O CI ERUPCIJI KAO FAKTORU KULTURNIH I DEMOGRAFSKIH PROMJENA NA PRELAZU IZ SREDNJEG U GORNJI PALEOLIT NA ISTOČNOJ OBALI JADRANA[1]

ON CI ERUPTION AS A FACTOR OF CULTURAL AND DEMOGRAPHIC CHANGES ON THE TURN OF MIDDLE TO UPPER PALEOLITHIC ON THE EAST ADRIATIC COAST [1]

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Apstrakt

Kompleksnost ranog orinjasijena širom Evrope je neupitna i često prisutna. S obzirom da se radi o jednoj industriji, koja je često prepoznata na velikoj površini Evrope, a nemogućnosti da se ona jasno definiše jer sinkretizuje određeni broj arheoloških osobenosti, situacija orinjasijena se komplikuje i nije je uvijek lako okarakterisati. Ovaj rad ima za pokušaj da kroz određeno prikazivanje arheoloških, klimatoloških, ekoloških, kulturnih i populacionih elemenata, donekle razjasni sliku kako na širem geografskom području tako i na istočnoj obali Jadrana, oblasti na kojoj je nešto većim dijelom stavljen akcenat u radu. Ključni element je CI erupcija koja se dogodila, sa svim svojim kasnijim posljedicama, za vrijeme kulturnog i biološkog perioda koji paleolitska arheologija poznaje kao period "tranzicije" iz srednjeg ka gornjem paleolitu. Bitan osvrt na njene aspekte može biti od velikog značaja kada se pokušava dati odgovor na mnoga nejasna pitanja ovog arheološkog fenomena, makar kada je u pitanju južni dio Italije i dobar dio istočnog Mediterana.

Ključne riječi: CI erupcija, Y5 tefra, gornji paleolit, srednji paleolit, orinjasijen, Neandertalci

1 Autor rada duguje veliku zahvalnost Prof. dr Dušanu Mihailoviću, sa kojim je svojevremeno razmjenio mišljenja o problematici o kojoj se ovdje radi i čije su sugestije mnogo pomogle da se o problemu razmišlja na specifičan način.

Abstract

The complexity of early Aurignacien throughout Europe is questionable and quite present. Given that this is one industry that is often identified on a large area of Europe, and the inability to be clearly defined since it synthetizes a number of archaeological features, the situation of Aurignacian is complicated and is not always easy to characterize it. This paper is an attempt to somewhat clarify the image of a wide geographic area as well as on the east Adriatic coast, an area which is mostly emphasized in the work, through the specific archaeological, climatological, ecological, cultural and population elements. The key element of the CI eruption that happened, with all its subsequent consequences, during the cultural and biological period which the Paleolithic archeology recognizes as a period of "transition" from the middle to the upper Paleolithic. An important review of its aspects can be of great importance when trying to answer a number of unclear issues of this archaeological phenomena, at least when it comes to the southern part of Italy and a good part of the eastern Mediterranean.

Key Words: CI eruption, Y5 tephra, Upper Paleolithic, Middle Paleolithic, Aurignacien, Neanderthals

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Abbreviations:
AMS – Accelerator mass spectrometry
BP – Before present
CI – Campanian Ignimbrite
GI – Greenland Interstadial
GISP – Greenland Ice Sheet Project
GS – Greenland Stadial
HE – Heinrich Event
ka – kiloannum
MIS – Marine Isotope Stage
ppb – part per bilion

Vulkanska erupcija kao ekološki fenomen

Današnje znanje o vulkanskim klimatskim sistemima bazirano je na njihovim savremenim preturbacijama, a vulkansko-klimatski sistemi u poslednjem glacijalu mogu biti znatno drugačiji (Fedele 2003). Radom vulkana, u atmosferi raste koncentracija fine vulkanske prašine, koja izaziva odbijanje veće količine sunčeve energije, a samim tim i pad temperature. Dejstvovanje vulkana može dovesti i do ledenog doba, mada u periodu kvartara nema dokaza za ovu vrstu hipoteze (Stevanović et al. 1992).

