt soil, clearly visible in the magnetic plot. At least two openings can be observed. The interior of the plateau evidence only three magnetic anomalies that could have as origin anthropic features, but they were not explored yet. Overall, the activities carried on in the past in the site do not seem to have left significant traces. Magnetic investigations should be continued on site in order to explore our hypothesis that also the rest of the ridge, between the known ditches, was enclosed with ramparts with burnt soil core, built on slopes.

C14 samples[90]

Sample	Material	Data BP (error)	Date calBC 2σ
P8	Burnt wood	2232 (35)	386– 204 calBC (95.4%)
P9	Burnt wood	2533 (36)	800 – 727 calBC (35.1%) 718 – 706 calBC (1.3%) 695 – 541 calBC (59%)
P12	Burnt wood	2043 (35)	166 calBC – 27 calAD (94.4%) 42 – 47) calAD (1%)

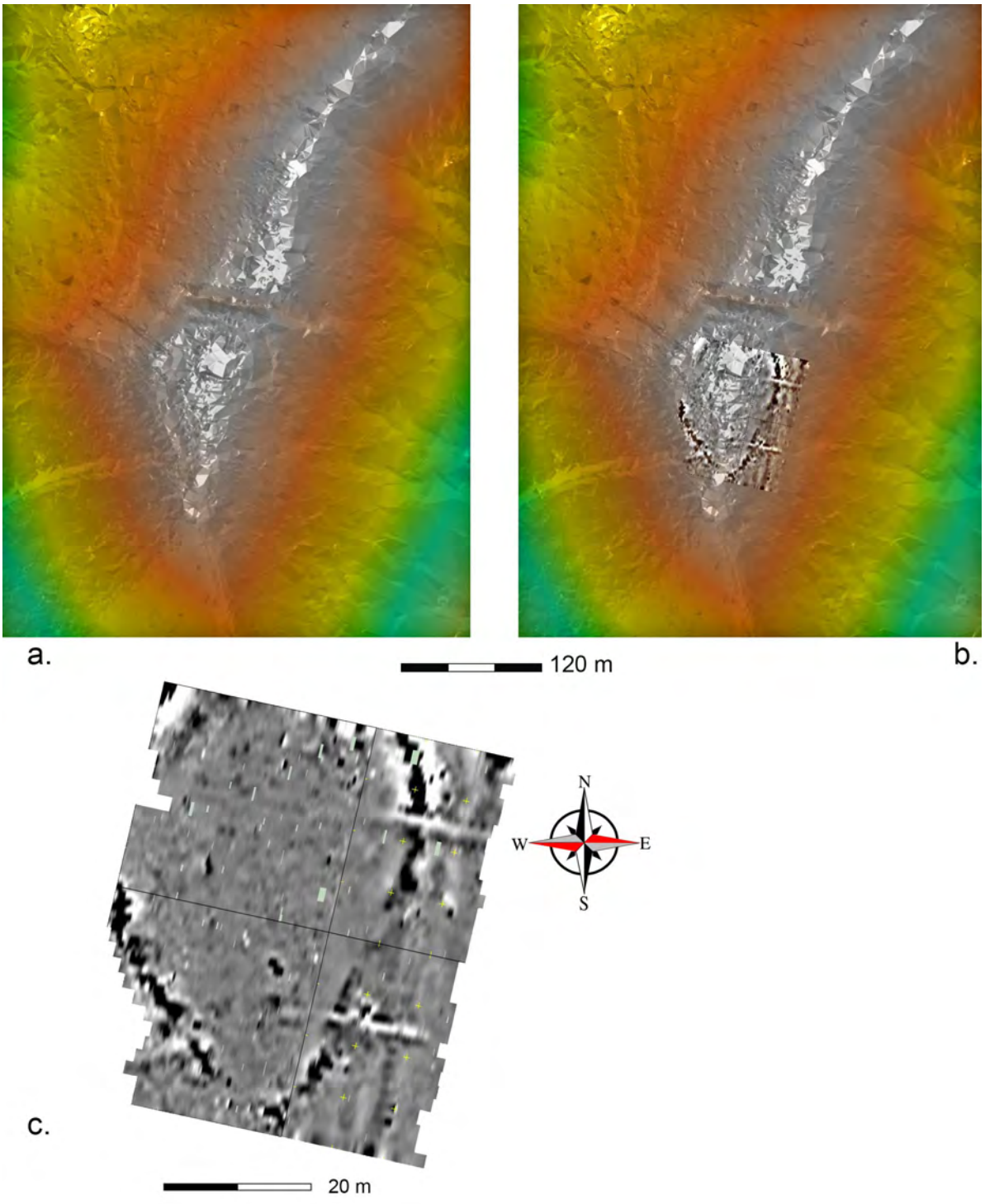

Fig. 45. Teliu Cetatea Mare, a-b top views of the southern plateau; c – magnetic plot.

