MULTIDISCIPLINARY RESEARCH AT THE VRBJANSKA ČUKA SITE NEAR SLAVEJ (PELAGONIA) IN 2016

MULTIDISCIPLINARNA ISTRAŽIVANJA NALAZIŠTA VRBJANSKA ČUKA KOD SLAVEJA (PELAGONIJA) – GODINA 2016.

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The Vrbjanska Čuka is archaeological tell site of the type that is common in the Pelagonian region. It is located approximately 1.3 km south of Slavej and the same distance east of Vrbjani (Pelagonia). The site was excavated from 1979 to 1989, and new multidisciplinary research on the tell started in 2016 and is still ongoing. The recent archaeological excavations took place in a 15 x 10 m trench, where two buildings with ovens, bins and framed cereal processing areas in their interior were recorded. Typical characteristics of the Pelagonian Neolithic were observed in the material culture but also remains from the Classical antiquity and Medieval periods were documented. Apart from the excavation and documentation of archaeological material, in 2016 an archaeobotanical analysis of organic samples was conducted, together with a geomagnetic survey of the whole area, digital topographic modelling of the tell and a 3D reconstruction of its appearance, and also an reconnaisance of the prehistoric sites around Vrbjanska Čuka. This multidisciplinary approach provided new data and a more detailed understanding of the processes through which this settlement developed.

Ključne riječi:
neolitik, Pelagonija, tel, multidisciplinarna arheologija, rekonstrukcija

Arheološko nalazište Vrbjanska Čuka je nalazište tipa tel kakvo je uobičajeno na području Pelagonije. Nalazi se oko 1,3 km južno od Slaveja, a toliko je udaljeno i od Vrbjana (Pelagonija). Nalazište je istraživano od 1979. do 1989. godine, a nova multidisciplinarna istraživanja na ovom telu počela su 2016. godine i još su u tijeku. U nedavnim arheološkim istraživanjima otvorena je sonda veličine 15 x 10 m u kojoj su otkrivene dvije kuće s pećima, jamama za otpatke, ogradama i platformama.

Materijalna kultura je obilježena tipičnim značajkama pelagonijskog neolitika, ali zabilježeni su i ostaci iz antičkog i srednjovjekovnog razdoblja. Osim iskopavanja i dokumentiranja arheološkog materijala, istraživanja iz 2016. su obuhvatila i arheobotaničku analizu organskih uzoraka, geomagnetsku prospekciju cijele površine istraživanja, digitalno topografsko modeliranje tela i trodimenzionalnu rekonstrukciju njegovog izgeda kao i rekognosciranje prapovijesnih nalazišta oko Vrbjanske Čuke. Ovaj multidisciplinarni pristup rezulturao je novim podacima i sveobuhvatnijim razumijevanjem procesa razvoja ovog nalazišta.

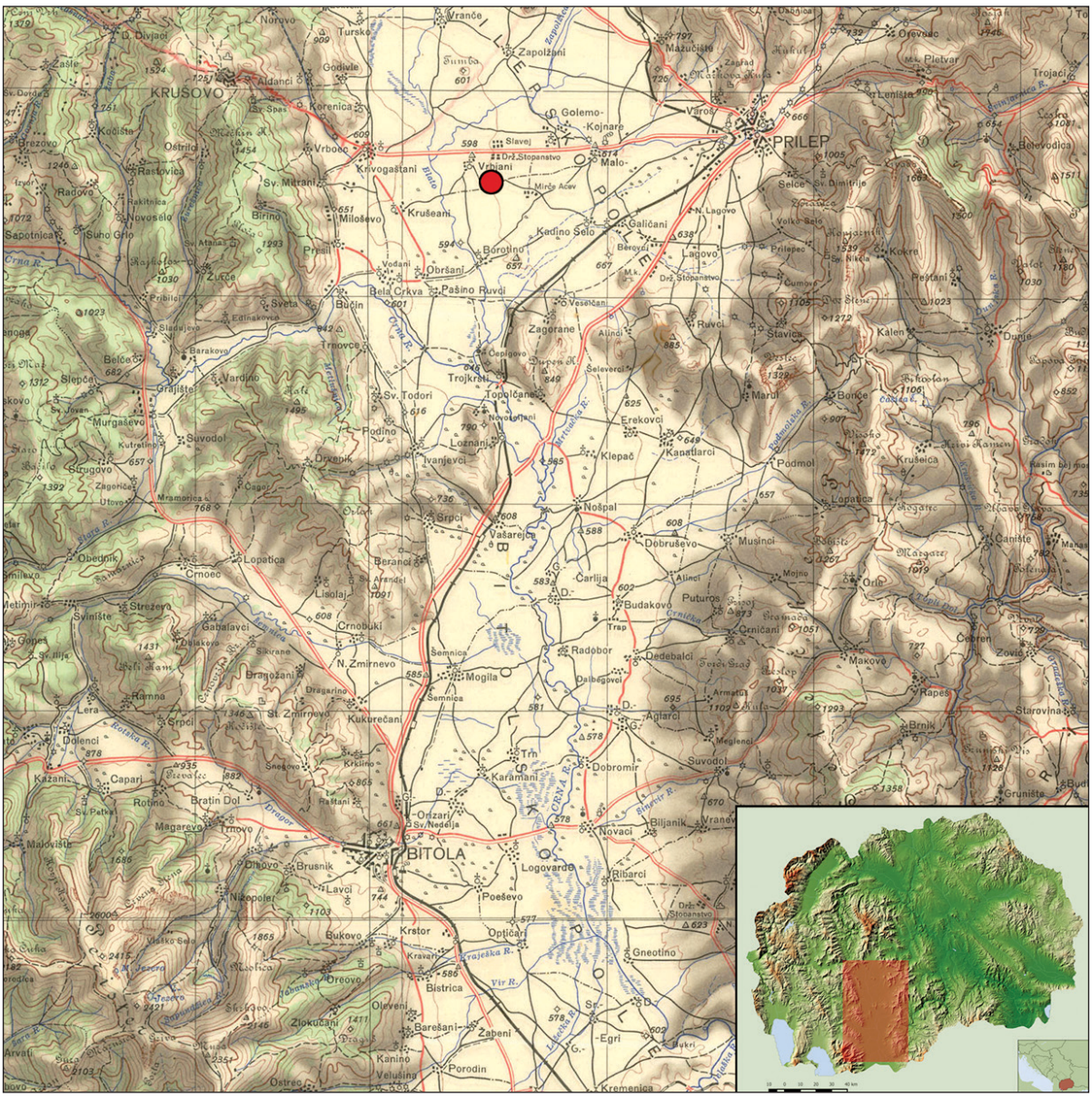
Vrbjanska Čuka represents one of the most distinctive Neolithic settlements in the Pelagonia. It mainly consists of elements typical of the Pelagonian Neolithic but at the same time is distinguished by a series of specific features in terms of its architecture and material culture. The site is located between the villages of Slavej and Vrbjani. This latter is from where the tell gets its name of Vrbjanska Čuka (Fig. 1).[1] The tell is positioned next to the road from Slavej to Borotino, whose construction led to the partial damaging of its eastern part. The tell was also damaged during the 1950s and 1970s when it was used as a place for extracting sand with heavy machinery and a farm was built there. The sand is right under the archaeological layers that have accumulated on top of a naturally formed elevation. This kind of sand is typical of Pelagonia and its occurrence is caused by the existence of a Neogenic lake that dried up and formed alluvial layers.[2] These geological features have provided fertile land from prehistory up to the present but also the formation of large areas of water (marshes, wetlands and small lakes). These are also the result of heavy rainfall, the run-off of the Crna Reka, and the melting of snow from the high mountains that surround Pelagonia.

Such areas of water were attractive to the first farmers that settled this basin and organised their settlements around the wetlands and lakes. The presence of diverse vegetation and fauna, and fertile soil nearby provided a vital basis for the establishment of the first Neolithic settlements but also for their further development during the following prehistoric phases.[3] In the late 1950s, the process of land reclamation in Pelagonia started when a network of channels was made to distribute water from the

Vrbjanska Čuka jedno je od najkarakterističnijih neolitičkih naselja na području Pelagonije. Na ovom nalazištu zastupljeni su elementi tipični za pelagonijski neolitik, ali i neke specifične značajke arhitekture i materijalne kulture. Nalazište je smješteno između naselja Slavej i Vrbjani prema kojem je tel nazvan Vrbjanska Čuka (Sl. 1).[1] Tel se nalazi uz cestu Slavej – Borotino koja je djelomično oštetila njegov istočni dio, a ponovo je oštećen i 1950-ih i 1970-ih kada je korišten za vađenje pijeska teškim strojevima i kada je tu izgrađena farma. Pijesak je neposredno ispod arheoloških slojeva koji se nalaze na vrhu prirodne uzvisine. Ova vrsta pijeska je tipična za Pelagoniju, a nastala je kao posljedica isušivanja neogenskog jezera koje je stvorilo aluvijalne naslage.[2] Ove karakteristike geološkog razvoja rezultirale su plodnom zemljom od prapovijesti do danas, ali su također uzrokovale nastajanje velikih vodenih površina (močvare i manja jezera). Obilne padaline, izlijevanja rijeke Crne i otapanje snijega s viših planina koje okružuju Pelagoniju također su pridonijeli njihovom nastanku. Takva vodna područja privlačila su prve zemljoradnike koji su naselili ovu udolinu i podigli svoja naselja uz močvare i jezera. Raznovrsna vegetacija i životinjski svijet, kao i plodno tlo u blizini, osiguravali su osnovne uvjete za daljnji razvoj u sljedećim prapovijesnim razdobljima.[3] Krajem 1950-ih počeo je proces melioracije tla u Pelagoniji kada je izgrađen sustav kanala za navodnjavanje, ali i zbog prevencije nastanka močvara i jezera[4] što je promijenilo okoliš ove doline koji se danas razlikuje od onog neolitičkog. U tome kontekstu nalazište Vrbjanska Čuka, čiji je okoliš danas drugačiji, treba zamisliti

1 The name *čuka* is typical of the part of Pelagonia that belongs to Prilep region and has the same meaning as the word *tumba* (tell), and is usually present in the toponyms of sites in the region of Bitola.
2 M. ARSOVSKI, 1997; J. TRIFUNOVSKI, 1998; N. DUMURDZANOV et al., 2004.
3 D. SIMOSKA, V. SANEV, 1976; M. GARAŠANIN, 1979; V. SANEV, 1994.

1 Termin „čuka" uobičajen je u dijelu Pelagonije oko Prilepa i ima isto značenje kao i riječ „tumba" (*tell*), koja se uobičajeno javlja u toponimima nalazišta s područja Bitole.
2 M. ARSOVSKI, 1997; J. TRIFUNOVSKI, 1998; N. DUMURZANOV et al., 2004.
3 D. SIMOSKA, V. SANEV, 1976; M. GARAŠANIN, 1979; V. SANEV, 1994.
4 M. BOŠEVSKI, 1977; A. RADEVSKI, 2009.



Slika 1. *Karta Pelagonije s naznačenom pozicijom Vrbjanske Čuke* (autori: G. Naumov, Gj. Milevski).
Figure 1 *Map of Pelagonia with the position of Vrbjanska Čuka indicated* (image: G. Naumov, Gj. Milevski).

rivers and at the same time stop the formation of marshes and lakes.[4] This has contributed to noticeable changes in the environment of the valley, which is now rather different from how it was in the Neolithic. Today, the site of Vrbjanska Čuka exists in a different environment without the presence of nearby marshes, small rivers (tributaries), numerous trees and the animals and birds characteristic of a wetland location.

The site was discovered in 1977 during sand

[4] M. BOŠEVSKI, 1977; A. RADEVSKI, 2009.

u okolišu močvara i potoka, obilja drveća te životinja i ptica karakterističnih za močvarna područja.

Nalazište je otkriveno 1977. prilikom vađenja pijeska, kada je i oštećeno (Sl. 2). Tada je zabilježena točna pozicija (1,3 km od Vrbjana i od Slaveja), visina (2,80 m) i približna veličina rasprostiranja (200 x 180 m). Nalazište je zaštićeno i iskopavano u dvije uzastopne kampanje od 1979. do 1982. i od 1987. do 1989. kada su određeni kulturni slojevi iz različitih razdoblja: srednjeg vijeka, antičkog perioda i neolitika (veluško-poro-

Slika 2. *Tel Vrbjanska Čuka, pogled s juga* (foto: A. Murgoski).
Figure 2 *The Vrbjanska Čuka tell, view from the south* (photo: A. Murgoski).

extraction activities that also damaged it (Fig. 2) in the 1980s. Its exact location was documented (1.3 kilometres from Vrbjani and the same distance from Slavej), together with its height (2.80 metres) and approximate area (200 x 180 metres). The site was excavated in two campaigns from 1979 to 1982 and from 1987 to 1989, which demonstrated that the site has cultural layers from different periods, i.e. Medieval, Classical antiquity and a Neolithic phase that belongs to the Velušina-Porodin cultural group.[5] A large building (Building 1) belongs to the Neolithic phase, together with a large clay construction in its interior, which distinguishes the site from other Neolithic settlements in Macedonia.[6] With regard to its material culture, multiple elements characteristic of the Pelagonian Neolithic were recorded, including vessels, anthropomorphic house models, altars, figurines, sling shots, etc. These categories of objects and architecture from Vrbjanska Čuka were also studied individually after the archaeological campaigns, which supplied more detailed conclusions about the characteristics and specifics of this Neolithic settlement.[7]

[5] B. KITANOSKI, 1989; B. KITANOSKI et al., 1990; A. MITKOSKI, 2005.
[6] A. MITKOSKI, 2005; G. NAUMOV, 2013.
[7] D. TEMELKOSKI, A. MITKOSKI 2001; D. TEMELKOSKI, A. MITKOSKI 2005a; D. TEMELKOSKI, A. MITKOSKI, 2005b; A. MITKOSKI, 2005; N. CHAUSIDIS, 2010; G. NAUMOV, N. CHAUSIDIS, 2011; G. NAUMOV, 2015a; G. NAUMOV, 2015b; Z. BLAŽESKA, 2016.

dinska kultura).[5] Jedan veliki objekt (Kuća 1) datira iz ove faze kao i masivna glinena konstrukcija iz njezine unutrašnjosti (spremište za žito) po čemu se ovo naselje izdvaja od ostalih neolitičkih lokaliteta.[6] Dokumentiran je niz elemenata materijalne kulture karakterističnih za pelagonijski neolitik, kao što su posude, antropomorfni modeli kuća, žrtvenici, figurine, projektili za praće itd. Ove kategorije nalaza i arhitekture iz Vrbjanske Čuke su zasebno proučavani nakon iskopavanja kako bi se došlo do što utemeljenijih zaključaka o obilježjima i posebnostima ovog neolitičkog naselja.[7] Terenska iskopavanja, kabinetski rad i laboratorijske analize ponovno su na nalazištu započeli 2016. godine, a traju i dalje, čime su postojeća saznanja o lokalitetu značajno unaprijeđena.[8]

[8] U ovom se radu donose rezultati istraživanja provedenih 2016. Rezultati kasnijih istraživanja objavljeni su u G. NAUMOV et al., 2018a i G. NAUMOV et al., 2018b; G. NAUMOV et al. (u tisku).

Field excavations, cabinet studies and laboratory analysis related with this site has been started with new research campaign in 2016 and it is still ongoing, so that the existing knowledge was upgraded with numerous new data.[8]

ARCHAEOLOGICAL EXCAVATIONS IN 2016

Excavations in 2016 of the Neolithic settlement of Vrbjanska Čuka were carried out as a collaboration between the Center for Prehistoric Research (Skopje), the Museum of Prilep (Prilep), the University of South Bohemia (České Budějovice), and the Institute for Old Slavic Culture (Prilep). The research is focused on the earliest levels of the tell site so that the beginnings of the Pelagonian Neolithic could be detected, and also on the functioning of this settlement positioned in the centre of Pelagonia. This region had a key role in the process of Neolithisation and provides an opportunity to obtain new data for a clear and precise picture of the dispersal of the earliest farmers in Pelagonia.[9] The excavations were located in the settlement's central part, using scientific methods that were not previously applied in this region. These methods provided variety of new knowledge about its formation, the area it occupied, its spatial organisation and the forms of its material culture.

During this season, a small trench of 15 x 10 metres was opened, situated in a north-south direction (Fig. 3). The trench overlapped the previous quadrants from the excavations of Blagoja Kitanoski in the 1980s, and for this

SKI, A. MITKOSKI 2005a; D. TEMELKOSKI, A. MITKOSKI, 2005b; A. MITKOSKI, 2005; N. CHAUSIDIS, 2010; G. NAUMOV, N. CHAUSIDIS, 2011; G. NAUMOV, 2015a; G. NAUMOV, 2015b; Z. BLAŽESKA, 2016.

8 The current paper reflects the results from the research season in 2016, while the results from the following seasons are published in G. NAUMOV et al., 2018a; G. NAUMOV et al., 2018b; G. NAUMOV et al. (forthcoming).

9 G. NAUMOV, 2009; G. NAUMOV, 2015a; G. NAUMOV, 2016.

ARHEOLOŠKA ISKOPAVANJA 2016.