[90] AMS C^{14} age determination at RoAMS Laboratory from IFIN-HH, Măgurele.

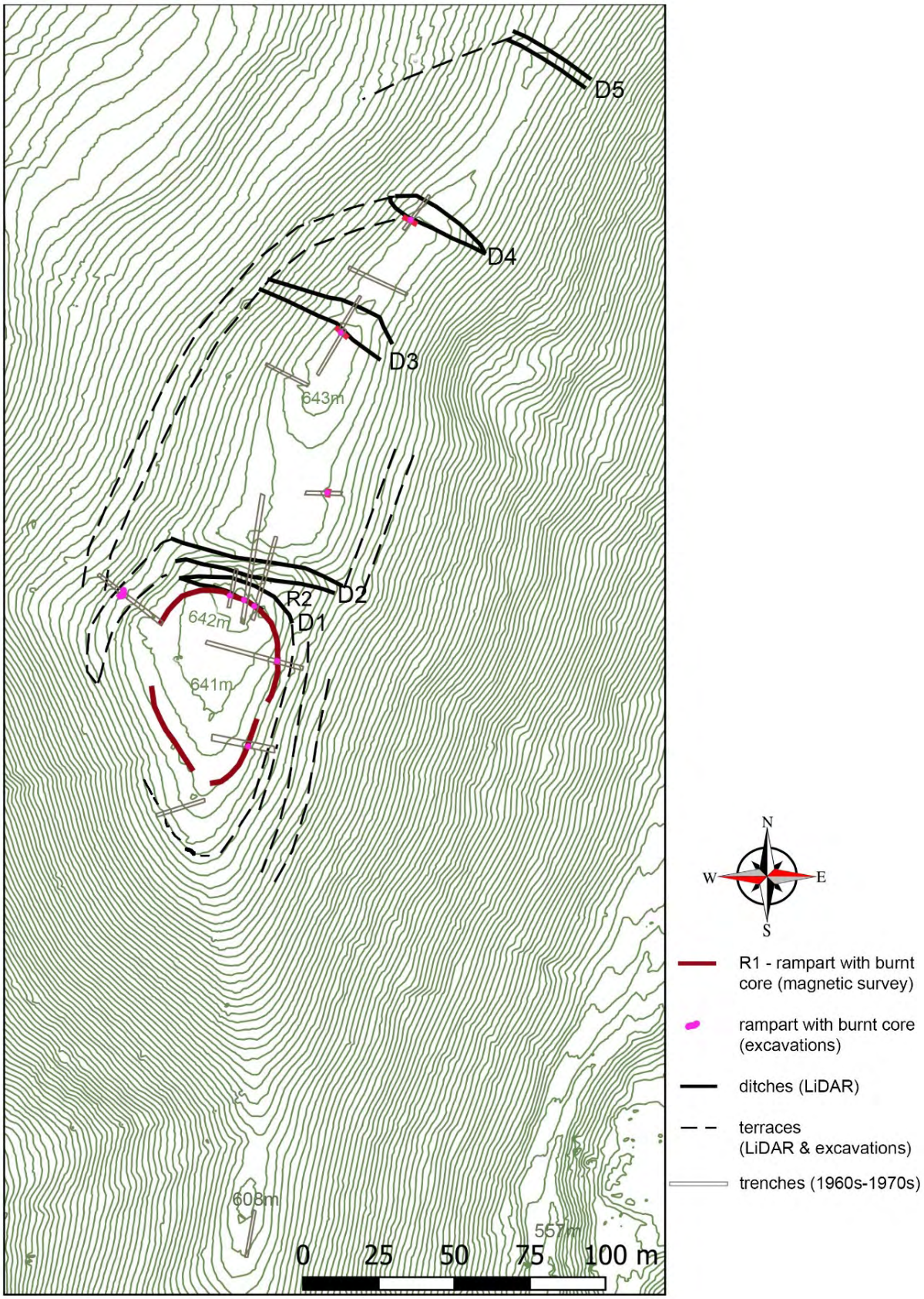

Fig. 46. Teliu Cetatea Mare, site plan based on LiDAR, geophysical prospection and integration of older excavations data.