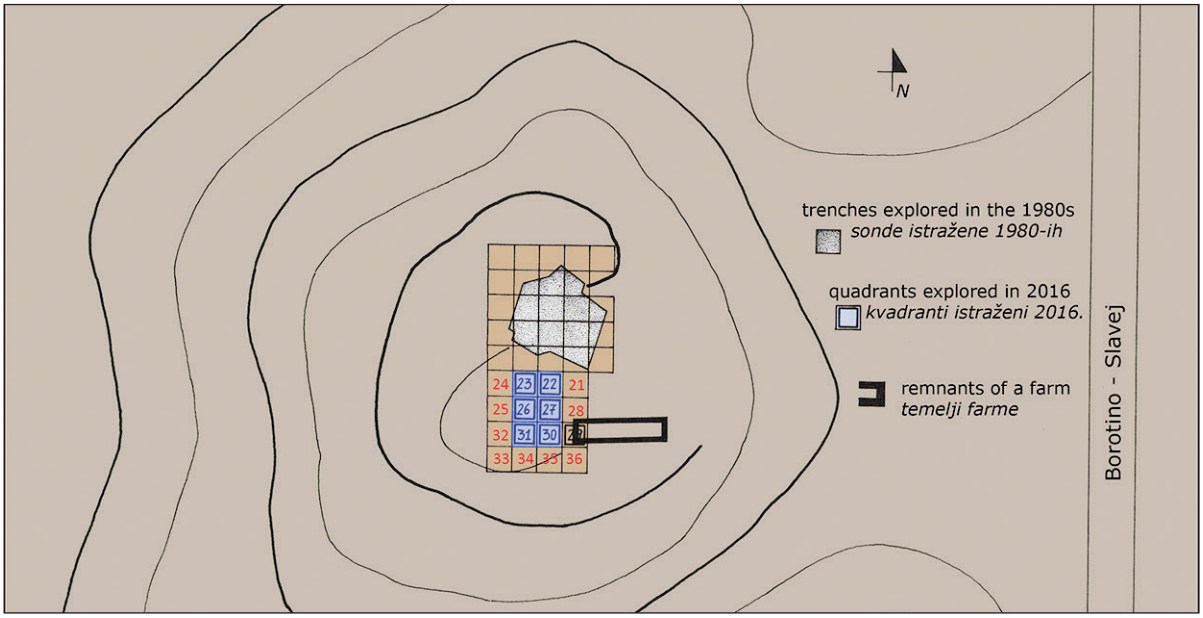
Iskopavanja neolitičkog naselja Vrbjanska Čuka 2016. godine provedena su u suradnji Centra za istraživanje prapovijesti (Skopje), Muzeja u Prilepu (Prilep) te Sveučilišta Južne Češke (České Budějovice) i Instituta za staroslavensku kulturu (Prilep). Istraživanje je bilo usmjereno na najranije slojeve tela kako bi se uočili počeci pelagonijskog neolitika, kao i funkcioniranje naselja koje je smješteno u središtu Pelagonije. Ovo područje imalo je ključnu ulogu u procesu neolitizacije i stoga je dobar izvor novih podataka za jasniju sliku rasprostranjenosti prvih zemljoradnika u Pelagoniji.[9] Iskopavanja su bila usmjerena na središnji dio naselja, uz upotrebu znanstvenih metoda koje se do sada nisu koristile na tom području, kako bi se došlo do novih saznanja o njegovom nastanku i veličini, prostornoj organizaciji i oblicima materijalne kulture.

U ovoj sezoni otvorena je manja sonda veličine 15 x 10 m, u smjeru sjever-jug (Sl. 3). Sonda se preklapa s kvadrantima iz iskopavanja Blagoja Kitanoskog iz 1980-ih pa su stoga zadržani nazivi kvadranata.[10] Istraživana je sonda čije iskopavanje nije dovršeno u prethodnim kampanjama pa je brzo stečen uvid u najstarije slojeve naselja. Također, neki su kvadranti prošireni da bi se dobila kompletna stratigrafija lokaliteta što je bacilo novo svjetlo na slojeve nataložene na vrhu prirodnog pjeskovitog uzvišenja.

Ovakav pristup je omogućio redefiniranje i točno određivanje stratigrafije i temeljito istraživanje ostataka arhitekture i materijalne kulture iz neolitičke faze. Tako je utvrđeno da se ne radi o jednoslojnom naselju, kako se činilo iz prijašnjih iskopavanja, već o složenijem nalazištu s nizom slojeva u tri neolitička horizonta. Zbog kompleksne naravi nalazišta

9 G. NAUMOV, 2009; G. NAUMOV, 2015a; G. NAUMOV, 2016.

10 Tijekom iskopavanja 2016. istraženi su sljedeći kvadranti: 22, 23, 26, 27, 30 i 31.



Slika 3. *Položaj istraženog dijela i raspored kvadranata u sondama* (crtež: A. Mirkoski; obrada: G. Naumov).
Figure 3 *Position of the explored area and disposition of the quadrants in the trenches* (drawing: A. Mirkoski; editing: G. Naumov).

reason the names of the quadrants were kept.[10] The research took place in a trench that had been excavated but not finished, so an insight into the oldest layers of the settlement was quickly established. In addition, some of the quadrants were expanded to determine the whole stratigraphy of the site, which gave a new insight into all the layers accumulated on top of the naturally formed sand elevation.

This approach enabled a redefining and accurate determination of the stratigraphy and a thorough exploration of the architectural remains and material culture from the Neolithic phase. Thus, it became evident that this was not a single-layered settlement, as suggested by previous excavations, but a more complex site that had at least dozens of layers in three Neolithic horizons. Given the complex character of the settlement, it was excavated with the application of a Harris matrix, with each context and layer being documented with separate stratigraphic units. There were approximately 60 of these, documenting each change from the most recent layer to

[10] During the excavations in 2016, the following quadrants were excavated: 22, 23, 26, 27, 30 and 31.

primijenjena je Harrisova matrica gdje je svaki kontekst i sloj dokumentiran zasebnom stratigrafskom jedinicom. Približan broj tih jedinica je 60 i one dokumentiraju svaku promjenu od najmlađih do najstarijih slojeva. Ovakva sistematizacija pruža detaljan uvid u sve kulturne horizonte i odnose između dokumentiranih struktura i pojava.

Osim novog pristupa u arheološkoj metodologiji, tel je u potpunosti dokumentiran GPS točkama pomoću kojih je napravljen digitalni topografski model za dosljedno ilustriranje površine tela. Nalazište i sonda su snimljeni pomoću drona što je dalo ortofotografije njihova izgleda i pružilo detaljniji i jasniji uvid u strukture otkrivene u sondi. Multidisciplinarni pristup ovog arheološkog projekta očitovao se i u arheobotaničkim analizama koje su provedene za organske ostatke iz naselja što je dalo dobre početne rezultate, a uzeti su i uzorci drvenog ugljena i drugih organskih materijala za ^{14}C analizu i AMS analizu.

Nakon iskopavanja i arheobotaničkih analiza izvršen je geofizički pregled tela što je rezultiralo sasvim novom perspektivom u razumijevanju prostorne organizacije naselja i planiranju budućih iskopavanja. U među-

the oldest. Their systematisation provided a detailed insight into all the cultural horizons and the ratio between all the documented structures and phenomena.

Besides this new approach in archaeological methodology, the tell was also fully documented with GPS points from which a digital topographic model was created to illustrate the tell site's area in a consistent manner. The site and the trench were photographed using a drone that provided orthophotographs of their appearance, and a more detailed and clearer view of the structures found in the trench. As part of the multidisciplinary approach of this archaeological project, archaeobotanical analyses were also conducted on the organic remains of the settlement, which in turn provided useful preliminary results. Many samples were retained for this type of analysis, and samples of charcoal and other organic material were also taken for ^{14}C and AMS analysis.

After the excavation and archaeobotanical analyses, a geophysical survey of the tell site was performed, which gave a completely new perspective on the settlement's spatial organisation and planning for further excavations. A 3D model of the site was also produced based on the information from the archaeological excavations and the geophysical survey. This approach provided the opportunity for a thorough hypothetical illustration of this Neolithic settlement and its internal organisation in the first half of sixth millennium BC, and also for the eventual reconstruction of the site.

PRELIMINARY RESULTS FROM THE RESEARCH

As a result of the multidisciplinary approach in the 2016 excavation at the Vrbjanska Čuka site, a large quantity of new and useful data on various aspects of the settlement was obtained. Some of this redefined preliminary results from previous excavations, while on the other hand some added new knowledge to the research con-

vremenu je izrađen 3D model nalazišta na osnovi podataka dobivenih u arheološkim iskopavanjima i geofizičkim prospekcijama. Ovaj pristup pruža priliku za temeljitu hipotetičku prezentaciju ovog neolitičkog naselja i njegove unutarnje organizacije te također moguću rekonstrukciju nalazišta u prvoj polovici šestog tisućljeća pr. Kr.

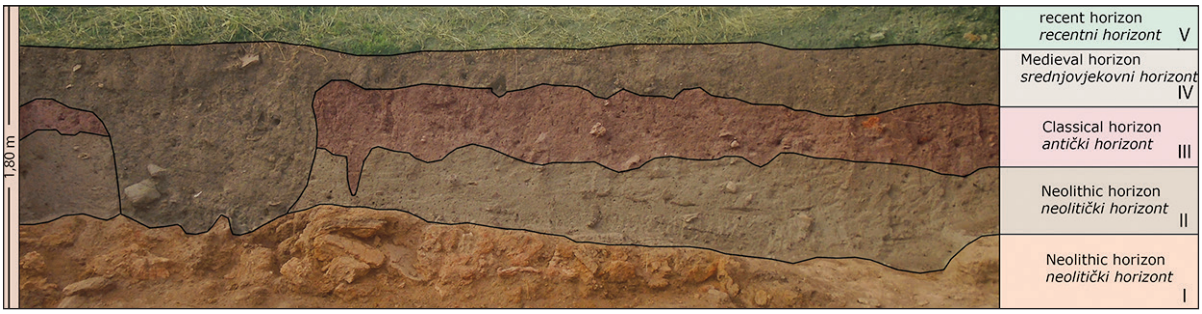
PRELIMINARNI REZULTATI ISTRAŽIVANJA

Ovogodišnja multidisciplinarna istraživanja lokaliteta u Vrbjanskoj Čuki urodila su znatnom količinom novih i korisnih podataka o različitim aspektima života u naselju. Neka od saznanja redefinirala su preliminarne rezultate prošlih istraživanja ili su nadopunila zaključke istraživanja iz 1980-ih. Može se zaključiti da se radi o neolitičkom naselju koje je nakon dugotrajnog hijatusa ponovo naseljeno u antičkom te srednjovjekovnom razdoblju. Na takvu kompleksnu stratigrafiju ukazivali su keramika i ostaci građevinskog materijala dok će arheobotaničke, kronološke i geološke analize preciznije odrediti početke i razvoj naselja u neolitiku. Prema novim podacima može se zaključiti da je bilo pet kulturnih horizonata visine 1,8 m, s višestrukim slojevima koji su rezultat promjena koje su se dogodile u različitim fazama života u naselju (Sl. 4[11]).

STRATIGRAFIJA

Najmlađi horizonti se prepoznaju u površinskim nalazima na telu uključujući posude tipične za recentna stoljeća i srednji vijek. U humusu i profilu sonde pronađen je kostur, točnije ostaci nogu, u smjeru istok-zapad, što

[11] U sljedećim istraživačkim kampanjama 2017. i 2018. zabilježen je još jedan neolitički horizont tako da su na temelju arhitektonskih ostataka utvrđena tri horizonta. G. NAUMOV et al., 2018a; G. NAUMOV et al., 2018b.



Slika 4. *Južni profil sonde i stratigrafija kulturnih horizonata* (foto i obrada: G. Naumov).
Figure 4 *Southern profile of the trench and the stratigraphy of the cultural horizons* (photo and editing: G. Naumov).

ducted during the 1980s. It can be concluded that this is a Neolithic settlement that after a big hiatus was also used in the Classical and Medieval periods. This complex stratigraphy was suggested by ceramic vessels and the remains of building material, although archaeobotanical, chronological and geological analyses will determine the time and climatic processes more precisely for the beginning and development of this settlement in the Neolithic. According to the new data, it can be concluded that there were five cultural horizons with a height of 1.80 m, with multiple layers in them as a result of the changes that happened in different phases of the life of the settlement (Fig. 4[11]).

STRATIGRAPHY

The most recent horizons were identified through surface finds on the tell, including the remains of vessels typical of the last couple of centuries and the medieval period. In the humus and profile of the trench, partially preserved skeleton was found (leg bones) placed in the east-west direction, suggesting this was probably Christian burial. From the data obtained during the excavation, it cannot be confirmed if constructions existed in Medieval cultural horizon, even though the remains of building material were found. In this layer, as in the next, tiles of larger dimensions were found,

[11] In the following fieldwork campaings of 2017 and 2018 another Neolithic horizon is recorded, so that in total three horizons are determined upon the features of architectual remains: G. NAUMOV et al., 2018a; G. NAUMOV et al., 2018b.

ukazuje na kršćanski ukop. Iz rezultata iskopavanja ne može se zaključiti je li bilo građevina u ovom kulturnom horizontu, iako su pronađeni ostaci građevinskog materijala. U ovom i idućem sloju nađene su oveće ploče, ali vjerojatno su u vezi s nekim antičkim objektom. Najmlađi horizonti su obilježeni prisustvom velikog broja jama koje ponekad dosežu neolitičke slojeve. One su probile starije horizonte tako da se u najmlađem horizontu nalazi mnoštvo neolitičke keramike i nešto manje antičkih nalaza koji su izbačeni kad su jame iskopane.

Idući kulturni horizont nije tako jasan, iako je mjestimice u profilu jasno odvojen od srednjovjekovnih i neolitičkih slojeva. Osim ploča i nekoliko ulomaka keramike drugih nalaza nije bilo, ali pronađeni materijal ukazuje da je ovaj horizont pripadao antičkom razdoblju.[12] U njemu nije bilo temelja i zidova tipičnih za antičke građevine za razliku od veće količine zapečenog lijepa iz neolitičkih kuća koji je izbačen kad su iskopavane jame u antičkom razdoblju. Prema dimenzijama tela može se pretpostaviti da je na ovom mjestu postojala *villa rustica* ili gospodarska zgrada. Ove pretpostavke mogu biti provjerene samo budućim iskopavanjima.

U najstarijim kulturnim horizontima otkriveno je više slojeva što je rezultat dinamičnog života u neolitičkom naselju. Iako se smatralo da se radi o jednoslojnom lokalitetu, detaljnim

[12] U prijašnjim iskopavanjima ovog horizonta nađene su posude, novčići, kopče, oruđa i imbreksi, datirani od 2. do 4. stoljeća (A. MITKOSKI, 2005).

but it is likely that they are connected to ancient buildings. The presence of many large pits was characteristic of the most recent horizon. In some cases, these go deep into the Neolithic layers, breaking through the older horizons, so that in the most recent horizon a multitude of Neolithic and a few Classical finds, discarded during the digging of the pits, were recorded.

The next cultural horizon is less clear, even though in certain places in the profile it is obviously separated from the Medieval and Neolithic layers. Besides tiles and a few ceramic fragments, there were no further finds. However, according to the uncovered material this horizon belongs to the Classical period.[12] There were no foundations or walls of typical Classical buildings in it, unlike the numerous remains of burned daub obtained from Neolithic houses. According to the dimensions of the tell, it can be assumed that at this time there was a *villa rustica* or building associated with agriculture. This assumption can only be confirmed or rejected through future excavations.

In the oldest cultural horizons, more layers were unearthed as a result of the dynamic life within the Neolithic settlement. Even though it was previously thought that this is a single-layered settlement, detailed observation of the profiles and archaeological contexts revealed further layering. They emerged as a result of the intensive use of the settlement in the first half of the sixth millennium BC. According to the results of the excavations in these horizons, it can be concluded that the settlement was established on the top of a smaller mound composed of thick sand, naturally formed by a Neogene lake. Solid building remains consists of burned wattle and daub as far back as the oldest layers, from which Building 2 and partially Building 4 were excavated. Current observations suggest that the discovered buildings were not built upon each other, as in the case of other Neolithic set-

[12] The data obtained from previous excavations in this horizon, when vessels, coins, buckles, tools and imbrices dated to between the 2nd and 4th century AD were discovered, has also contributed to this view (A. MITKOSKI, 2005).

pregledom profila i arheološkog konteksta utvrđeno je daljnje uslojavanje koje je rezultat intenzivne upotrebe naselja u prvoj polovici šestog tisućljeća pr. Kr. Prema rezultatima iskopavanja u ovim horizontima može se zaključiti da je naselje osnovano na vrhu manje uzvisine od pijeska koji je nastao prirodno kao posljedica neogenskog jezera. Čvrste konstrukcije od pruća i zapečenog kućnog lijepa izgrađene su već u najstarijim slojevima. U ovogodišnjoj kampanji su iskopane Kuća 2 i Kuća 4 (djelomično). Prema dosadašnjim saznanjima otkrivene nastambe nisu bile izgrađene jedna iznad druge kao u slučaju drugih neolitičkih naselja nego jedna uz drugu i bile su razdvojene malom hodnom površinom. Buduća istraživanja bi mogla promijeniti ove pretpostavke, iako stratigrafija profila ne ukazuje da je bilo gradnje iznad Kuće 2.

Otkriveni neolitički ostaci bili su prekriveni debelim slojem kompaktne sivobijele zemlje, iznad kojeg je antički horizont. Stratigrafska istovremenost neolitičkih građevina potvrđena je pokretnim nalazima, posebice keramikom koja je vrlo ujednačena. Njihova kronološka bliskost bit će provjerena budućom analizom nalaza. Što se tiče nalaza iz ovog kulturnog horizonta, ulomci keramike su najbrojniji, osobito oni fine fakture. Među glinenim nalazima ističu se „žrtvenici" tipični za pelagonijski neolitik, kao i projektili za praćke, diskovi i antropomorfni modeli kuća. Figurine i utezi su puno rjeđi, nađeno ih je tek nekoliko. Među kamenim nalazima sječiva od kremena su rijetka dok je broj sjekira i žrvnjeva karakterističnih za ovaj period puno veći. Analiza ostataka škroba provedena je na većini žrvnjeva što je rezultiralo uvidom u prehrambene i gospodarske aspekte u životu zajednice koja je živjela u ovom neolitičkom naselju.

ARHITEKTURA

Već je spomenuto da su u kampanji 2016. otkrivene dvije neolitičke kuće (Kuća 2 i 4), dok u antičkom i srednjovjekovnom razdoblju

tlements, but next to each other, separated by a small horizontal walking area. However, such views could be modified during future research, as the stratigraphy of the profiles does not suggest buildings on top of Building 2.

The unearthed Neolithic remains were covered with a thick layer of compact grey-whitish clay soil, on top of which the Classical horizon was established. In addition to the stratigraphic synchronicity between the Neolithic buildings, there are also movable finds, particularly ceramic ones, which have very similar characteristics. Of course, further research on the inventory will follow in the future and this will confirm or deny their chronological proximity.

As for the findings in this cultural horizon, the most common are ceramic vessels, especially those with fine fabric. Among the clay finds, the distinctive tablets ("altars") of the Pelagonian Neolithic were also found, as well as sling shots, discs and fragments of anthropomorphic house models. Much less frequent are figurines and weights, of which only a few samples were found. Among stone tools, flint tools are very rare, while the number of axes and grindstones is far greater and contains elements characteristic of this period. Analyses of starch residues were performed on most of the grindstones which provided a detailed insight into the nutritional and economic aspects of the community that lived in the Neolithic settlement.