Bibliography: MARȚIAN 1921; HORWARTH 1944; ALEXANDRESCU/POP 1989; ȘTEFAN/ȘTEFAN/BUZEA 2019.

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REFERENCES

ALEXANDRESCU/POP 1989

Alexandrescu, A. D./Pop, I.I., Cetățuia dacică de la Teliu, jud. Brașov, *Cumidava* 14, 10-22.

ARDEU *et alii* 1997

Ardeu, A./Badea, A./Bălos, A./Costea, Fl./Țuțuianu, Fl., Racoș | Județ: Brașov | Punct: Piatra Detunată, Dealul Vărăriei (Meszes)| Anul: 1997, *Cronica cercetărilor arheologice din România. Campania 1997*, http://cronica.cimec.ro/detaliu.asp?k=543 (visited 20.04.2021).

ARMIT 2007

Armit, I, Hillforts at War: From Maiden Castle to Taniwaha Pā, *Proceedings of the Prehistoric Society* 73, 25-38.

BOWDEN/MCOMISH 1987

Bowden, M./McOmish, D., The required barrier, *Scottish Archaeological Review* 4, 76–84

CAVRUC 1998

Cavruc V. (ed.), *Repertoriul Arheologic al Județului Covasna* (Sfântu Gheorghe: Muzeul Carpaților Răsăriteni).

CAVRUC 2000

Cavruc, V. (ed.), *Repertoriul Arheologic al Județului Harghita* (Sfântu Gheorghe: Editura Carpații Răsăriteni).

CAVRUC 2005

Cavruc, V., The Ciomortan Group in the light of new researches, *Marmatia* 8 (1), 81-123.

COSTEA 2004

Costea, Fl., *Repertoriul Arheologic al Județului Brașov* (Brașov: Editura C2 design).

COSTEA, BĂLOS 1996

Costea, Fl., Bălos, A., Cercetările arheologice de la Racos - „Piatra Detunată", Campania 1995 (epoca dacică), *Cumidava* 20, 41-64.

COSTEA *et alii* 2006

Costea, Fl./Bălos, A./Savu, L./Ardevan, R./Ursuțiu, A./Șoneriu, I./El Susi, G./Ciută, B.D./Ștefan, D.,/Ștefan, M.M., *Augustin Tipia Ormenișului: Județul Brașov*. Monografie Arheologică 1 (Brașov: Editura C2 Design).

COSTEA *et alii* 2015

Costea, Fl./Bălos, A./Sîrbu, V./Ștefănescu, R./Savu L./Gonciar, A., *Racoș – Piatra Detunată, județul Brașov.* Monografie arheologică (I). Epoca Bronzului: cultura Wietenberg (Brașov: Muzeul Județean de Istorie Brașov).

COWLEY *et alii* 2019

Cowley, D./Fernández-Götz, M./Romankiewicz, T./Wendling, H. (eds.), *Rural Settlement. Relating Buildings, Landscape, and People in the European Iron Age* (Leiden).

CRIȘAN 2000

Crișan, V., *Dacii din estul Transilvaniei* (Sfântul Gheorghe: Editura Carpații Răsăriteni).

CRIȘAN/MOLNAR 1994

Crișan, V., Molnar, E., Mereşti | Județ: Harghita | Punct: Dâmbul Pipaşilor | Anul: 1994, *Cronica cercetărilor arheologice din România* 1994, http://cronica.cimec.ro/detaliu.asp?k=23 (visited 22.04.2021).

CRIȘAN/DĂRVAȘ/POPESCU 2001

Crișan, V./Dărvaș, L./Popescu, M., Mereşti | Județ: Harghita | Punct: Dâmbul Pipaşilor | Anul: 1994, *Cronica cercetărilor arheologice din România* 2001, http://cronica.cimec.ro/detaliu.asp?k=1431 (visited 22.04.2021).