ARCHITECTURE

It was mentioned above that in this research, two Neolithic buildings were revealed (Building 2 and Building 4), while in the Classical period and Medieval layer there were none, although there were tiles and imbrices. Research on Building 2 started in the 1980s. However, excavations were not finished, so the goal was to fully study it and to record the inventory in detail. The eastern part of the house was damaged by the extraction of sand in the 1970s, and in future excavations a detailed insight into this peripheral space is expected.

ostataka arhitekture nije bilo osim nalaza tegula i imbreksa. Istraživanja Kuće 2 počela su 1980-ih, ali su ostala nedovršena pa je cilj bio istražiti objekt u potpunosti i detaljno dokumentirati inventar. Kuća je oštećena u istočnom dijelu vađenjem pijeska 1970-ih pa se više podataka o ovom rubnom dijelu objekta očekuje u budućim istraživanjima.

U istraženom dijelu Kuće 2 dokumentirano je nekoliko pojava koje ukazuju na njenu kompleksnu funkciju, kao što su dijelovi zidova i unutarnjeg inventara npr. peći, jame za otpatke, platforme za obrađivanje žitarica. Istraživanjem je određena točna pozicija objekta (u smjeru SZ-JI), dimenzije (13 x 10 m) te također moguće aktivnosti koje su se događale u kući (Sl. 5).

Osim uništenih zidova s istočne strane dokumentirani su i zidovi sa sjeverozapadne, zapadne i jugoistočne strane kuće. Sadrže karakteristične elemente neolitičkih kuća: čvrstu osnovu od kompaktne žbuke koja je nanešena na niz stupova. Na brojnim ostacima lijepa su otisci stupova i pruća različitih dimenzija koji su služili za ojačanje konstrukcije. Tijekom iskopavanja nađeno je i nekoliko komada opeka od blata čija pripadnost ovom objektu ne može biti potvrđena sa sigurnošću ali definitivno upućuje na upotrebu ove vrste građevinskog materijala koji se rijetko nalazi na neolitičkim objektima u Makedoniji.[13] Što se tiče arhitektonskog inventara iz Kuće 2, pronađene su dvije peći, jedna jama za otpatke, jedna platforma za obradu žitarica i dijelovi kružne strukture čija se svrha još ne može sa sigurnošću utvrditi (Sl. 6).

Ove strukture se nalaze u rubnim dijelovima kuće pa su tako masivna peć i platforma u jugoistočnom dijelu, manja peć i kružna struktura u sjeveroistočnom, dok je jama za otpatke u sjeverozapadnom segmentu. Valja

[13] Ostaci opeka od blata nađeni su na neolitičkim nalazištima Anzabegovo, Madjari i Nea Nikomedeia, što je prema određenim autorima još jedan argument za anadolijske utjecaje na prve zemljoradničke zajednice na Balkanu (M. GIMBUTAS, 1976; G. PYKE, 1996; C. COMMENGE, 2009).

Slika 5. *Istražena sonda iz 2016. i raspored Kuće 2 i Kuće 4* (foto: O. Petkov).
Figure 5 *The explored trench in 2016 and the disposition of Building 2 and Building 4* (photo: O. Petkov).

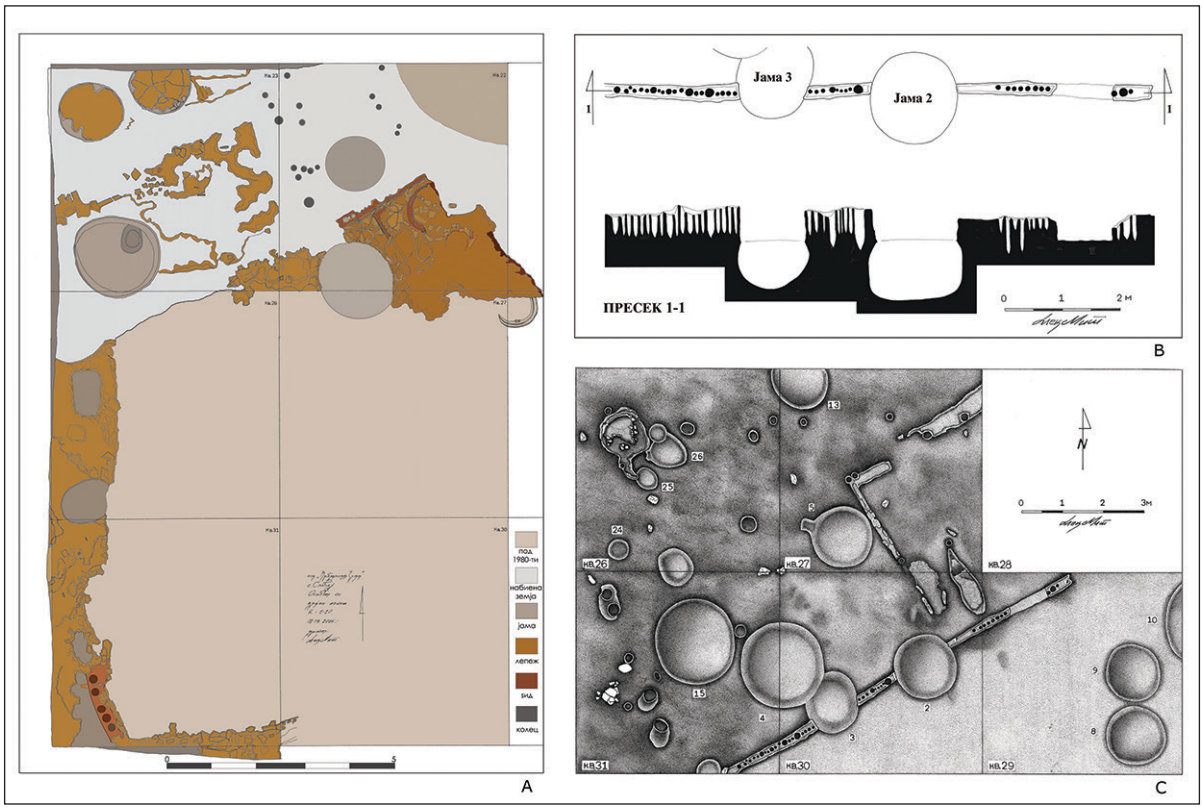
In the excavated space of House 2, several important components of this building were recorded that indicate its complex function, such as part of the house walls and the internal inventory, which consisted of several economic elements (ovens, bins and clay instalations for processing cereals). These provided the precise determination of the building's position (a northwest-southeast direction), its dimensions (13 x 10 metres), and also the activities that took place inside it (Fig. 5).

Besides the destroyed walls from the eastern part, those from the north-western, western and south-eastern parts of the building were also documented. They contain the typical elements of Neolithic buildings, i.e. a solid base of compact plaster applied around a row of posts. On numerous fired daub remains, imprints from posts and rods of different dimensions were found that made up the reinforcement of this building. During the excavations, several pieces of mudbrick were unearthed. It cannot be determined for certain that they belonged to this building, but they definitely suggest the use of a kind of building element that is not often found

naglasiti da su velika peć i platforma kao i manja peć i kružna struktura odvojene od ostatka kuće tankom ogradom ili zidom što ukazuje na gospodarsku funkciju ovog dijela kuće. Nekoliko žrvnjeva i zrna žita sačuvanih u uzorcima tla iz ovog dijela podržavaju tu prepostavku. Povećana koncentracija gareži i pepela zabilježena je u prostoru oko ovih konstrukcija, najvjerojatnije kao posljedica gorenja ili namjernog spaljivanja kuće što je bilo uobičajeno u neolitičkim zajednicama na Balkanu.[14] Prije završetka iskopavanja preostalih dijelova kuće teško je reći je li ovo bila kuća za stanovanje ili veća gospodarska zgrada (radionica), posebice ako imamo u vidu da je veliki dio objekta oštećen antičkim i srednjovjekovnim jamama.

Sjeveroistočno od Kuće 2 zabilježen je još jedan objekt, označen kao Kuća 4, jer je Kuća 3 dokumentirana u iskopavanjima 1980-ih, ali na drugom stratigrafskom ni-

[14] R. TRINGHAM, 1991; J. CHAPMAN, 1999; M. STEFANOVIĆ, 2002; R. TRINGHAM, 2005; D. GHEORGHIU, 2007.



Slika 6. *Tehnički planovi istraženog područja u kvadrantima 22, 23, 26, 27, 30 and 31: a) područje istraženo 2016. s Kućom 2 (peći, parapet, dijelovi sjevernog i zapadnog zida) i Kućom 4 u kvadrantu 23; b) presjek i baza južnog zida; c) područje istraženo 1980-ih s Kućom 2 (južni zid, parapeti, platforma, peć i jama za otpatke)* (crteži: A. Mitkoski; obrada: G. Naumov).

Figure 6 *Technical plans of the explored area in quadrants 22, 23, 26, 27, 30 and 31: a) area with Building 2 explored in 2016 (ovens, parapet, parts of northern and western walls) and Building 4 in quadrant 23; b) section and base of the southern wall; c) area with Building 2 explored in the 1980s (southern wall, parapets, clay instalation, oven and bin)* (drawings: A. Mitkoski; editing: G. Naumov).

in Neolithic buildings in Macedonia.[13] As for the architectural inventory from the Building 2 interior, two ovens, a bin, a clay instalation for processing cereals, and the elements of circular structure, whose purpose cannot be determined at the moment, were recorded (Fig. 6).

These structures are located in the peripheral parts of the house: the large oven and platform are in the south-eastern part, the smaller oven and circular structure are in the north-eastern part, and the bin is in the north-western part. Here, it should be emphasised that the large

[13] Mudbrick remains were found at Neolithic sites in Amzabegovo, Madjari and Nea Nikomedeja, which according to researchers is another argument for Anatolian traditions amongst the first Balkan agricultural communities (M. GIMBUTAS, 1976; G. PYKE, 1996; C. COMMENGE, 2009).

vou, odnosno u mlađim slojevima nalazišta.[15] Kuća 4 se nalazi uz Kuću 2, a obje su okružene uskom linijom zelenkaste zbijene žbuke (Sl. 6). Ovaj objekt je na nešto višoj poziciji od Kuće 2, što može biti posljedica neravne konfiguracije terena tela ili različitih faza izgradnje. Budući da je istražen samo mali dio njene jugoistočne polovice, tek će se u budućim istraživanjima otvoriti njezin veći dio i u potpunosti dokumentirati njezine dimenzije i značajke arhitekture. Za sada možemo zaključiti da se radi o objektu sličnom drugim konstrukcijama otkrivenima u ovom naselju, ali vjerojatno manjih dimenzija na što ukazuju tanji zidovi koji su znatno manji od onih na Kući 2 iako

[15] A. MITKOSKI, 2005.

oven and clay/instalation, and also the smaller oven and circular structure are separated from the rest of the building by a thin fence or wall, indicating the economic function of this part of the house. Several grinding stones and the presence of cereal grains, preserved in soil samples from this part, support this thesis. In the space around these constructions, a large presence of soot and ashes was recorded, most probably the result of a fire or the deliberate burning of the house, a common activity of Neolithic communities in the Balkans.[14] Until the final unearthing of the remaining parts of the building, it is hard to say if this is a house or maybe a larger economic structure (workshop), especially if we consider that a large part of it was damaged by the Classical and Medieval pits.

North-east of Building 2, one more building was recorded. This was named Building 4 due to Building 3 being already documented during the excavations in the 1980s but on a different stratigraphic level i.e. in the more recent layers of the settlement.[15] Building 4 is located next to Building 2, and they are both separated by a small narrow concentration of greyish pressed plaster present around the houses (Fig. 6). The building is set a bit higher above Building 2, which might also be the result of the rugged terrain of the tell and/or a different stage of construction. Since only a small part of its south-eastern half has been explored, it remains for future excavations to unearth a larger area and to fully document its dimensions and architectural characteristics. Currently, it can be concluded that it is a building similar to the other ones discovered in this settlement but most probably of smaller dimensions.

This is indicated by the thin walls, which are considerably smaller than those in House 2, although this assumption should be further prepostavku valja provjeriti u budućim istraživanjima.

Osim jednog tankog zida u smjeru jugozapad-sjeveroistok zabilježena je i jedna dobro sačuvana peć te pravokutna konstrukcija. Također su dokumentirani kalota peći i podloga na kojoj je napravljena. Pravokutna konstrukcija je malih dimenzija i djelomično ulazi u zapadni profil zbog čega joj je teško odrediti funkciju. Na dnu jedne od srednjovjekovnih jama koja prodire duboko u ovaj objekt, otkrivena je velika ravna površina od zapečene zemlje koja bi mogla biti pod Kuće 4 ili neke druge konstrukcije. Nekoliko jama za stupove je otkriveno u sjeveroistočnom dijelu Kuće 4, uz ostatke zapečenog lijepa. Ovi stupovi su raspoređeni u dva usporedna niza, u smjeru SZ-JI. Nabijeni su u kompaktnu sivu zemlju/glinu.

POSUDE

Posude su najčešći keramički nalazi. Za razliku od mnogih drugih neolitičkih nalazišta u Vrbjanskoj Čuki nađena je neuobičajeno velika količina fine keramike. Mogući razlog ove pojave bi mogla biti centralna pozicija kuća u kojima su posude nađene i njihovo istaknuto mjesto u naselju. Ne treba isključiti moguću sklonost lokalne neolitičke populacije prema ovom tipu posuda, posebno ako uzmemo u obzir raznovrsnost oblika načinjenih u ovoj tehnici. Oni odgovaraju tipološkim standardima pelagonijskog neolitika, ali nisu ograničeni samo na omiljene oblike. Među najčešćim predstavnicima ove vrste su crveno obojane zdjelice kakve se često nalaze na pelagonijskim nalazištima, ali ne u tolikom broju kao u Vrbjanskoj Čuki (Sl. 7).[16] Ova vrsta posuda se proizvodila od izuzetno fine gline bez dodataka, pekući se na visokim temperaturama. Što se tiče oblika, osim uobičajenih karakteristika, ponekad imaju masivan bikonični prijelom i blago izvučen rub prema

[14] R. TRINGHAM, 1991; J. CHAPMAN, 1999; M. STEFANOVIĆ, 2002; R. TRINGHAM, 2005; D. GHEORGHIU, 2007.

[15] A. MITKOSKI, 2005.

[16] V. SANEV, 1995; Lj. FIDANOSKI, 2009.

ther examined by future research. Besides one thin wall in a southwest-northeast direction, a smaller, well-preserved oven and a rectangular construction were also recorded. The calotte of the oven and the platform on which it was placed were documented too. The rectangular construction (bin?) has very small dimensions and partly enters the western profile, making it difficult to determine its function. On the bottom of one of the Medieval pits that penetrates deeply into this building, a large flat area of burned clay/daub was discovered that could represent the floor of Building 4 or maybe another construction. Next to the burned daub remains in the north-eastern part of Building 4, several postholes were revealed. These posts were placed in two parallel rows in a northwest-southeast direction. They were crammed into compact grey earth/clay.

VESSELS

The most common ceramic finds are vessels. Unlike many other Neolithic sites, a large quantity of fragments of fine fabric were found at Vrbjanska Čuka. Statistical analyses are necessary, but the uncommonly large quantity of fine pottery should be emphasised. The possible reason for this phenomenon is the central position of the houses where these vessels are found and their prominent role in the settlement. The affinity of the local Neolithic population towards this type of vessel should not be excluded, given the variety of forms produced with this technique. By default, they enter the domain of the typological standards of the Pelagonian Neolithic. However, they are not limited only to certain preferred forms. The most common representatives of this kind of vessel include red-coloured pots, which are often found at sites in Pelagonia, though not in such numbers as at Vrbjanska Čuka (Fig. 7).[16]

These types of vessel are made of extremely fine clay without additives, and were fired at a

[16] V. SANEV, 1995; Lj. FIDANOSKI, 2009.

van. Na velikom broju takvih posuda nalazimo tanki premaz širim ili užim prugama crne boje koja se lako otire s površine. Pruge su ravne ili zakrivljene, okomite ili dijagonalne, ali ima slučajeva gdje one horizontalno prate rub. Ovakva vrsta ukrašavanja neolitičkih posuda u Pelagoniji se smatra rijetkom i posebno je karakterstična za Vrbjansku Čuku. Zanimljivo je da neki primjerci crveno glačane keramike imaju tri ili četiri tanke nožice što je još jedna rijetkost u neolitičkoj produkciji keramike u Pelagoniji i drugdje.

Među ostalom finom keramikom zastupljene su plitice i lonci svjetlosmeđe, crne i crvenkaste boje (Sl. 7). Crne posude s glačanom površinom dolaze u oblicima sličnima prije opisanim. Imaju tanke stijenke, S-profil i djelomično bikoničan trbuh što je česta pojava čak i na nekim ranoneolitičkim nalazištima u Pelagoniji.[17] Svjetlosmeđe posude su često većih dimenzija i pripadaju tipu nalik amforama. Za ove posude karakterističan je istaknuto izduženi vrat, katkad blago izvučen prema van. Zastupljena je i keramika manjih dimenzija i prijelazne fakture. Dolaze u svjetlosmeđoj, crnoj i smeđoj boji, a ponekad su ukrašene utiskivanjem nokta (impreso).

Gruba keramika je također zastupljena, doduše u manjoj količini što je neuobičajeno za nalazišta iz ovog razdoblja (Sl. 7). Tijekom iskopavanja nađeno je više ulomaka posuda oblika amfore svjetlosmeđe boje ukrašenih barbotinom. Istoj kategoriji pripadaju i lonci ukrašeni gusto raspoređenim bradavičastim aplikacijama što je zabilježeno na nekoliko pelagonijskih nalazišta. Askosi također pripadaju gruboj keramici. Obično su masivni, smeđecrvenkaste boje, s dubokim okomitim žljebovima u donjem dijelu. Osim posuda nalik amforama i askosa, na Vrbjanskoj Čuki su pronađene i masivne posude za pohranu, iako ih je samo nekoliko zabilježeno u istraženoj sondi.

[17] D. SIMOSKA, V. SANEV, 1976; G. NAUMOV, A. TOMAŽ, 2015.