CRIȘAN *et alii* 2003

Crișan, V./Ignat, M./Dărvaș, L./Magyari, E./Popescu, M.C./Trandafir, R., Mereşti | Județ: Harghita | Punct: Dâmbul Pipaşilor Anul: 2003, *Cronica cercetărilor arheologice din România* 2003, http://cronica.cimec.ro/detaliu.asp?k=2290 (visited 22.04.2021).

DIMITROVA 2008

Dimitrova, Y., From Late Bronze to Early Iron Age - Thracian Sanctuaries in Eastern Rhodopi Mountain – Bulgaria, *ANODOS. Studies of the Ancient World* 6/2006-2007 (2008), 493-507.

FERENCZI 1938

Ferenczi, Al., Cetăți antice în județul Ciuc, *Anuarul Comisiunii Monumentelor Istorice Secția pentru Transilvania* 4 (1932-1938), 237-352.

FERENCZI 1929

Ferenczi, Al., Raport asupra unei excursii arheologice in județul Trei Scaune, *Anuarul Comisiunii Monumentelor Istorice*, 1926-1928, 242-246.

FLOREA 2011

Florea, G., *Dava et Oppidum. Débuts de la genèse urbaine en Europe au deuxième âge du Fer* (Cluj Napoca: Acad. Roumaine, Centre d'Études Transylvaines).

GOGÂLTAN 2016

Gogâltan Fl., Building Power Without Power? Bronze Age Fortified Settlements on the Lower Mureș Basin. In: Gogâltan Fl./Cordoș, C. (eds.), *Prehistoric Settlements: Social, Economic and Cultural Aspects. Seven Studies in the Carpathian Area* (Cluj-Napoca: Mega).

HINGLEY 1984

Hingley, R., The archaeology of settlement and the social significance of space, *Scottish Archaeological Review* 3(1), 22–7

HLOŽEK/MENŠÍK/PROCHÁZKA 2019

Hložek, J./Menšík, P./Procházka, M., An Overview of Southern Bohemian Hilltop Settlements from Prehistory to the Late Middle Ages, *Archaeologia Lituana* 19, 34–61.

HORWARTH 1944

Horwath, W., Wallburgen aus dem Burzenlande, Mitteilungen des Burzenländischen Sächsischen Museums 5. Jg., Kronstadt, 36-39.

JÁNOVITS 1999

Janovits, I., Noi periegheze arheologice din depresiunea Ciucului, *Angvstia* 4, 121-150.

KAVRUK *et alii* 2008

Kavruk, V./Buzea, D.L./Garvăn, D./Munteanu, R.E., Leliceni, com. Leliceni, jud. Harghita. Punct: Muntele cu piatră – Kőhegy. In: *Cronica Cercetărilor Arheologice din România. Campania 2007* (București), 181-182, 381.

KAVRUK *et alii* 2017

Kavruk, V./Ștefan, M.M./Buzea, D.L./Ștefan, D./Bordi, Z.L., O analiză etnografică și arheologică a rutelor de aprovizionare cu sare din Sud-Estul Transilvaniei / An Archaeological and Ethnographic Network Analysis of Salt Supply Routes in South-Eastern Transylvania, *Istros* 23, 381-430.

LAHARNAR/LOZIĆ/ŠTULAR 2019

Laharnar, B./Lozić, E./Štular, B., A structured Iron Age landscape in the hinterland of Knežak, Slovenia. In: Cowley, D./Fernández-Götz, M./Romankiewicz, T./Wendling, H.

(eds.), *Rural Settlement. Relating Buildings, Landscape, and People in the European Iron Age* (Leiden), 263-271.

LÁSZLÓ 1993

László, A. Aşezări întărite ale culturii Ariuşd Cucuteni în sud estul Transilvaniei. Fortificarea aşezării de la Malnaş Băi, *Arheologia Moldovei* 16, 33–50.

LELOCH *et alii* 2021

Leloch, M./Jakubczak, M./Przybyła, M./Pyżewicz, K./Szeliga, M./Wojenka, M./Czajka, G./Kot, M., A multiproxy approach to studying a large prehistoric enclosure in Ojców, Kraków Upland, Poland, *Archaeological Prospection* 2021,1-21.