Slika 7. *Posude pronađene u istraženom dijelu, dimenzije: 1. v-16 cm; 2. v-12 cm; 3. pr-13 cm; 4. pr-18 cm; 5. 13 cm; 6. pr-20 cm* (foto: A. Mitkoski, A. Murgoski, G. Naumov; crteži: N. Atanasoska; obrada: G. Naumov).
Figure 7 *Vessels unearthed in the explored area, dimensions: 1. h-16 cm; 2. h-12 cm; 3. d-13 cm; 4. d-18 cm; 5. 13 cm; 6. d-20 cm* (photos: A. Mitkoski, A. Murgoski, G. Naumov; drawings: N. Atanasoska; editing: G. Naumov).

high temperature. In terms of form, they sometimes have a large carinated profile and a slightly everted rim. Majority of these vessels have thin black-coating, usually in the form of wide and thin strips, which are quite easy to loosen from the surface. The strips are flat or curved, usually vertical and diagonal, but there are also cases where the strips follow the rim horizontally. This decoration of Neolithic vessels in Pelagonia is considered rare but is especially typical of those produced at Vrbjanska Čuka. It is interesting that some of the red polished pottery has three or four thin legs, which again is rare in Pelagonian and Neolithic ceramic production in general.

Other vessels with a fine texture include cream, black and reddish plates and pots (Fig. 7). Black vessels with a polished surface have forms similar to the previously described finds.

FIGURINE, MODELI I ŽRTVENICI

Nađeno je malo figurina (pet komada) što nije iznenađujuće s obzirom na veličinu istraživane površine i slabu zastupljenost ove vrste nalaza na neolitičkim telovima u Pelagoniji (Sl. 8).[18] Imaju uska cilindrična tijela i masivnu bazu dok na tijelu nema puno detalja osim malih apliciranih ruku na torzu i pločastih očiju.

Tijekom iskopavanja otkriven je veći broj fragmenata antropomorfnih modela kuća (Sl. 8). Uglavnom se radi o kockastim modelima s velikim otvorima, tipičnim za sjeverne dijelove Pelagonije.[19] Nađeno je i nekoliko

[18] G. NAUMOV, 2014; G. NAUMOV, 2015b.
[19] D. TEMELKOSKI, A. MITKOSKI, 2005b; G. NAUMOV,

They have thin walls and an S profile and a partially carinated belly, which is a common phenomenon often encountered even at certain Early Neolithic sites in Pelagonia.[17] The cream vessels are usually bigger and in terms of form are amphora-like. A massively prolonged neck, sometimes slightly everted, is typical of these vessels. In contrast, pottery of a smaller size and intermediate fabric have also been found. These are cream, black, red and brown in colour, and sometimes contain impresso decoration made with nails.

Pottery made with coarse fabric was also produced, although in smaller amounts, which is unusual for sites from this period (Fig. 7). During the excavation, several fragments from cream-coloured amphora-like vessels, decorated with barbotine, were unearthed. Some of the discovered finds are parts of jars with dense nipple-like applications, which as a phenomenon is present at several Pelagonian sites. Vessels made from coarse fabric include *askoi* as well. These are usually large, with a creamy-reddish colour and deep vertical grooves on the lower part. Besides the amphora-like finds and *askoi*, massive storage vessels have been found at Vrbjanska Čuka, although only a few were recorded in the excavated trench.

FIGURINES, MODELS AND ALTARS

The number of figurines is very small (i.e. 5), which is not surprising considering the small excavated area and the rare presence of these finds at Neolithic tells in Pelagonia (Fig. 8).[18] They have a cylindrical thin body and large base, while on the body there are not any features except small hands sometimes applied to the torso and plated eyes.

During the research, a large number of fragments from anthropomorphic house models were discovered (Fig. 8). Most of them are rec-

[17] D. SIMOSKA, V. SANEV, 1976; G. NAUMOV, A. TOMAŽ, 2015.

[18] G. NAUMOV, 2014; G. NAUMOV, 2015b.

valjaka sa središnjim otvorom na vrhu i tragovima gorenja odnosno dima koji je izlazio iz otvora. Dimenzije ovih nalaza su relativno velike, obično su svjetlosmeđe ili smeđe boje, faktura je prijelazna, bez organskih ili mineralnih dodataka. Nijedan od cilindara nema antropomorfne karakteristike, iako treba uzeti u obzir njihovu krhkost i slabu zastupljenost ovih elemenata u gornjim djelovima Pelagonije.[20]

Žrtvenici spadaju u dobro zastupljene nalaze na Vrbjanskoj Čuki (Sl. 8: 4). Najčešće se radi o ulomcima nogu ili malim dijelovima recipijenata koji pokazuju karakteristike tipične za ovu regiju – nazubljene masivne noge i plitki recipijent s tragovima gorenja organske tvari.[21] Manje su veličine, obično svjetlosmeđe ili rijetko crvenkastosmeđe boje.

PROJEKTILI ZA PRAĆKE, UTEZI I ORUĐA

Neolitičko naselje Vrbjanska Čuka obiluje keramičkim projektilima za praćke (Sl. 9). Malih su dimenzija, elipsoidnog oblika i crvene ili smećkaste boje ovisno o pečenju. U ostalim krajevima Makedonije su vrlo rijetki ili ih uopće nema.[22] Obično su okruglog oblika s perforacijom na gornjem dijelu, iako su zastupljeni i primjerci s uglastom strukturom (Sl. 9). Među keramikom nalazimo i probušene diskove manjih dimenzija koji su vjerojatno korišteni kao utezi za tkanje ili utezi za ribarske mreže. Masivni nalazi koničnog ili pravokutnog oblika pripadaju posebnoj grupi nalaza i njihova uloga nije do kraja razjašnjena (Sl. 9). Moguće je da su korišteni kao zatvarači posuda, podlošci ili predmeti simboličkog značenja.

2011.

[20] D. TEMELKOSKI, A. MITKOSKI, 2005b.

[21] D. TEMELKOSKI, A. MITKOSKI, 2005b; G. NAUMOV, 2011.

[22] D. SIMOSKA, V. SANEV, 1976; B. KITANOSKI, 1977; D. SIMOSKA et al., 1979; A. MITKOSKI, 2005; G. NAUMOV, A. TOMAŽ 2015.

Slika 8. *Figurine, žrtvenici i model kuće iz istraženog dijela, dimenzije: 1. v-8 cm; 2. v-6 cm; 3. v-7,5 cm; 4. v-12 cm; 5. v-6 cm* (foto: A. Mitkoski, A. Murgoski, G. Naumov; obrada: G. Naumov).
Figure 8 *Figurines, altars and house model unearthed in the explored area, dimensions: 1. h-8 cm; 2. h-6 cm; 3. h-7.5 cm; 4. h-12 cm; 5. h-6 cm* (photos: A. Mitkoski, A. Murgoski and G. Naumov; editing: G. Naumov).

tangular cubes with large openings, typical of the northern parts of Pelagonia.[19] In addition to the cubes, several cylinders with a central opening on the top with traces of burning, i.e. from smoke exiting, were also recorded. The dimensions of these finds are relatively large, their colour is usually creamy and brown, and the fabric is intermediate without organic and mineral temper. None of the cylinders have anthropomorphic characteristics. However, their fragility

[19] D. TEMELKOSKI, A. MITKOSKI 2005b; G. NAUMOV, 2011.

Broj nalaza od kamena i kosti je puno manji od broja keramičkih nalaza. Uglavnom pripadaju kategoriji oruđa koja su korištena za rezanje, sječenje i bušenje. Osim toga, česte su kamene sjekire različitih dimenzija s dobro sačuvanim oštricama (Sl. 9). Kremenih oruđa gotovo uopće nema, osim malih ulomaka koji su ostali u naselju tijekom procesa izrade. Također, iznenađujuće je mali broj životinjskih kostiju što se odrazilo i na broj alata napravljenih od kosti.[23] Šila, igle i dlijeta spa-

[23] G. NAUMOV et al., 2018a.

Slika 9. *Projektil za praćku, disk i oruđa nađena u istraženom dijelu, dimenzije: 1. š-5,5 cm; 2. š-10,5 cm; 3. š-5 cm; 4. š-15 cm; 5. š-6 cm* (foto: A. Mitkoski, A. Murgoski, G. Naumov; obrada: G. Naumov).
Figure 9 *Sling shot, disc and tools unearthed in the explored area, dimensions: 1. w-5.5 cm; 2. w-10.5 cm; 3. w-5 cm; 4. w-15 cm; 5. w-6 cm* (photos: A. Mitkoski, A. Murgoski, G. Naumov; editing: G. Naumov).

should be considered, and also the rarity of such elements in the upper parts of Pelagonia.[20]

Altars are also a frequent category of find at Vrbjanska Čuka (Fig. 8: 4). Most often, they are fragments of legs and small parts of a receptacle that have the common features of this region, i.e. large serrated legs and a shallow receptacle with traces of burning from organic matter.[21] Their size is smaller, while their colour is usually creamy and occasionally reddish-brown.

SLINGSHOTS, WEIGHTS AND TOOLS

The Neolithic settlement site of Vrbjanska Čuka is rich in ceramic slingshots (Fig. 9). They have small dimensions, an ellipsoidal shape and a red or brownish colour achieved by firing. Their presence is frequent compared to other regions in Macedonia, where they are completely absent or extremely rare.[22] The slingshots usually have a

[20] D. TEMELKOSKI, A. MITKOSKI 2005b.
[21] D. TEMELKOSKI, A. MITKOSKI 2005b; G. NAUMOV, 2011.
[22] D. SIMOSKA, V. SANEV 1976; B. KITANOSKI, 1977; D. SIMOSKA et al., 1979; A. MITKOSKI, 2005; G. NAU-

daju u ovu grupu nalaza i slabo su zastupljena u istraživanjima Kuće 2 (Sl. 9).

NOVE METODE PRIMIJENJENE TIJEKOM ISTRAŽIVANJA

Osim metoda standardnih za arheološka istraživanja u Makedoniji, pri istraživanju neolitičkog naselja u Slaveju primijenjeno je nekoliko novih metoda kako bi se omogućilo bolje razumijevanje lokaliteta. Primijenjen je multudisciplinarni pristup kako bi se bolje razumio okoliš, paleoekonomija i prehrana neolitičkih populacija, prostorna organizacija naselja, njegov oblik, opseg i izgled. Korištena je arheobotanička analiza organskih ostataka, cijeli je tel topografski izmjeren upotrebom digitalne tehnologije, a također je napravljen i 3D-model tela na osnovi podataka geofizičkog pregleda i s iskopavanja.

ARHEOBOTANIČKE ANALIZE

Jedna od novih metoda primijenjenih na

round shape and perforations in the upper part, although sometimes there are examples with an angular structure (Fig. 9). Ceramic finds also include fragments of small perforated discs, which were most likely used as weights for spinning or fishing nets. The large finds of a conical or rectangular shape belong to specific ceramic objects and their function is not very clear (Fig. 9). They are thought to be vessel plugs, bases or objects that have symbolic characteristics.

Unlike the ceramic finds, the number of those made from stone and bone is far smaller. They usually fall into the category of tools that are used for cutting, slicing and drilling. The most common of these are stone axes of various dimensions and with well-preserved edges (Fig. 9). Chipped stone tools are almost absent, except smaller fragments from flakes that remained in the settlement during the process of being made. The number of animal bones is also surprisingly small, and is reflected in the quantity of tools made of this material.[23] Awls, needles and chisels belong to this group of tools and were rarely found in the excavations inside and outside Building 2 (Fig. 9).

NEW METHODS USED DURING THE RESEARCH

Besides the standard methods characteristic of archaeological research in Macedonia, several new methods were applied during the work on the Neolithic settlement at Slavej that will enable a much more profound understanding of this site in the future. In order to understand the environment, paleoeconomy and diet of the Neolithic population, the spatial organisation of the site, and its shape, volume and outlook, a multidisciplinary approach was employed. Thus, an archaeobotanical analysis of organic residuals was carried out, the whole tell was topographically measured using digital technologies, and a

MOV, A. TOMAŽ 2015.

[23] G. NAUMOV et al., 2018a.

telu Vrbjanska Čuka su arheobotaničke analize organskih materijala koji su prikupljeni za pilot-studiju, a zatim su pojedinačno organizirani u skladu s kategorijom ostataka. Osnovni cilj bio je praktično osposobljavanje čeških i makedonskih arheologa za primjenu geoarheoloških i bioarheoloških metoda na istraživanju neolitičkog tela u Vrbjanskoj Čuki. Neolitičko nalazište tipa tela je bilo prikladno za ovakvu praksu jer su različite metode mogle biti primijenjene na jednom arheološkom nalazištu (telu) s jasno artikuliranom stratigrafijom i djelomično poznatim razvojem. Drugi cilj je isključivo znanstvene prirode. Neolitik u Makedoniji nije dobro poznato razdoblje sa stanovišta arheologije okoliša, a neke metode, posebno arheobotanika, bile su vrlo ograničenog dosega i rijetko korištene.[24] Stoga ove početne analize predstavljaju dobro polazište i nude mogućnost otvaranja novih perspektiva poznavanja prapovijesnog razdoblja, posebice vremena početaka zemljoradnje.

Prva terenska i istraživačka faza organizirana je 2016. u Prilepu u Institutu za staroslavensku kulturu i Laboratoriju za arheobotaniku i paleoekologiju pri Sveučilištu Južne Češke u Češkim Budějovicama. Ova faza je poslužila kao „probni period" s glavnim ciljem utvrđivanja prikladne strategije za sakupljanje uzoraka iz neolitičkih slojeva Vrbjanske Čuke i njihovih specifičnih stratigrafskih konteksta. Odlučeno je da će se koristiti metode koje se sastoje od analiza biljnih makroostataka (uključujući antrakologiju)[25] te također analize životinjskih ostataka (uključujući malakologiju i entomologiju).[26] Druga grupa obuhvaća analize mikroostataka biljaka, posebno analize škroba i biljnih fitolita.[27] Analiza škroba je adekvatna za nalazište tipa Vrbjanske Čuke, ali je ipak zapostavljena kao

[24] M. GRBIĆ et al., 1960; M. HOPF, 1961; H. J. BEUG, 1976; E. GRÜGER, 1976; J. RENFREW, 1976.

[25] S. JACOMET, S. KREUZ, 1999.

[26] C. CLAASEN, 1999; G. A. KING, 2012.

[27] T. C. MESSNER et al., 2008; D. R. PIPERNO, 2006.

3D model of the tell was made based on the data from the geophysical survey and excavations.

ARCHAEOBOTANICAL ANALYSES

One of the new methods applied to the tell at Vrbjanska Čuka was the archaeobotanical analysis of organic material, which was collected for the pilot study and then selectively organised according to residual categories. The first goal was the practical training of Czech and Macedonian archaeologists in the geoarchaeological and bioarchaeological methods incorporated in the research at the Neolithic tell at Vrbjanska Čuka. The Neolithic tell site is appropriate for such practices and offers the opportunity to use different methods focusing on a single archaeological space (the tell) with an excellent stratigraphy and partially known development. The second goal was exclusively scientific. The Neolithic period in Macedonia is not well known from the perspective of environmental archaeology, and the use of certain methods, specifically archaeobotany, has been restricted and taken place very rarely.[24] Because of this, the initial analyses offer a good starting point and may provide a new perspective on the prehistoric period here, especially in terms of the beginnings of agriculture.

The first field and analytical phase in 2016 was organised in Prilep at the Institute for Old Slavic Culture and in the Laboratory for Archaeobotany and Paleoecology at the University of South Bohemia in České Budějovice. This phase functioned as a test period, with the main goal being to establish a good strategy for collecting samples from the Neolithic layers of Vrbjanska Čuka and their specific stratigraphic contexts. It was decided to use methods that consisted of analysing plant macroremains (including anthracology)[25] and also animal remains (including malacology and entomology).[26] The

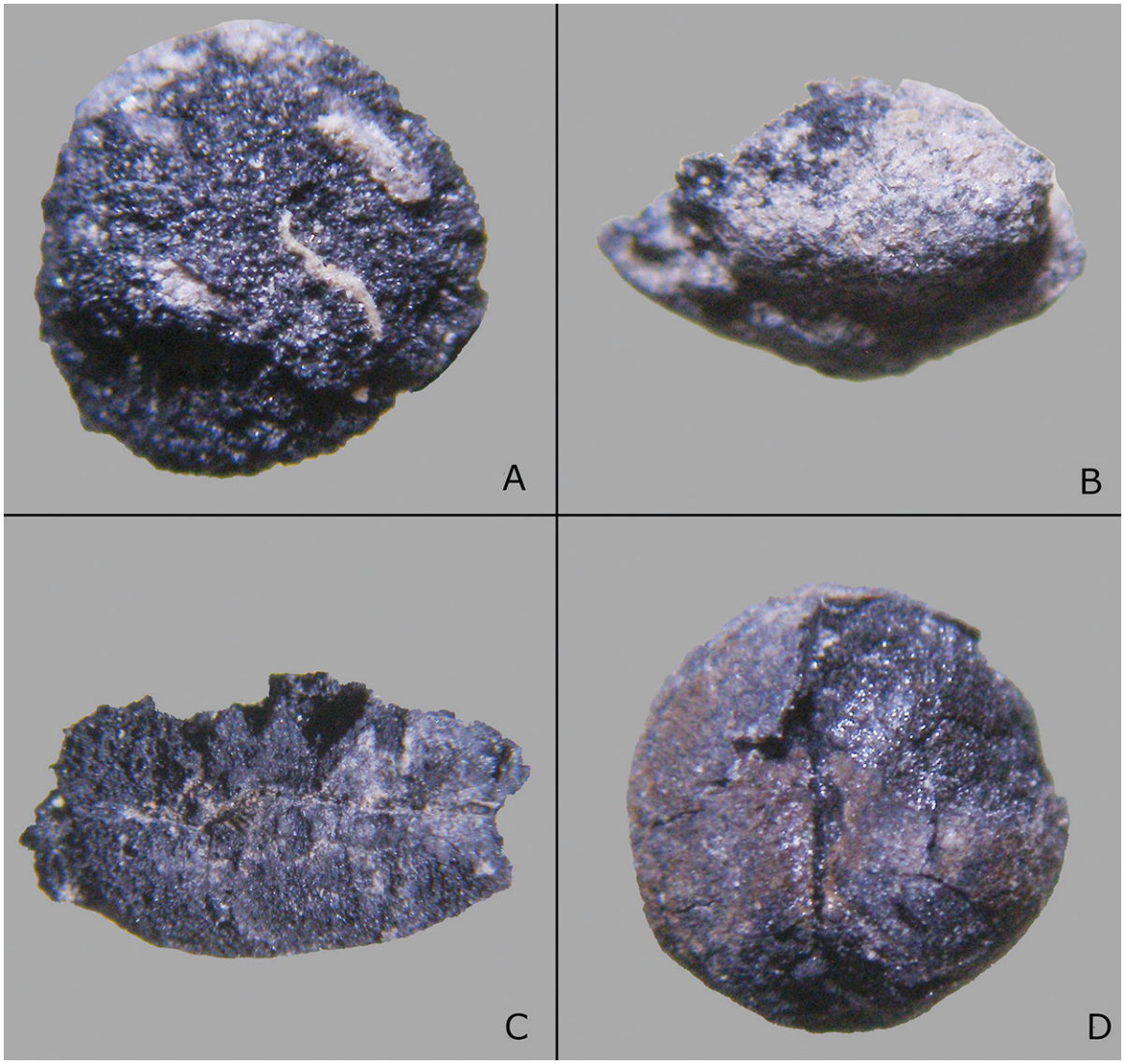
[24] M. GRBIĆ et al., 1960; M. HOPF, 1961; H. J. BEUG, 1976; E. GRÜGER, 1976; J. RENFREW, 1976.
[25] S. JACOMET, A. KREUZ, 1999.
[26] C. CLAASEN, 1999; G. A. KING, 2012.