MACREA *et alii* 1951

Macrea, M./Buzdugan, I./Ferenczi, G./Horedt, K./Popescu, I./Russu, I. I./Székely, Z./Vasiu, N./Winkler, I, Despre rezultatele cercetărilor întreprinse de şantierul arheologic Sft. Gheorghe-Brețcu, 1950, *Studii şi Cercetări de Istorie Veche* II, 1, 115-122.

MARȚIAN 1921

Marțian, I., *Urme din războaiele romanilor cu dacii* (Cluj).

MĂRGINEANU-CÂRSTOIU/APOSTOL 2019.

Mărgineanu, M., Apostol, V., La fortification dace La Cité des Fées (Covasna). Analyse des structures construites, *Caiete ARA* 10, 90-140.

NEKHRIZOV 2005

Nekhrizov, G., Cult Places of the Thracians in the Eastern Rhodopes Mountains (end of the 2nd – 1st millennium BC). In: Bouzek, J./Domaradzka, L. (eds.), *The Culture of Thracians and their Neighbours. Proceedings of the International Symposium in Memory of Prof. Mieczyslaw Domaradzki*, (Oxford), 153-158.

ORBÁN

Orbán Balázs, A Székelyföld leírása, Pesta, 1868. Available online at http://mek.oszk.hu/04800/04804/html/ (visited 22.04.2021).

PARKINSON/DUFFY 2007

Parkinson, W.A./Duffy, P.R., Fortifications and Enclosures in European Prehistory: A Cross-Cultural Perspective, *Journal of Archaeological Research* 15, 2007: 97-141.

PUPEZĂ 2011

Pupeza, P., Murus dacicus, simbol al razboiului sau al pacii?, *Revista Bistriței* 25, 2011: 148-158.

PUȘCAS *et alii* 2019

Pușcaș, C: M./Ferencz, I. V./Stremțan, C.C./Tămaș, T./ Căsălean, A., The amazing architecture of the Dacians. Few thoughts concerning the use of mortars based on new analyses, *Plural. History-Culture-Society* 7/2, 53-67.

PUSKÁS 2016

Puskás, J., Middle Bronze Age Settlement Patterns and Metal Discoveries in the Valley of the Black River. In: Rezi B./Németh, R.E. (ed.), *Bronze Age Connectivity in The Carpathian Basin. Proceedings of the International Colloquium from Târgu Mureș 13–15 October 2016* (Târgu Mureș: Mega), 217-278.

ROMAN/DODD-OPRIȚESCU/JÁNOS 1992

Roman, P.I./Dodd-Opriţescu, A./János, P., *Beiträge zur Problematik der Schnurverzierten Keramik Südosteuropas* (Mainz: von Zabern).

ROMANKIEWICZ *et alii* 2019

Romankiewicz, T./Fernández-Götz, M./Lock, G./ Buchsenschutz, O. (eds.), *Enclosing Space, Opening New Ground: Iron Age Studies from Scotland to Mainland Europe* (Oxford&Philadelphia: Oxbow Books).

SÎRBU/MATEI/DUPOI 2005

Sîrbu, V./Matei, S./Dupoi, V., *Incinta dacică fortificată de la Pietroasa Mică - Gruiu Dării, com. Pietroasele, jud. Buzău* (II) (Buzău: Biblioteca Mousaios).

SÎRBU *et alii* 2021

Sîrbu, V./Ștefan, D./Ștefan, M.M./Teodor, E.S./Cândea, I./ Popa, Al./Măndescu, D./Matei, S., L./Măndescu, D./Savu, L./ Munteanu, R./Buzea, D./Kavruk, V./Croitoru, C./Pandrea, S./Șuteu, C./Ciupercă, B./Garvăn, D./ Vîlcu, A./Isvoranu, Th., Unhiding forested landscapes. The Archaeological Index of South-Eastern Carpathians, *Journal of Ancient History and Archaeology* 8/2, 190-201. DOI: 10.14795/j.v8i2.631

SÓFALVI 2013

Sófalvi, A., Ramparts in the Görgényi, Hargita and Persanyi Mountains. In: Czajlik, Z., Bödőcs, A. (eds.), *Aerial Archaeology and Remote Sensing from the Baltic to the Adriatic* (Budapest), 89-126.

SZÉKELY 1976-1977

Székely, Z., Contribuții la problema fortificațiilor şi formelor de locuire din sud-estul Transilvaniei, *Aluta* 8-9, 52-110.