izvor informacija u arheološkim istraživanjima. Čestice škroba spadaju u kategoriju biljnih mikrofosila zajedno s fitolitima, peludom i sporama te se mogu naći na površini oruđa ili drugih predmeta. Njihova analiza je korisna u rekonstrukciji načina korištenja oruđa i parametara njihove upotrebe. Spomenute analize bi mogle unaprijediti naše znanje o antropogenim aktivnostima u Pelagoniji u srednjem holocenu, u kontekstu prijašnjih studija na području Balkana.[28]

Glavni cilj arheobotaničkih terenskih istraživanja bio je rekonstrukcija paleoekonomije nalazišta i rekonstrukcija paleovegetacije oko nalazišta. Životinjski ostaci poslužili su za određivanje odnosa između domaćih i divljih životinja, a u slučaju močvarnog okruženja Vrbjanske Čuke otkrit će se više o izvornom okolišu nalazišta u kojem su živjele zajednice u neolitiku.[29] Tijekom ljeta prikupljeno je 391 l sedimenta, u 79 uzoraka. Svrha skupljanja uzoraka bila je kvantifikacija biljnih i životinjskih makroostataka i utvrđivanje detaljne strategije istraživanja za statistički zadovoljavajuću količinu bioloških uzoraka koja bi mogla odgovoriti na niz pitanja iz domene paleoekonomije. Iako je opća slika neolitičke ekonomije poznata,[30] nekadašnji močvarni i vlažni okoliš Pelagonije bi mogao otvoriti neka zanimljiva pitanja u arheobotaničkim istraživanjima.

Jedan od prvih rezultata je prepoznavanje pougljenjene leće (*Lens culinaris*), Einkorn pšenice (*Triticum monococcum*), ječma (*Hordeum vulgare*) i graška (*Pisum sativum*) što su česte neolitičke vrste koje su pridonijele formiranju jedne grupe neolitičkih biljaka (Sl. 10). Odlično sačuvane sinantropske i divlje biljke su također nađene, ali mogle bi biti i znatno mlađe.

[28] E. MARINOVA et al., 2012.
[29] G. NAUMOV et al., 2018a.
[30] A. KREUZ et al., 2015.



Slika 10. *Mikroskopske fotografije arheobotaničkih nalaza: a)* Lens culinaris *(leća); b)* Triticum monococcum *(pšenica); c)* Hordeum vulgare *(ječam); d)* Pisum sativum *(grašak)* (foto: J. Beneš; obrada: G. Naumov).
Figure 10 *Microscopic photos of archaeobotanic material: a)* Lens culinaris *(lentils); b)* Triticum monococcum *(einkorn wheat); c)* Hordeum vulgare *(barley); d)* Pisum sativum *(peas)* (photos: J. Beneš; editing: G. Naumov).

second group involves analysing the microremains of plants, especially starch analyses and plant phytoliths.[27] Starch analysis for Vrbjanska Čuka is adequate but it still remains neglected as a source of information in archaeological research. Starch grains belong to the category of plant microfossils together with phytoliths, pollen and spores, and can also be found on the surface of tools or other objects. They represent a useful way of identifying the application of tools and the parameters of their use. The afore-

[27] T. C. MESSNER et al., 2008; D. R. PIPERNO, 2006.

TOPOGRAFSKA MJERENJA I DIGITALNI MODEL TERENA

Tijekom istraživanja Vrbjanske Čuke, provedena su topografska mjerenja i izrađen je model terena za tel čime je omogućeno točno određivanje oblika, opsega i visine tela te njegovih modifikacija koje su posljedica stalne upotrebe ovog mjesta. Budući da je nalazište djelomično oštećeno građevinskim aktivnostima, a i oblik je promijenjen zbog vegetacije, primjena geodetskog mjerenja i modeliranja pružila je ujednačenu sliku izgleda i

mentioned groups of analyses may improve our knowledge of anthropogenic activity in Pelagonia during the Middle Holocene in the context of previous studies in the Balkan region.[28]

The main goal of the archaeobotanical field research is to reconstruct the palaeoeconomy of the site. The expected results may define a whole spectrum of plants but may also reconstruct the vegetation around the site. The identified fauna remains provide data about the ratio between domestic and wild animals and, in the case of the marshy surroundings of Vrbjanska Čuka, information about the initial environment of the site in which the Neolithic people functioned.[29] During the summer, the remains from 391 litres of sediment were taken and articulated into 79 samples. The purpose of the sample collection was the quantification of plant and animal macroremains, and establishing a detailed research strategy for a statistically suitable amount of biological samples to provide answers to several questions in the palaeoeconomic domain. Even though the general picture of the Neolithic economy is known,[30] the marshy and wetland environment of Pelagonia in the past suggests certain interesting questions for archaeobotanical research.

One of the first results was the identification of charred *Lens culinaris* (lentils), *Triticum monococcum* (einkorn wheat), *Hordeum vulgare* (barley) and *Pisum sativum* (peas), which frequently occur among Neolithic species and contributed to the shaping of a pocket of Neolithic plants (Fig. 10). Syntrophic and wild plants in an excellent condition were also identified. However, they could be much younger, having shaped the local seed bank in the soil.

TOPOGRAPHIC MEASUREMENTS AND DIGITAL ELEVATION MODEL

During the excavations of Vrbjanska Čuka, veličine lokaliteta.

Ograničena vidljivost tela povezana je s relativno malom visinom, ali i vegetacijom jer se površina tela, obrasla visokom trstikom i drvećem, naglo obrušava prema istoku, dok je prema drugim stranama pad nešto blaži a tlo je obradivo i posijano žitaricama. Istočni rub tela je oštećen cestom Slavej – Borotino, a topografija tela pokazuje minimalne varijacije. Upotrebom digitalnih uređaja GPS i RTK (*Real Time Kinetic*), površina tela je prekrivena mrežom točaka opsega cca 200 x 180 m u skladu s rezultatima arheoloških istraživanja iz 1980-ih.[31]

Zabilježene su ukupno 172 točke s ekvidistancom od 10 do 20 m, uključujući točke gdje se površina blago spuštala, tako da će konačni model biti korigiran (Sl. 11). Mjerenja pokazuju da je najviša točka tela na 603.187 m, a najniža na 599 m, dok je njegova dijagonalna dužina 180 m. Točke su zatim ubačene u *MGI Balkan Zone 7* sustav i primjenom TIN-metode za interpolaciju dobiven je digitalni model terena (Sl. 12). Pomoću novonastalog modela koji sadrži visine postignut je točan prikaz oblika tela uključujući visinu, opseg i razlike na njegovim rubovima s obzirom na jarak koji je okruživao neolitičko naselje. Osim ovih važnih podataka, GIS-pristup je otvorio mogućnost 3D-vizualizacije tela i virtualno dokumentiranje njegovog sadašnjeg stanja.

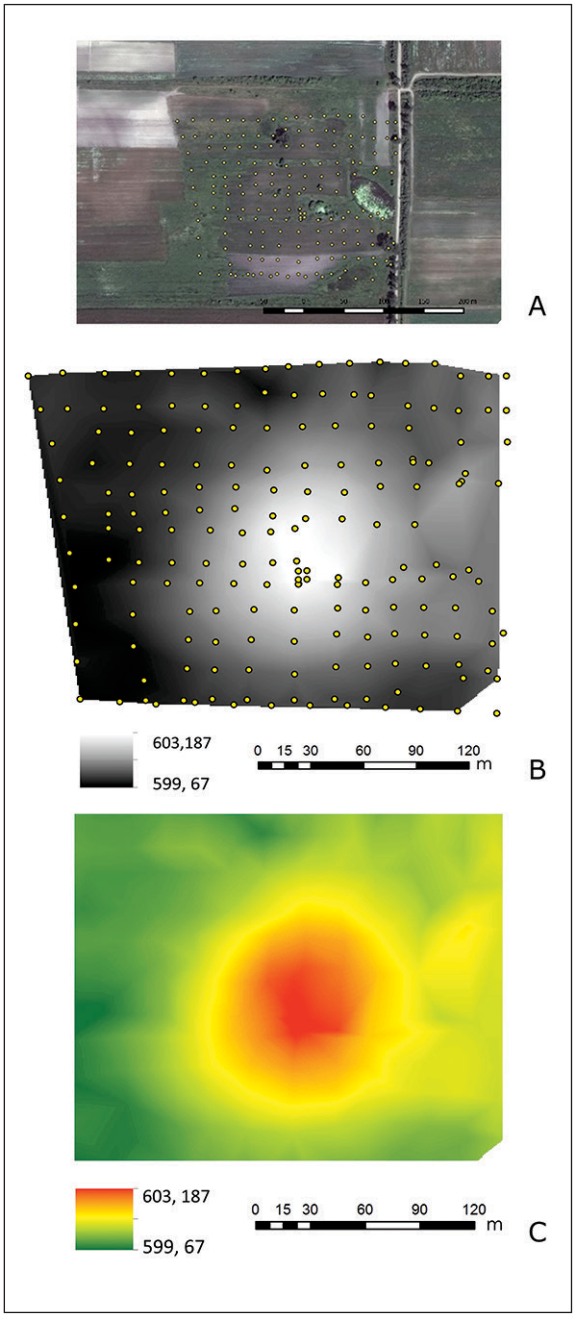
Izrada digitalnog modela terena je važan dio uključivanja GIS-a u istraživanja jednog arheološkog lokaliteta.[32] Model terena za Vrbjansku Čuku izrađen je na osnovi pojedinačnih točaka i njihovih visina, dok je od početka isključena mogućnost izrade digitalnog modela terena na osnovi digitalizacije konturnih linija s topografske karte. Razlog ovoj odluci je topografsko svojsto pelagonijskih telova u vezi s visinom.[33] Prosječna

[28] E. MARINOVA et al., 2012.
[29] G. NAUMOV et al., 2018a.
[30] A. KREUZ et al., 2015.
[31] A. MITKOSKI, 2005.
[32] K. L. WESTCOTT, R. J. BRANDON, 2000.
[33] G. NAUMOV et al., 2014.

topographic measurements and the production of an elevation model for the tell were conducted, enabling an accurate determination of the shape, volume and height of the tell, and also of modifications to it resulting from the constant use of this location. Despite the fact that this site has been partially damaged by building activities and its shape has changed due to the vegetation, the application of geodetic measurements and modelling has yielded a consistent picture of the site's appearance and size.

A major contributor to the limited visibility of the tell, besides its relatively low height, is the vegetation. The area comprises a sharp slope towards the east, which is overgrown with high reeds and trees, while towards the other sides the gradient of the slope is less and the area is arable land for growing grain. The eastern edges of the tell are damaged by the Slavej-Borotino road, and the tell's topography has minimal variations. With the use of GPS and RTK (Real Time Kinetic) digital devices, a grid network of points was placed over the whole area of the tell, which, according to the archaeological research during the 1980s, is approximately 200 x 180 metres.[31]

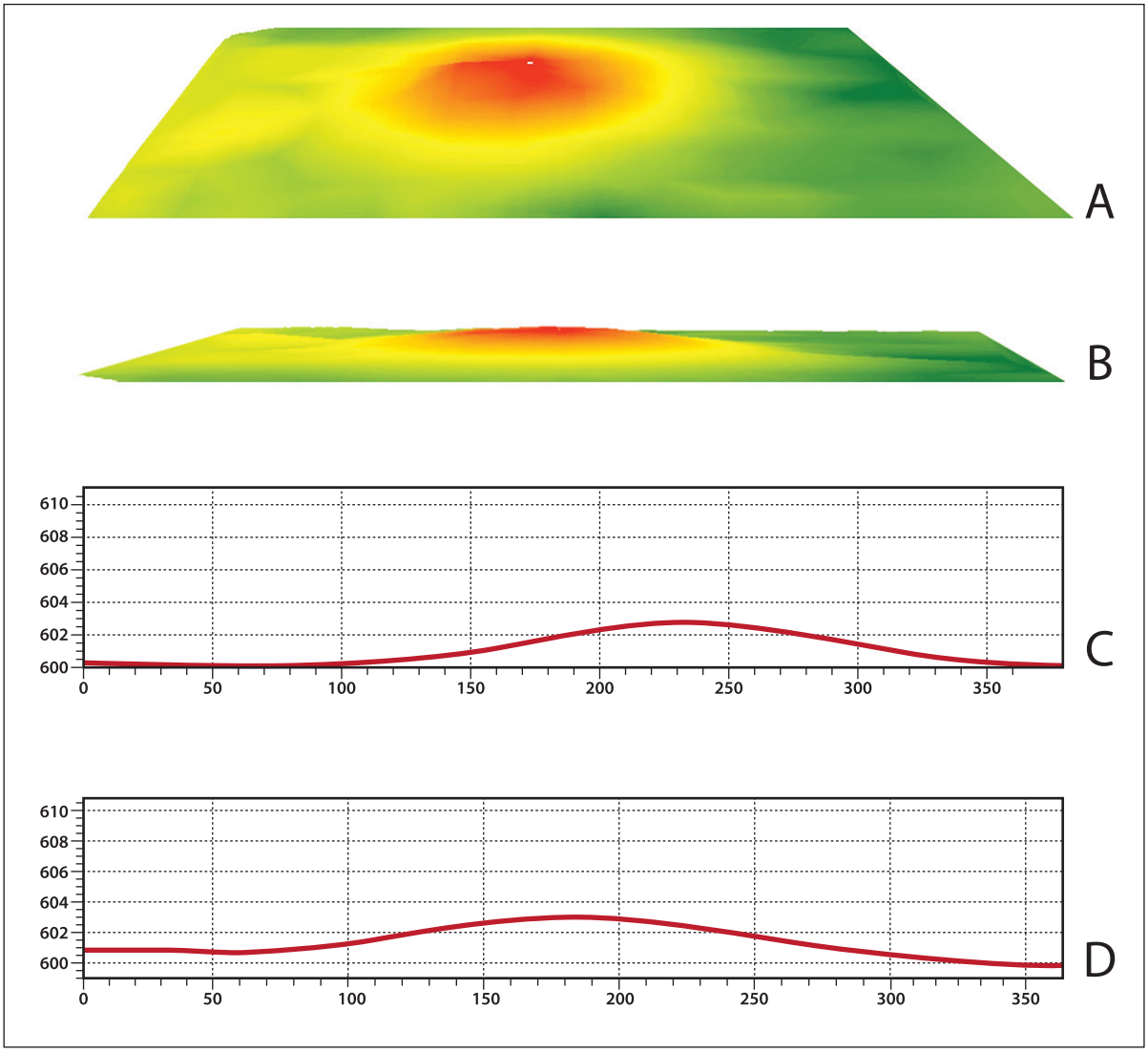
A total of 172 points with an equidistance from each other of 10 to 20 metres were recorded, including points where the surface suggested a slight incline, in order to improve the final model (Fig. 11). The measurements show that the highest point of the tell is 603.187 metres and the lowest 599 metres, while its diagonal length is 180 metres. The points were then transformed in the MGI Balkan Zone 7 system and, with the application of the Triangulated Irregular Network (TIN) interpolation method, a digital elevation model (DEM) was produced (Fig. 12). With the help of the newly created model containing height values, an accurate representation of the tell's shape was provided, including its shape, height, volume and also variations in its periphery, taking into consideration the ditch that surrounded the Neolithic settlement. Apart from this important data, the



Slika 11. *Topografija i digitalni model reljefa tela: a) položaj točaka na satelitskoj snimci; b) i c) proces izrade digitalnog modela reljefa* (ilustracije: Gj. Milevski; obrada: G. Naumov).
Figure 11 *Topography and digital elevation model of the tell: a) position of the points on the satellite image; b) and c) process of digital elevation model provision* (illustrations: Gj. Milevski; editing: G. Naumov).

visina ovih arheoloških lokaliteta je između 2 i 4 m, a za digitalizaciju i izradu modela terena bile bi potrebne preciznije topografske karte u većem mjerilu koje nisu bile dostupne.

[31] A. MITKOSKI, 2005.



Slika 12. *Digitalni model terena i vizualni presjek tela: a) i b) digitalni model terena (DEM); c) i d) vizualni presjek prema izrađenom DEM* (ilustracije: Gj. Milevski; obrada: G. Naumov).
Figure 12 *Digital elevation model and visual section of the tell: a) and b) digital elevation model (DEM); b) and c) visual section according to provided DEM* (illustrations: Gj. Milevski; editing: G. Naumov).

GIS approach opened up the possibility of a 3D visualisation of the tell and the virtual documentation of the state in which it is today.