SZÉKELY 1980

Székely, Z., Cetatea dacică din Valea Caşinului (jud. Covasna), *Cvmidava* 20/1, 23-34.

SZÉKELY 1981a

Székely, Z., Cetăți din epoca bronzului din județul Covasna, *Aluta* 12-13, 21-30.

SZÉKELY 1981b

Székely, Z., Sistemul de fortificare la aşezarea neolitică de la „Tyiszk" şi „Csókás" în satul

Ariuşd (jud. Covasna), *Aluta* 12-13, 39–53.

SZÉKELY 2003

Székely, Zs., Descoperiri privind epoca bronzului şi perioada romană la Cetatea Turia şi la Pasul Oituzului, *Mousaios* 8, 75–85.

SZÉKELY 2012

Székely, Sz. (red.), Zoltán Székely: Lucări alese (Sfântu Gheorghe: Muzeul Național Secuiesc).

SZTÁNCSUJ 2015

Sztáncsuj, S., *Grupul cultural Ariuşd pe teritoriul Transilvaniei* (Cluj-Napoca: Mega).

ȘTEFAN/ȘTEFAN/BUZEA 2015a

Ștefan, M. M., Ștefan, D., Buzea, D.L., Studii de arheologie aeriană în situri dacice din sud-estul Transilvaniei, *Angvstia* 19, 133-162

ȘTEFAN/ȘTEFAN/BUZEA 2015b

Ștefan, M. M./Ștefan, D./Buzea, D.L., A new fortified site in the archaeological landscape of the 1st c. BC – 1st c. AD in the area of Jigodin-Harghita in Eastern Transylvania, *Istros* 21, 499-535.

ȘTEFAN/ȘTEFAN/BUZEA 2015c

Ștefan, M. M./Ștefan, D./Buzea, D.L., From Sites to Landscapes in Late Second Iron Age Eastern Transylvania, *Ephemeris Napocensis* 25, 21-42.

ȘTEFAN *et alii* 2018a

Ștefan, M.M./Buzea, D./Ștefan, D./Kovács, A./Puskás, J., Raport preliminar asupra cercetărilor desfăşurate la Reci-Doboika, jud. Covasna,un sit cu depuneri în gropi din epoca

fierului / Preliminary report on the researches in Reci-Doboika (Covasna county) a 1st millennium BC site with deposits in pits, *Angvstia* 22, 137-166.

ȘTEFAN/ȘTEFAN 2018b

Ștefan, M. M./Ștefan, D., Teledetecție și arheologie montană în Carpații de Curbură. Fortificațiile de la Vârful lui Crai/Remote-Sensing for Mountain Archaeology in the Curvature Carpathians. The Fortifications around Crai's Peak, *Istros* 24, 219-288.

ȘTEFAN/ȘTEFAN 2019

Ștefan, M. M./Ștefan, D., Connected peripheries - North Danube Thrace in the 3rd-4th centuries BC. Exploring settlement patterns in the environs of the ostentatious grave of Peretu, *Peuce S.N.* 17, 27-98.

ȘTEFAN/ȘTEFAN/BUZEA 2019

Ștefan, M. M./Ștefan, D./Buzea, D.L., Noi cercetări asupra fortificațiilor de la Teliu, jud. Brașov / New investigations in the fortifications from Teliu, Brașov County, *Angvstia* 23, 229-256.

ȘTEFAN/ȘTEFAN/BUZEA 2020

Ștefan, M. M./Ștefan, D./Buzea, D.L., Rezultate preliminare ale cercetărilor geofizice și de teledetecție de la Covasna - Cetatea Zânelor. In: Cândea, I. (ed.), *Tracii și vecinii lor în antichitate: arheologie și istorie / The Thracians and their neighbours in antiquity: archaeology and history* (Brăila), 521-534.

URSUȚIU 2006

Ursuțiu, A., Descoperirile aparținând primei vârste a fierului, In: Costea, Fl./Bălos, A./Savu, L./Ardevan, R./ Ursuțiu, A./Șoneriu, I./El Susi, G./Ciută, B.D./Ștefan, D.,/ Ștefan, M.M., *Augustin Tipia Ormenișului: Județul Brașov*. Monografie Arheologică 1 (Brașov: Editura C2 Design), 155-160, Pl. VIII-XXXIII.