The construction of a DEM is an extremely important part of GIS implementation in researching an archaeological site.[32] The elevation layer for Vrbjanska Čuka was produced based on individual points and their height, as from the very beginning the possibility of producing a DEM based on the digitalisation of the contour lines from a topographic map was excluded. The reason behind this decision was the topograph-

Način prikupljanja prostornih podataka je također utjecao na izbor tipa interpolacije. Tijekom procesa izbora parametara, TIN-metoda (*Triangulated Irregular Network*) je izabrana kao prikladna za izradu modela terena jer su prostorni podaci koji su bili obrađeni u GIS-u i mreža točaka bili nepravilno raspoređeni u prostoru.[34] Istraženo područje u središnjem dijelu tela pretvoreno je u gotovo ravnu površinu s postavljanjem dodatnih točaka oko sonde veličine 15 x 10 m s ciljem postavljanja na ovo područje snimaka dobi-

[32] K. L. WESTCOTT, R. J. BRANDON, 2000.

[34] D. WHEATLEY, M. GILLINGS, 2002.

ic feature of Pelagonian tells in terms of their height.[33] The average height of these archaeological sites is between 2 and 4 metres. To digitise and produce an elevation model, the research would need to include specific topographic maps with a greater scale and precision than those available.

The choice of the type of interpolation was also affected by the means of gathering the spatial data. During the parameter selection process, the TIN method was selected, which was suitable for the production of the elevation model, because the field data that had been processed in the GIS and the grid of points were irregularly deployed in the space.[34] The explored area in the central part of the tell was transformed into a virtual flat surface with the positioning of additional points around a trench 15 x 10 metres in volume, with the aim of positioning in this area the newly created imagery realised from a drone with which the whole working area had been documented and photographed.

GEOMAGNETIC SURVEY

After the site excavation, the process of geomagnetic surveying of the tell and several neighbouring tells started. This kind of method had been previously applied during research on prehistoric tells in Pelagonia, and because of its effectiveness was used during this year's archaeological campaign at Vrbjanska Čuka.[35] The survey provided new information and showed that the site was surrounded by a ditch and had more than twenty houses in one of its phases.

During the research at the sites in Pelagonia (Fig. 13), the magnetic survey method was chosen because of its high rate of gathering information. In appropriate conditions, clear anomalies are created by the remains of buildings built with daub or brick, and in rare cases, with stone. Human activity increases the sensitivity of the upper layer of the soil, which causes

venih dronom kojim je cijela radna površina dokumentirana i fotografirana.

GEOMAGNETSKI PREGLED

Nakon iskopavanja počeo je proces geomagnetskog istraživanja ovog i nekoliko susjednih telova. Ova metoda je prethodno primijenjena na istraživanjima telova u Pelagoniji i zbog pokazane učinkovitosti upotrijebljena je i na Vrbjanskoj Čuki.[35] Istraživanje je pružilo sasvim nova saznanja za ovo nalazište koje je bilo okruženo jarkom i imalo više od dvadeset kuća u jednoj svojoj fazi.

Magnetski pregled je izabran za istraživanje pelagonijskih nalazišta (Sl. 13) zbog uspješnosti u skupljanju informacija. U odgovarajućim uvjetima vidljive su jasne anomalije koje nastaju zbog ostataka građevina od kućnog lijepa, cigle, ili rijetko kamena. Ljudska aktivnost povećava osjetljivost gornjeg sloja tla zbog čega se te pojave manifestiraju kao „zonalne" magnetske anomalije.[36] Stoga magnetska metoda omogućava gotovo potpuno prepoznavanje arheoloških nalazišta, posebno prapovijesnih. Glavni nedostatak metode je mala dubina penetracije, rijetko preko 1-1,5 m.[37]

Magnetska mjerenja su provedena uređajem *Fluxgate magnetometer* 4.032 DLG Foerster Ferrex opremljenim s dva senzora s rezolucijom od 0,2 nT koji mjeri stupanj vertikalne komponente Zemljinog magnetnog polja. Podaci su prikupljeni u dvostrukom formatu (deset mjerenja u jednom kvadratnom metru). *Archeo Surveyour* je korišten za obradu i kartiranje velikog broja anomalija.

Vrbjanska Čuka

Geomagnetska istraživanja ovog lokaliteta provedena su na ukupnoj površini od 3,6

[33] G. NAUMOV et al., 2014.
[34] D. WHEATLEY, M. GILLINGS, 2002.
[35] G. NAUMOV et al., 2014.
[35] G. NAUMOV et al., 2014.
[36] K. MISIEWICZ, 2006.
[37] A. DAVID et al., 2008.

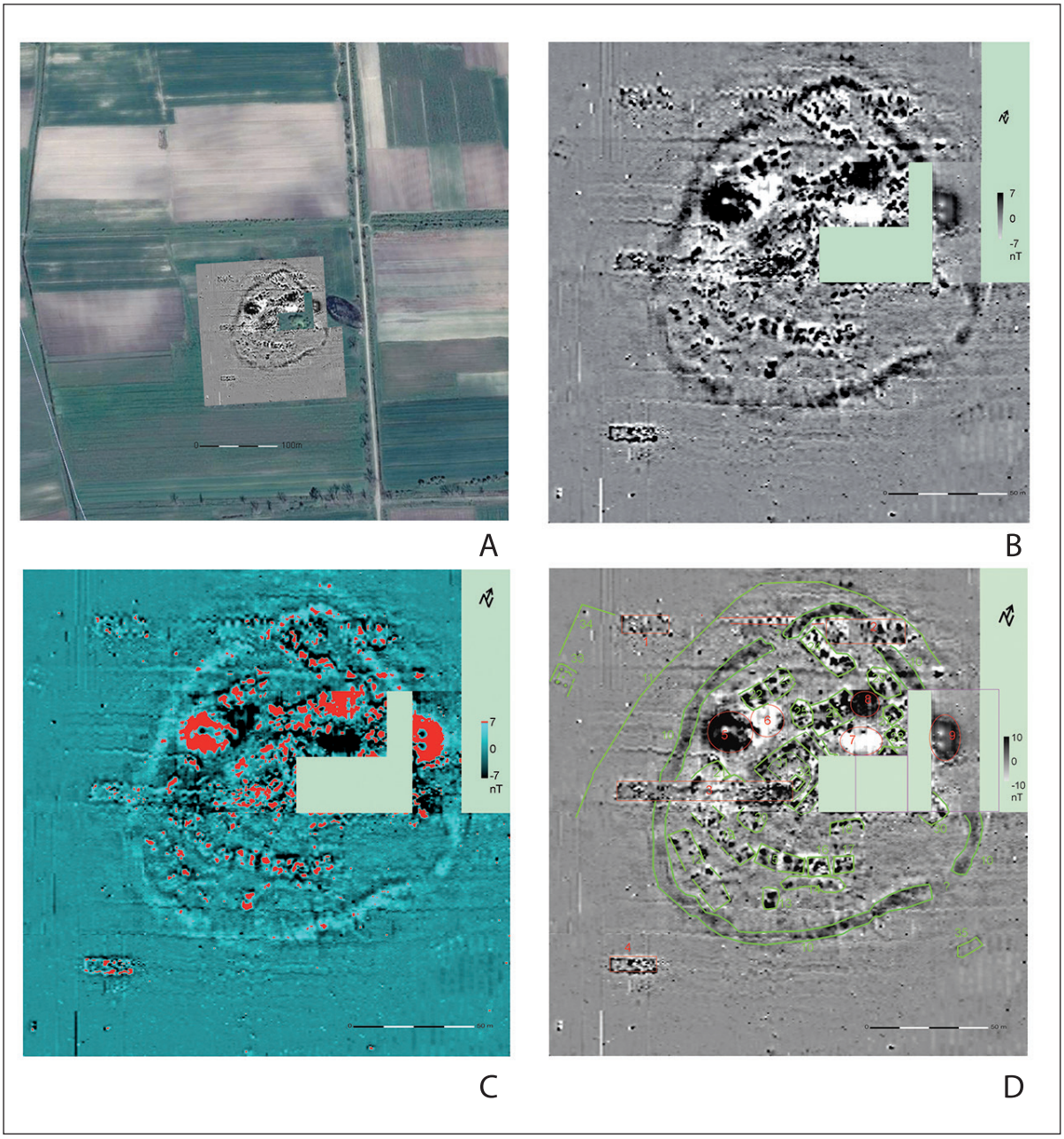
Slika 13. *Karta s položajem telova gdje su izvršena geomagnetska istraživanja* (karta: M. Przybyla).
Figure 13 *Map with the location of tells where a geomagnetic survey was conducted* (map: M. Przybyla).

phenomena to be manifested as "zonal" magnetic anomalies.[36] Because of this, the magnetic method allows an almost complete recognition of archaeological sites, especially prehistoric ones. However, the main drawback is its shallow penetration, as it rarely goes deeper than 1-1.5 metres.[37]

Magnetic measurements were carried out with a 4.032 DLG Foerster Ferrex fluxgate magnetometer equipped with two sensors with a resolution of 0.2 nT, which measures the degree of the vertical component of the Earth's magnetic field. The data were collected in a two-way format (10 measurements were taken per square metre). A large number of

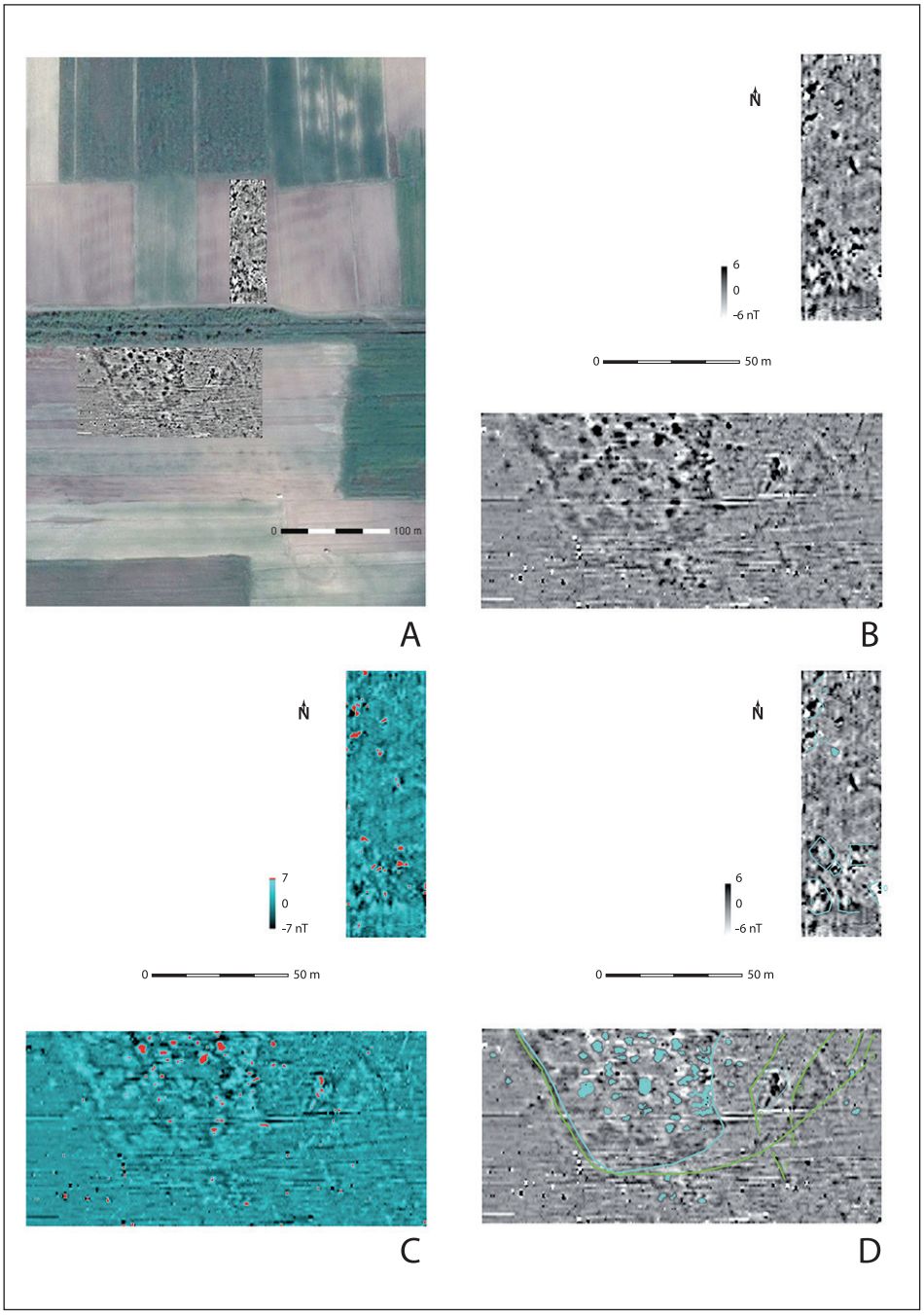
[36] K. MISIEWICZ, 2006.
[37] A. DAVID et al., 2008.

ha, uglavnom izmijenjenoj u modernom periodu. Visokonaponski stupovi i ostaci gospodarskih zgrada su oštetili lokalitet što je utjecalo na čitljivost rezultata. Osim toga, otkriveno je i nekoliko anomalija povezanih s funkcioniranjem neolitičkog tela. Rezultati su prikazani u obliku magnetske karte u sivim tonovima i u boji, s naglašenim najvećim vrijednostima (Sl. 14). Interpretacija izabranih anomalija je prikazana na Sl. 14g; a među karakterističnijim su: linearne pozitivne anomalije u vezi s obrambenim jarkom (s dva moguća ulaza; Sl. 14g: 11); grupa dipolarnih anomalija u vezi s ostacima izgorene gline s objekata (vjerojatno iz neolitika; Sl. 14g: 12-13); dvije grupe dipolarnih anomalija koje tvore kvadratnu strukturu u središnjem dijelu lokaliteta (mogle bi biti povezane s građevi-



Slika 14. *Geomagnetski pregled Vrbjanske Čuke: a) geomagnetska karta preko satelitske snimke; b) magnetska karta s rezolucijom -7/7 nT u sivim tonovima; c) magnetska karta s rezolucijom -7/7 nT u boji s naglašenim višim vrijednostima; d) interpretacija izabranih anomalija – 1-9: anomalije u vezi s modernim strukturama; 10: linearna pozitivna anomalija u vezi s obrambenim jarkom i dva moguća ulaza u naselje; 11: linearna pozitivna anomalija u vezi s manjim jarkom ili komunikacijom; 12-30: grupa dipolarnih anomalija u vezi s ostacima spaljenih kuća; 31-32: dvije grupe dipolarnih anomalija koje tvore kvadratne oblike u vezi s mogućim antičkim objektima; 33 i 35: grupa anomalija u vezi s ostacima objekata; 34: linearna pozitivna anomalija* (ilustracije: M. Przybyla; obrada: G. Naumov).

Figure 14 *Geomagnetic survey of Vrbjanska Čuka a) geomagnetic map layered over satellite imagery; b) magnetic map with -7/7 nT greyscale resolution; c) magnetic map with -7/7 nT colour resolution with higher values emphasised; d) interpretation of selected anomalies - 1-9: anomalies connected to modern structure; 10: a linear positive anomaly connected with a defensive ditch and two hypothetical entrances to the settlement; 11: a linear positive anomaly connected with a smaller ditch or communication line; 12-30: a group of dipolar anomalies connected with the remains of burned houses; 31-32: two groups of dipolar anomalies that make up square forms connected to possible ancient objects; 33 and 35: a group of anomalies connected to the remains of objects; 34: a linear positive anomaly* (illustrations: M. Przybyla; editing: G. Naumov).



Slika 15. *Geomagnetski pregled Visa Konjarskog: a) geomagnetska karta preko satelitske snimke; b) magnetska karta s rezolucijom -6/6 nT u sivim tonovima; c) magnetska karta s rezolucijom -7/7 nT u boji s naglašenim višim vrijednostima; d) interpretacija izabranih anomalija – 1: linearna pozitivna anomalija u vezi s uskim jarkom; 2-5: linearne pozitivne anomalije u vezi s palisadama; 6: zona pojačanog intenziteta magnetskog polja u vezi s ljudskim aktivnosima; 7-14: grupa dipolarnih anomalija u vezi s ostacima spaljenih kuća* (ilustracije: M. Przybyla; obrada: G. Naumov).

Figure 15 *Geomagnetic survey of Vis Konjarski: a) geomagnetic map layered over satellite imagery; b) magnetic map with -6/6 nT greyscale resolution; c) magnetic map with -7/7 nT colour resolution with higher values emphasised; d) interpretation of selected anomalies - 1: a linear positive anomaly connected to a narrow ditch; 2-5: linear positive anomalies connected to palisades; 6: a zone of increased magnetic field intensity connected to human activity; 7-14: a group of dipolar anomalies connected to the remains of burned houses* (illustrations: M. Przybyla; editing: G. Naumov).

anomalies of a various nature were processed and mapped in Archeo-Surveyor.

Vrbjanska Čuka

The geomagnetic research on this site was carried out over a total surface area of 3.6 hectares, which has been largely transformed in modern times. The presence of high voltage pylons and the remnants of farm buildings caused numerous disturbances which affected the readability of the results. In addition, several anomalies connected with the functioning of the Neolithic tell were discovered. Results are shown in the form of magnetic maps in greyscale and colour, with the highest values emphasised (Fig. 14). The interpretation of the chosen anomalies is shown in Figure 14g. The most significant include: a linear positive anomaly associated with a defensive ditch (with two hypothetical entrances (Fig. 14g: 11); a group of dipolar anomalies associated with remains from burned clay from the buildings (probably from the Neolithic (Fig. 14g: 12-13); two groups of dipolar anomalies forming a square structure in the central part of the site (maybe related to a building from the Roman period (Fig. 14g: 31-32); a group of positive anomalies connected with architectual remains outside the tell (Fig. 14g: 33); a linear positive anomaly (Fig. 14g: 34) probably associated with Building number 33; and a probable group of positive anomalies associated with house remains (Fig. 14g: 35).

Vis Konjarski

This site is located next to Vrbjanska Čuka, i.e. 100 metres to the north-east (Fig. 13). It also represents a small elongated tell on which Neolithic finds were recorded during reconnaissance. This was a good initiative step to check if the site had a similar spatial organisation, given the synchronous archaeological material. Because of the fact that the whole of the tell was not scanned, the research area covered 1.4 hectares and the measurements were taken at two isolated places.

nama iz rimskog razdoblja; Sl. 14g: 31-32); grupa pozitivnih anomalija povezanih s arhitektonskim ostacima, izvan tela (Sl. 14g: 33); linearna pozitivna anomalija (Sl. 14g: 34); vjerojatno povezana s „kućom broj 33" i vjerojatna grupa pozitivnih anomalija povezana s ostacima kuće (Sl. 14g: 35).

Vis Konjarski

Nalazište se nalazi u blizini Vrbjanske Čuke, 100 m prema sjeveroistoku (Sl. 13). Također se radi o malom izduženom telu na kojem su zabilježeni neolitički nalazi prilikom rekognosciranja što je bio dobar prvi korak u procjenjivanju ima li ovo nalazište istu prostornu organizaciju s obzirom na istovremeni arheološki materijal. S obzirom da je samo dio tela skeniran, istraženo je područje od 1,4 ha, a mjerenja su provedena na dva odvojena mjesta (Sl. 15). Interpretacija izabranih anomalija prikazana je na Sl. 15g. Najkarakterističnije su: linearna pozitivna anomalija povezana s uskim jarkom čija funkcija nije do kraja razjašnjena (Sl. 15g: 1); zona povećanog intenziteta magnetskog polja povezana s ljudskom aktivnošću (Sl. 15g: 6); linearna pozitivna anomalija povezana s ravnom strukturom, vjerojatno palisadom (Sl. 15g: 2-5); točkasta pozitivna anomalija, vjerojatno povezana sa strukturama kao što su jame i ognjišta te istovremeni koncentrirani kružni fokus u zoni 6 i grupa dipolarnih anomalija u vezi s ostacima zapečene gline (Sl. 15g: 7-14) koji su koncentrirani u sjevernom i vjerojatno istočnom dijelu nalazišta te je moguće da su povezani s različitim kronološkim fazama, za razliku od prije spomenutih anomalija. Nepravilan oblik i fragmentiranost anomalija vjerojatno su rezultat ozbiljnih oštećenja građevina koje su njihov izvor.

Borotino – Tumba

Nalazište je smješteno oko 1 km južno od Vrbjanske Čuke. Tijekom rekognosciranja su

The results are shown in the form of magnetic maps in greyscale and colour, with the highest values emphasised (Fig. 15).

The interpretation of the chosen anomalies is shown in Fig. 15g. The most significant include: a linear positive anomaly associated with a narrow ditch whose function is not very clear (Fig. 15g: 1); a zone of increased magnetic field intensity associated with human activity (Fig. 15g: 6); a linear positive anomaly associated with a straight-line structure, probably a palisade (Fig. 15g: 2-5); a point positive anomaly, probably associated with structures like pits or hearths, forming a concentrated, circular focus in zone 6; a group of dipolar anomalies associated with the remains of burned clay (Fig. 15g: 7-14). These are concentrated in the northern and probably eastern part of the site, and it is possible that they are associated with different chronological phases contrary to the aforementioned anomalies. The irregular shape and fragmented nature of the anomalies is probably the result of the destruction of the buildings that were also the source of their creation.

Borotino – Tumba

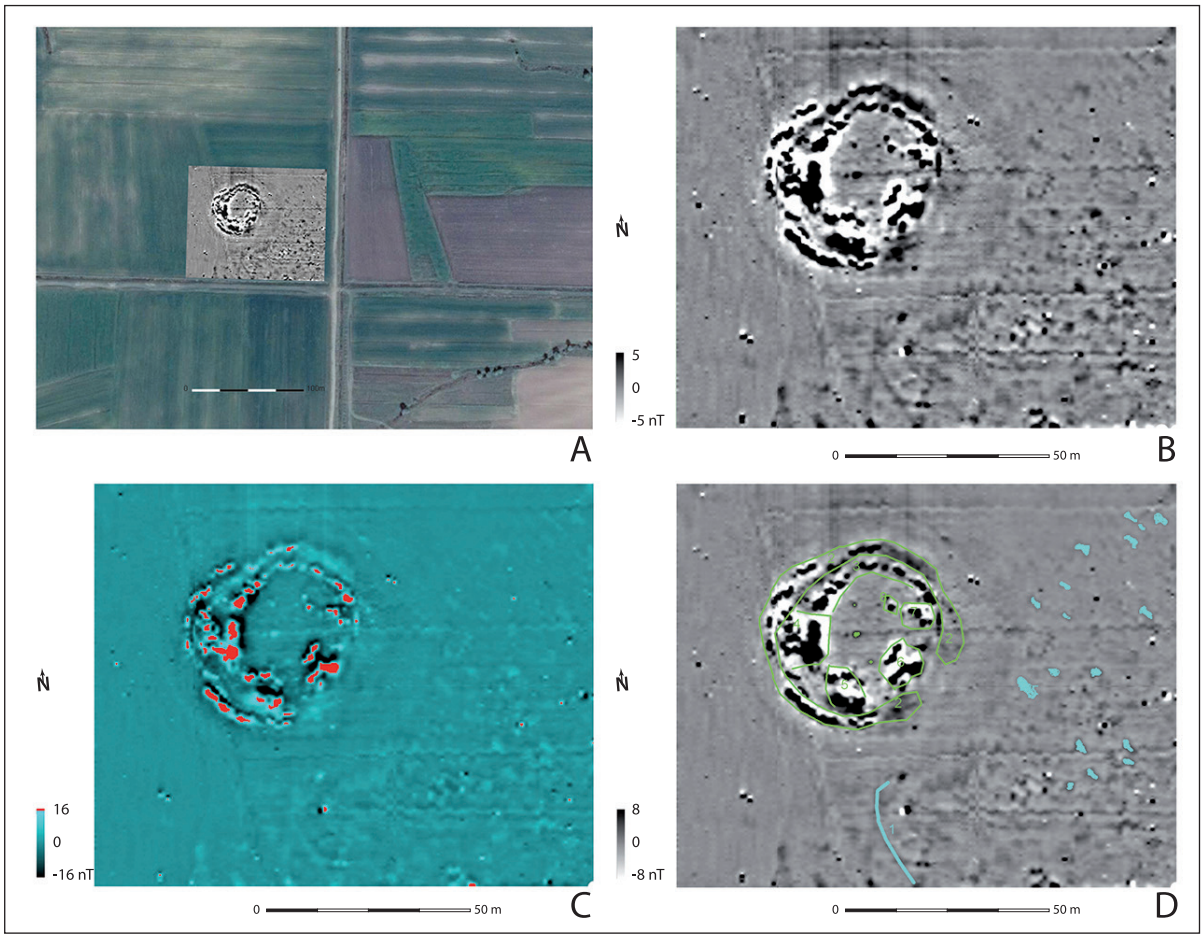
This site is located around 1 kilometre south of Vrbjanska Čuka. Fragments of Late Neolithic and Chalcolithic vessels and figurines were documented on its surface during reconnaissance (Fig. 13). It consists of two smaller tells that are next to each other. Geomagnetic surveys were conducted over an area of 1.25 hectares, which allowed clearer results compared to the previous sites. The results are shown in the form of magnetic maps in greyscale and colour, with the highest values emphasised (Fig. 16). The interpretation of the chosen anomalies is shown in Fig 16g. The measurements demonstrate that in the western part of the survey area there is a small settlement with a circular shape, surrounded by ditches. South-east of area, there is an open site of a different kind in which there are most probably skeletal burials.

Several anomalies were recorded during the

na površini nađeni ulomci kasnoneolitičkih i eneolitičkih posuda i figurina (Sl. 13). Sastoji se od dva manja tela. Geomagnetska istraživanja su provedena na površini od 1,5 ha što je omogućilo jasnije rezultate u usporedbi s prije spomenutim nalazištima. Rezultati su prikazani u obliku magnetskih karata u sivim tonovima i u boji, s naglašenim najvećim vrijednostima (Sl. 16). Interpretacija izabranih anomalija prikazana je na Sl. 16g. Mjerenja ukazuju na postojanje manjeg naselja kružnog oblika okruženog jarcima u zapadnom dijelu. Jugoistočno od ovog naselja je nalazište na otvorenom vjerojatno s pokopima s inhumacijom. U geomagnetskoj prospekciji zabilježeno je više anomalija, u obliku pozitivne točkaste anomalije, vjerojatno s antropogenim karakteristikama. Točke su gušće koncentrirane u istočnom dijelu nalazišta. Niske vrijednosti, oblik, slična veličina i ista orijentacija za većinu bi mogla ukazivati da se radi o grobovima s inhumacijom (Sl. 16a). Druga anomalija je pozitivna linearna anomalija koja bi mogla predstavljati jarak ili komunikaciju (Sl. 16g: 1). Više anomalija ukazuje na mogućnost postojanja utvrđenog prapovijesnog naselja: linearna dipolarna/pozitivna anomalija povezana s obrambenim jarkom punim izgorene tvari (Sl. 16g: 2); više dipolarnih anomalija koje su vjerojatno povezane s ostacima izgorene gline ili (manje vjerojatno) izgorenog obrambenog zida (Sl. 16g: 3-5); grupa pozitivnih anomalija koje bi mogle predstavljati ostatke izgorene kuće (Sl. 16g: 6-8). S jedne strane, prisutnost izgorenog materijala rezultira jakim magnetskim signalom, prikladnim za geomagnetska mjerenja, a s druge strane, teško je razlučiti anomalije vezane s obrambenim strukturama (jarak ili zidovi) od drugih objekata (izgorene kuće ili druge strukture od izgorene zemlje).

3D MODELIRANJE NALAZIŠTA

U sklopu arheoloških istraživanja na Vrbjanskoj Čuki, izrađen je 3D-model nalazi-



Slika 16. *Geomagnetski pregled lokaliteta Borotino – Tumba: a) geomagnetska karta preko satelitske snimke; b) magnetska karta s rezolucijom -8/8 nT u sivim tonovima c) magnetska karta s rezolucijom -16/16 nT u boji s naglašenim višim vrijednostima; d) interpretacija izabranih anomalija – 1: linearna pozitivna anomalija u vezi s jarkom ili komunikacijom; 2: linearna pozitivna anomalija u vezi s obrambenim jarkom punim izgorenog materijala; 3-5: grupa dipolarnih anomalija u vezi s ostacima izgorenih kuća ili manje vjerojatno s izgorenim obrambenim zidom; 6-8: grupa dipolarnih anomalija u vezi s mogućim ostacima izgorenih kuća* (ilustracije: M. Przybyla; obrada: G. Naumov).
Figure 16 *Geomagnetic survey of Borotino – Tumba site: a) geomagnetic map layered over satellite imagery; b) magnetic map with -8/8 nT greyscale resolution; c) magnetic map with -16/16 nT colour resolution with the higher values emphasised; d) interpretation of selected anomalies - 1: a linear positive anomaly connected to a ditch or communication line; 2: a linear positive anomaly connected to a defensive ditch filled with burned structures; 3-5: a group of dipolar positive anomalies connected to the remains of burned houses or, less probably, a burned defensive wall; 6-8: a group of dipolar anomalies connected to the possible remains of burned houses* (illustrations: M. Przybyla; editing: G. Naumov).

geomagnetic survey. One of them is a positive point anomaly, probably with anthropogenic characteristics. This point grouping is concentrated in the eastern part of the site. The low value, shape, similar size and identical orientation of most of them may suggest that these are inhumation graves (Fig. 16a). Another is a positive and linear anomaly that could be identified as a ditch or communication line (Fig. 16g: 1). Other anomalies suggest the possible existence of a prehistoric defensive settlement: a linear di-

šta (Sl. 17). Cilj ove digitalne rekonstrukcije je vizualno predstaviti mogući izgled neolitičkog nalazišta na osnovi podataka prikupljenih na iskopavanjima i geofizičkim metodama. U modeliranju i rekonstrukciji korištene su fotografije s iskopavanja lokaliteta i slikovni materijal geofizičkih prospekcija na površini nalazišta. Postojeće ilustracije korištene su tijekom modeliranja dok su građevine modelirane u 3DS Max programu. Tijekom modeliranja tela naglasak je bio na

polar/positive anomaly associated with a defensive ditch filled with a burned substance (Fig. 16g: 2); a group of dipolar anomalies that are probably associated with remains from burned clay or (less probably) a burned defensive wall (Fig. 16g: 3-5); a group of positive anomalies that could be remains from a burned building (Fig. 16g: 6-8). On the one hand, the presence of burned material results in a strong magnetic signal suitable for geomagnetic measurement. On the other, it is very hard to distinguish between anomalies caused by defensive (a ditch or walls) and other buildings (burned houses or other structures of burned clay).

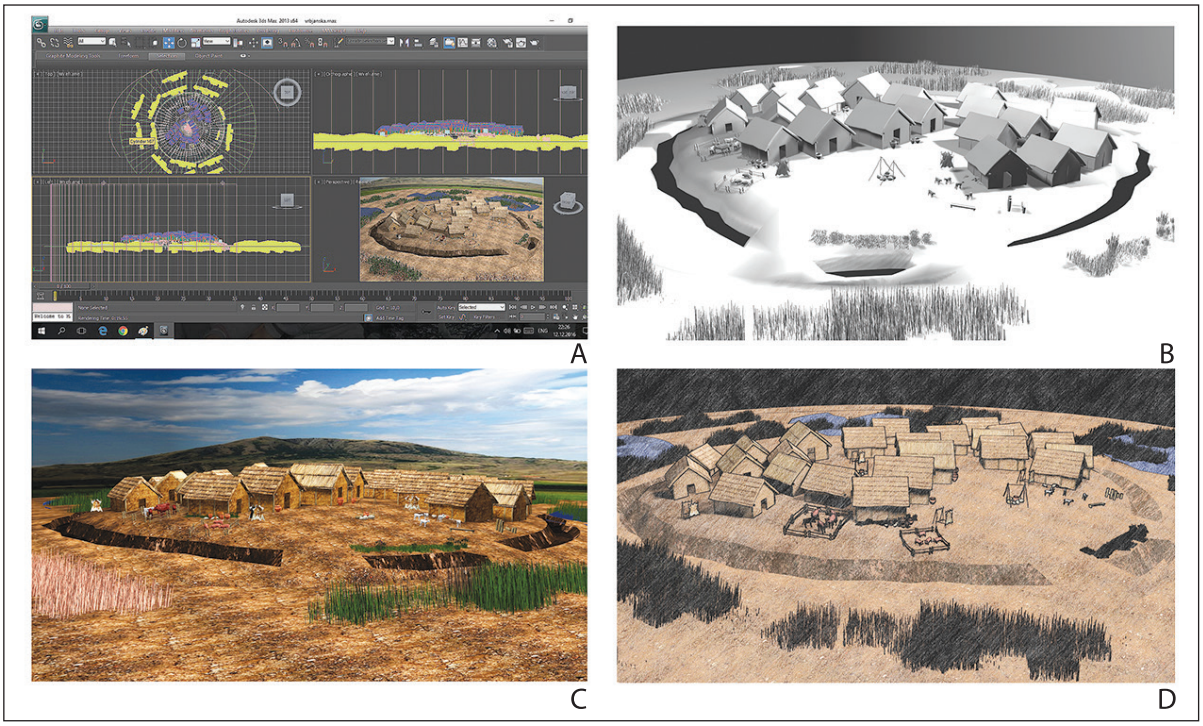
3D MODELLING OF THE SITE

As part of the archaeological research at Vrbjanska Čuka, 3D modelling of the site was carried out (Fig. 17). The aim of this digital reconstruction was to visually present the possible appearance of the Neolithic settlement based

istaknutijim dijelovima naselja kao što je jarak koji okružuje nekoliko kuća s jasnom pozicijom i pretpostavljenom veličinom. Osnovni cilj ove vrste digitalnog modeliranja i rekonstrukcije bio je vizualizacija izgleda naselja i objekata u njemu te rezultata koji će se koristiti u znanstvene svrhe, za kulturno i obrazovno promoviranje nalazišta, ali i popularizaciju neolitika u Pelagoniji.

REKOGNOSCIRANJE

Rekognosciranje nalazišta je uobičajena arheološka praksa kada se određeno geografsko područje istražuje prvi put. U slučaju projekta Vrbjanska Čuka rekognosciranje terena oko nalazišta poduzeto je da bi se uočila istovremena ili mlađa naselja na ovom području. Njihova buduća istraživanja pokazati će je su li bila povezana s naseljem u Vrbjanskoj Čuki ili je populacija ovog naselja osnovala neke od ovih telova prije



Slika 17. *3D-rekonstrukcija nalazišta Vrbjanska Čuka: a) proces modeliranja u Autodesk 3ds Max programu; b) 3D-model u negativu; c) 3D-model s rekonstrukcijom okoliša; d) 3D-model u obliku crteža* (ilustracije: I. Stoimanovski; obrada: G. Naumov).

Figure 17 *3D reconstruction of the Vrbjanska Čuka site: a) the modelling process in Autodesk 3ds Max; b) 3D model in negative; c) 3D model with landscape reconstruction; d) 3D model in the form of a drawing* (illustrations: I. Stoimanovski; editing: G. Naumov).

on data gathered from the excavation and the geophysical survey. The modelling and reconstruction mostly used photos from the excavations that had taken place at the site but also the imagery produced by the geophysical survey of its area. During the modelling, existing illustrations were used, while the buildings were modelled with 3DS Max. During the modelling of the tell, an emphasis was put on certain significant features of the settlement, such as a ditch surrounding several houses, together with a clear position and presumed size. The primary goal of this kind of digital modelling and reconstruction was to visualise the appearance of the settlement and the buildings in it, and for the results to be used for scientific purposes, the cultural and educational promotion of the sites, and also the popularisation of the Neolithic in Pelagonia.

RECONNAISSANCE

Reconnaissance of sites is common practice among archaeologists when a specific geographical region is explored for the first time. However, as part of the project focusing on Vrbjanska Čuka, reconnaissance around the site took place in order to detect some of the remaining synchronous or later settlements that existed in this area. Future research on these sites may show whether they co-existed with the settlement at Vrbjanska Čuka or if these settlements' populations established some of these tells prior to their migration. Some of the initial findings suggest the existence of settlements around Vrbjanska Čuka that could be dated to the Middle or Late Neolithic, and also the Chalcolithic.

During the reconnaissance, several previously mapped sites were visited but also a few new ones were discovered that were not included on the archaeological map of Macedonia.[38] In total, 8 sites were documented that are located within an approximate radius of 3 km around Vrbjanska Čuka (Fig. 18).

migracije. Neki od ranih nalaza ukazuju na postojanje naselja oko Vrbjanske Čuke koja možemo datirati u srednji ili kasni neolitik i eneolitik.

Tijekom rekognosciranja pregledano je nekoliko već kartiranih nalazišta, ali otkrivena su i neka nova koja nisu bila na arheološkoj karti Makedonije.[38] Dokumentirano je ukupno osam nalazišta koja se nalaze u promjeru od oko 3 km od Vrbjanske Čuke (Sl. 18).

Prema satelitskim snimcima i arheološkoj karti može se zaključiti da je broj lokaliteta na ovom području i veći, ali rekognosciranje 2016. je bilo usmjereno na samo nekoliko njih: Jošeska Tumba (oko 2 km sjeverozapadno od Vrbjana) s kasnijim površinskim nalazima (antički/srednjovjekovni); Čukarčinja (1 km zapadno od Vrbjana) – mali tel bez površinskih nalaza; Sredselo u Vrbjanima s nalazima iz nekoliko prapovijesnih razdoblja; Krušeanska Čuka (1 km jugozapadno od Vrbjana) s eneolitičkim površinskim nalazima; Tumba (1,5 km sjeverno od Borotina) s nalazima iz neolitika, eneolitika i brončanog doba; Vis Konjarski (1,5 km južno od Slaveja) s neolitičkim površinskim nalazima i Bel Kamen (800 m jugoistočno od Slaveja) s nalazima iz neolitika, eneolitika i antike.

Fokus istraživanja bio je na Visu Konjarskom i Tumbi jer su najbliže Vrbjanskoj Čuki zbog čega su ovi lokaliteti pregledani i magnetometrom. Vis Konjarski je samo 100 m sjeveroistočno od Vrbjanske Čuke. Na površini se nalaze srednjeneolitički keramički ulomci i izgoreni lijep.[39] Moguće je da ovo naselje pripada istom vremenu kao i Vrbjanska Čuka s obzirom na sličnosti u materijalnoj kulturi. Ipak, takve pretpostavke mogu potvrditi ili osporiti samo buduća iskopavanja te posebice datiranje metodom ^{14}C. Za razliku od tog nalazišta, na Tumbi koja se sastoji od dva manja povezana tela, uglavnom se nalaze kasnoneo-

[38] For a chapter on the region around Prilep, i.e. the villages of Slavej, Vrbjani and Borotino, see D. KOCO et al., 1996.

[38] O prilepskoj regiji, odnosno selima Slavej, Vrbjani i Borotino vidi u D. KOCO et al., 1996.

[39] G. NAUMOV et al., 2017.

Slika 18. *Karta rekognosciranja s položajem nalazišta oko Vrbjanske Čuke (u blizini sela Slavej, Vrbjani i Borotino): 1. Jošeska Tumba; 2. Čukarčinja; 3. Krušeanska Čuka; 4. Sredselo – Vrbjani; 5. Borotino – Tumba; 6. Vis Konjarski; 7. Bel Kamen* (karta: G. Naumov).
Figure 18 *Reconnaissance map with the position of the sites around Vrbjanska Čuka (in the vicinity of the villages of Slavej, Vrbjani and Borotino): 1. Jošeska Tumba; 2. Čukarčinja; 3. Krušeanska Čuka; 4. Sredselo-Vrbjani; 5. Borotino – Tumba; 6. Vis Konjarski; 7. Bel Kamen* (map: G. Naumov).

According to the satellite imagery and the archaeological map, it can be concluded that the number of settlements in this area is larger. However, this year the reconnaissance was concentrated on only a few of the sites. Thus, visits were made to the sites of: Josheska Tumba (around 2 kilometres north-west of Vrbjani), which has later surface material (Classical/Medieval); Čukarchinja (1 kilometre west of Vrbjani), a small tell without surface finds; Sredselo in Vrbjani, which has material from several prehistoric periods; Krusheanska Čuka (1 kilometre south-west of Vrbjani), which has Chalcolithic surface material; Tumba (1.5 kilometres north of Borotino), which has finds from the Neolithic, Chalcolithic and Bronze Age; Vis Konjarski (1.5 kilometres south of Slavej), which has Neolithic surface material; Bel Kamen (800 metres south-east of Slavej), which has finds from the Neolithic, Chalcolithic and Classical periods.

Most of the attention of the research was focused on Vis Konjarski and Tumba, given their proximity to Vrbjanska Čuka and because of which they were later surveyed with a magnetometer. Vis Konjarski is only 100 metres north-east of Vrbjanska Čuka, and there are predominately Middle Neolithic pottery fragments and litički i eneolitički nalazi (ulomci posuda, figurine, pečati itd.). To znači da je ovo naselje nastalo nakon što je završio život na Vrbjanskoj Čuki, ali prema sadašnjim spoznajama teško je reći radi li se o istoj populaciji ili o nekoj sasvim nepovezanoj koja donosi različite oblike materijalne kulture.

ZAKLJUČAK

Istraživanje u Vrbjanskoj Čuki 2016. godine dopunilo je spoznaje iz prethodnih iskopavanja, ali je ponudilo i obilje novih podataka o početku i razvoju naselja. Istraživanje je imalo kompleksniji karakter jer je primijenjeno nekoliko metoda kako bi se stekao dublji uvid u prirodu nalazišta i njegovog okruženja kao što su: kontekstualni pristup Harrisove matrice, arheobotaničke analize, geomagnetska prospekcija, mikrolokalno rekognosciranje, digitalno topografsko i 3D modeliranje. Ovakva strategija je omogućila puno šire razumijevanje nalazišta, uključujući njegov razvoj i prostornu organizaciju.

Prema rezultatima arheoloških istraživanja i obradi podataka može se zaključiti da

burned daub over its area.[39] There is a possibility that this settlement functioned at the same time as Vrbjanska Čuka, given the similarities in the material culture. However, such assumptions can only be confirmed or denied through future excavations, especially with the aid of chronological radiocarbon analyses. In contrast, at Tumba, which consists of two smaller and connected tells, mostly Late Neolithic and Chalcolithic finds have been uncovered (fragments of vessels, figurines, stamps, etc.) This means that this settlement was formed after life at Vrbjanska Čuka, although at the current time it is hard to say if it was the same population or a completely unrelated one that brought different forms of material culture.

CONCLUSION

The research at Vrbjanska Čuka in 2016 complemented the knowledge about this site from previous excavations but also offered a lot more new data about the beginning and development of this settlement. The studies had a more complex approach by applying several methods for a more profound insight into the nature of this site and its surroundings, such as: a Harris matrix contextual approach, archaeobotanical analyses, geomagnetic surveying, micro local reconnaissance, and digital topographic and 3D modelling. This strategy provided a much broader understanding of this site, including its development and spatial organisation.

According to the results of the archaeological excavations and the processing of the data, it can be concluded that the settlement has the characteristics of the Pelagonian Neolithic in its developed stage. Without a more thorough treatment of the material culture and radiocarbon analyses, it cannot be claimed that it belongs solely to the Middle Neolithic, as certain elements suggest earlier features. Although it contains more characteristics of the Pelagonian Neolithic, a multi-

[39] G. NAUMOV et al., 2017.

naselje ima obilježja pelagonijskog neolitika razvijene faze. Bez temeljitije obrade materijalne kulture i analize metodom ^{14}C ne može se tvrditi da pripada samo srednjem neolitiku, jer određeni elementi ukazuju na ranije pojave. Iako su zastupljene karakteristike pelagonijskog neolitika, mnoštvo nalaza autentičnih obilježja proizvedeno je u naselju. Za razliku od ostalih nalazišta u ovoj zavali, broj bijelo oslikanih posuda je puno manji u Vrbjanskoj Čuki, a brojnije su one s crnim uzorcima. Crno slikani motivi su rijetki u Pelagoniji,[40] ali način na koji su izvedeni na posudama iz Vrbjanske Čuke zasad je jedinstven u regiji. Također treba spomenuti posebne karakteristike askosa jer se pojavljuju samo na ovom nalazištu.

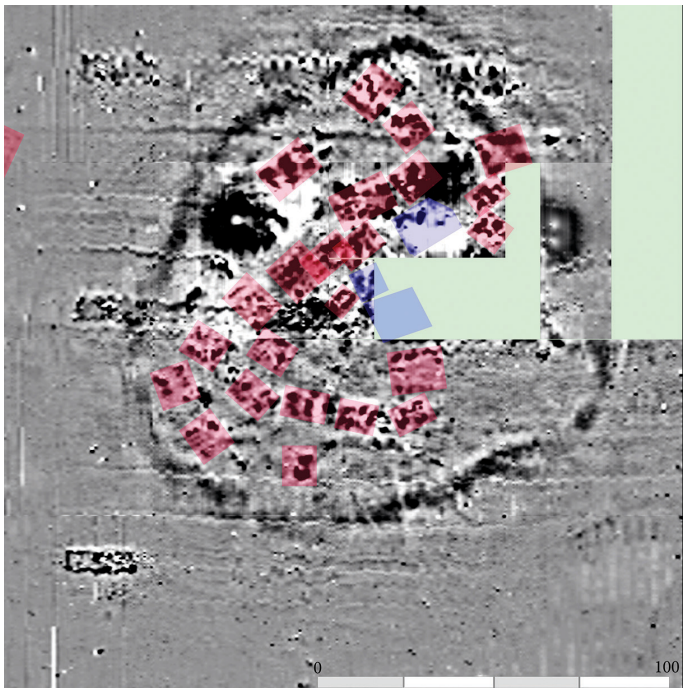
Tijekom iskopavanja istražen je veći objekt (Kuća 2) i dio nastambe neposredno uz nju (Kuća 4) koja je pružila više podataka o arhitektonskim tradicijama ovog naselja. Dimenzije Kuće 2 (13 x 10 m) djelomično odstupaju od uobičajenih standarda neolitičkih kuća u Makedoniji te se može smatrati jednom od najvećih u regiji. Otkriće struktura u njenoj unutrašnjosti (peć, jame za otpatke i platforma) ukazuju na objekt s intenzivnim gospodarskim djelatnostima u obradi žitarica, grahorica i drugih biljnih proizvoda što potvrđuju mnogi kameni žrvnjevi i arheobotaničke analize uzoraka uzetih oko ovih struktura. Kuća 4 je otkrivena pokraj ovog objekta, smještena u različitom stratigrafskom sloju između Kuće 2 i Kuće 1 iskopane 1980-ih.[41] Oblik i pozicija ovih triju kuća ukazuje na njihov smještaj u središnjem dijelu neolitičkog sela. Rezultati geomagnetske prospekcije su znatno pridonijeli boljem razumijevanju prostorne organizacije ovog naselja budući da potvrđuju linearni raspored nastambi okruženih jarkom u smjeru JZ-SI i SZ-JI (Sl. 19). U jugoistočnom dijelu jarka primijećen je

[40] M. GRBIĆ et al., 1960; D: TEMELKOSKI, A. MITKOSKI 2005a.

[41] B. KITANOSKI, 1989; A. MITKOSKI, 2005.

tude of objects with distinctive features were produced in this settlement. Unlike other sites in this basin, there are far fewer white painted vessels at Vrbjanska Čuka, although many more were revealed that contain black patterns. Such black-coloured patterns are rare in Pelagonia,[40] but the way they are applied to the vessels from Vrbjanska Čuka for now appears unique in this region. The specific features of the *askoi* should also be highlighted as characteristic of only this site.

During the excavations, a large building (Building 2) was explored together with part of the building immediately next to it (Building 4), which provided more data about the architectural traditions of this settlement. The dimensions of House 2 (13 x 10 m) partially deviate from the normal standards of Neolithic architecture in Macedonia, and it can be considered one of the largest in the region. The discovery of structures in its interior (oven, bins and a oval clay instalation) suggests a building with intensive economic activity in the domain of processing cereals, legumes and other plant products. This is confirmed by the numerous grinding stones and archaeobotanical analyses of the samples around these structures. Building 4 was discovered next to this object. It is located in a different stratigraphic level between Building 2 and Building 1 excavated in the 1980s.[41] The definition of the forms and position of these three houses points to their placement in the Neolithic village in its central space. With regard to the spatial organisation of this settlement, the results of the geomagnetic survey have made a significant contribution. They confirm the linear disposition of buildings in southwest-northeast and northwest-southeast directions, enclosed by a circu-



Slika 19. *Hipotetski položaj objekata i organizacija naselja prema rezultatima geomagnetske prospekcije. Iskopavane kuće su označene plavim, a moguće crvenim* (geomagnetska karta: M. Przybyla; obrada: G. Naumov).
Figure 19 *Hypothetical position of objects and settlement organisation based on the results of the geomagnetic survey. The excavated houses are shown in blue and possible ones in red* (geomagnetic map: M. Przybyla; editing: G. Naumov).

poremećaj koji bi mogao predstavljati ulaz u naselje jer na tom dijelu nema građevina.

Koncentracija objekata u središnjem dijelu naselja koja se može uočiti na ilustraciji geomagnetskog pregleda mogla bi pripadati neolitičkom razdoblju ili bi mogla biti dio antičke masivne građevine (*villa rustica*). Karakter ovih objekata biti će određen u budućim istraživanjima, iako zastupljenost rimske keramike, tegula i imbreksa ukazuje na upotrebu ovog tela u antičkom periodu i moguće postojanje *ville rustice* u području bogatom plodnim poljima. Iz ovog se čini da je tel koji je osnovan kao neolitičko selo naknadno korišten za gospodarske svrhe. Ove geografske značajke i visina od 3,5 m (izmjereno u digitalnom modelu terena) bile su prikladne za upotrebu lokacije kao skladišnog prostora i nekropole u srednjem vijeku. Otkrivene ljudske kosti kao i keramika, građevinski materijali, metalna oruđa i broj-

[40] M. GRBIĆ et al., 1960; D: TEMELKOSKI, A. MITKOSKI 2005a.
[41] B. KITANOSKI, 1989; A. MITKOSKI, 2005.

lar ditch (Fig. 19). In the south-eastern part of the ditch, a disruption is noticed which could be the entrance to the settlement, as there is no presence of buildings.

A concentration of buildings in the central part of the settlement can be seen in the illustration from the geomagnetic surveying. This could belong to the Neolithic period or possibly could be part of a large building from the Classical period (a *villa rustica*). The character of these buildings will be determined by future research, although the presence of Roman pottery, *tegulae* and imbrices indicates the use of this tell in the Classical period and the possible existence of a *villa rustica* in an area that is rich in fertile fields. This demonstrates that the tell established by the Neolithic village was later used for economic purposes. Its geographic character and height of 3.5 metres (as measured by the digital elevation model) were also suitable for using this location as a storage area and necropolis in the Middle Ages. The discovery of human remains, as well as pottery, construction materials, metal tools and numerous storage pits, suggest activity on the tell in this period. In the 20th century, the tell was used as a place for animal farming, hunting and arable land, which only confirms its dynamic character and continuity of use from the Neolithic to the present.

Data obtained from research in 2016 confirmed that Vrbjanska Čuka is a complex site even though it represents a small settlement. It evolved in an environment attractive for the formation of farming villages in the Neolithic and Chalcolithic periods, which is also testified to by the reconnaissance conducted parallel to the excavations. The large concentration of tells on a micro scale is a common feature of the Pelagonian Neolithic and is bound to the presence of a large marshy area and fertile land.[42] The relationship between Vrbjanska Čuka and other tells should be explored in detail, and by employing geoarchaeologi-

[42] G. NAUMOV et al., 2014; G. NAUMOV, S. STOJKOSKI, 2015; G. NAUMOV, 2016.

ne jame za pohranu ukazuju na aktivnosti na telu i u ovom periodu. U 20. stoljeću tel je korišten za potrebe životinjske farme, za lov i kao obradivo tlo što samo potvrđuje njegov dinamični karakter i kontinuitet upotrebe od neolitika do danas.

Podaci prikupljeni u istraživanju 2016. potvrdili su da je Vrbjanska Čuka kompleksno nalazište iako manjeg opsega. Razvilo se u okruženju pogodnom za nastanak zemljoradničkih naselja u neolitiku i eneolitiku što je potvrđeno u rekognosciranju koje je provedeno paralelno s iskopavanjima. Gusta koncentracija telova na manjem području karakteristična je za pelagonijski neolitik i često je povezana s prisutnošću velikih močvarnih područja i plodne zemlje.[42] U tom smislu bi odnos između Vrbjanske Čuke i drugih telova trebalo detaljnije istražiti, a upotrebom geoarheoloških i paleoekoloških metoda mogla bi se odrediti i njihova pozicija u odnosu na močvare i rijeke. Ipak, takva gravitacija nekoliko naselja prema jednom području ne znači da ona dijele istu prostornu organizaciju i materijalnu kulturu. Geofizičke prospekcije na Vrbjanskoj Čuki, Visu Konjarskom i telu Borotino otkrile su različita naseobinska uređenja (s jednim ili više jaraka, palisadama, linearnim rasporedom kuća ili njihovim potpunim odsustvom) dok je rekognosciranje ovih lokaliteta rezultiralo nalazima koji se mogu datirati od srednjeg neolitika do eneolitika. Evidentno je da su potrebna detaljnija istraživanja Vrbjanske Čuke, ali i početna istraživanja na dva susjedna naselja da bi se utvrdio njihov potencijalni odnos i društvena dinamika. Na taj način bilo bi moguće pratiti prvu pojavu zemljoradnje u ovom dijelu Pelagonije i njen utjecaj na formiranje neolitičkog društva i njegovu postupnu transformaciju u sljedećim prapovijesnim fazama.

[42] G. NAUMOV et al., 2014; G. NAUMOV, S. STOJKOSKI, 2015; G. NAUMOV, 2016.

cal and paleoecological studies their position in relation to prehistoric wetlands and rivers could also be determined. Nevertheless, such a gravitation of several settlements towards one area does not mean that they share the same spatial organisation and material culture. The geophysical surveys at Vrbjanska Čuka, Vis Konjarski and the tell at Borotino indicated different settlement arrangements (with one or more ditches, palisades, the linear deployment of houses or their total absence), while the reconnaissance of these sites provided finds that can be attributed to Middle Neolithic to the Chalcolithic. This demonstrates that more detailed excavations at Vrbjanska Čuka are necessary but also that preliminary research needs to be conducted at the two neighbouring settlements in order to determine their potential relationship and social dynamics. This would allow the first forms of agriculture in this part of Pelagonia and their impact on the establishment of Neolithic society and its gradual transformation in the following prehistoric stages to be traced.

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