Prvi stepen udara će svakako najupečatljivije posljedice ostaviti u geografski najbližem dijelu, i to će se neminovno reflektovati na okruženje, zemljište, ekosistem. Međutim, najbitnija posljedica koju će udar velikih razmjera ostaviti za sobom je direktan uticaj na klimu. Kratkoročno hlađenje nastalo uslijed mega erupcija može da uništi nekoliko ekosistema, čak i za vrijeme interglacijalne klime (Fedele 2008). Vulkan erupcijom izbacuje pepeo koji se akumulira u atmosferi, kao i druge vrste vulkanskog materijala koje su kompaktnije, pogađaju teritoriju u neposrednoj blizini vulkana. Pepeo iz atmosfere pogađa vegataciju (šume, pašnjake), zemljanu površinu (sve vidove zemljišta, močvare, oblasti prekrivene snijegom i ledom), vodene sisteme (mora i morske sedimente, jezera i jezerske sedimente, rijeke i riječna korita) (Ayris 2012). Vulkanski pepeo može da djeluje devastirajućom snagom na ekosistem, putem hemijskih i fizičkih promjena u vodama jezera i rijeka te da dovede do djelimičnih ili totalnih destrukcija šuma i pašnjaka. Konzumiranje vegetacije koja je pokrivena pepelom dovodi do oštećenja

Volcanic Eruption as an Ecological Phenomenon

Today the knowledge on volcanic climate systems is based on their contemporary perturbations and volcanic-climate systems in the last glacial could be significantly different (Fedele 2003). The work of the volcano, in an atmosphere of growing concentration of fine volcanic dust, causes rejection of greater amounts of solar energy, and thus the temperature drop. Firing volcanoes can lead to an ice age, although the Quaternary period there is no evidence for this type of hypothesis (Stevanović *et al*. 1992).

The first level of impact will certainly the most striking consequences of leaving the geographically nearest part, and it will inevitably reflect on the environment, land, and ecosystem. However, the most important result of which the impact of large-scale leave behind a direct impact on the climate. Short-term cooling resulting from the mega eruption can destroy a number of ecosystems, even during interglacial climate (Fedele 2008). Volcano eruption ejected ash that accumulates in the atmosphere, as well as other types of volcanic materials that are more compact, affecting territory in the immediate vicinity of the volcano. The ash in the atmosphere affects the vegetation (forest, pasture), earthen surface (all types of land, wetlands, areas covered with snow and ice), aquatic systems (sea and marine sediments, lakes and lake sediments, rivers and river beds) (Ayris 2012). Volcanic ash can affect with devastating power on the ecosystem, through chemical and physical changes in the waters of lakes and rivers and lead to partial or complete destruction of forests and grasslands. Consumption of vegetation covered with ash leads to damage of the eyes, teeth, internal organs as in ruminants and in other herbivores (Costa 2012).

Tephra

Tephra is classified as any particle of pyroclastic materials (parts early ejected magma and rock) that has erupted during and immediately prior to eruption. Tephra ejected into the atmosphere can directly affect the local weather

očiju, zuba, unutrašnjih organa kako kod preživara tako i kod ostalih biljojeda (Costa 2012).

Tefra

Tefra je klasifikovana kao bilo koja čestica piroklastičnog materijala (dijelovi rano izbačene magme i stijena) koje je eruptiralo tokom i neposredno pred erupciju. Izbačena tefra u atmosferu može direktno da utiče na lokalne vremenske prilike. Tefra u atmosferi nakon erupcije planine Sveta Helena 18. maja, 1980. godine, padala je dva dana na obližnju teritoriju, te je dovela do pada temperature i do 8 °C (Ayris 2012). Depoziti tefre koji nisu vidljivi golim okom, mogu se takođe izdvojiti radi istraživanja, te stoga uzeti u razmatranje. Sastoje se uglavnom od sićušnih komada staklastih sedimenata (obično veličine oko 150μm), te se kao takvi izdvajaju u laboratorijskim uslovima. Obično tefra u takvom stanju (mikrotefra) može putovati dosta duže od one koja je uočljiva okom i koja formira veće depozite (Lowe et al. 2012). Mikrotefra u pećinama i lokalitetima može biti sprata uslijed bujica i poplava i nagomilati se kasnije na mnogo mlađim kulturnim depozitima. Stoga pri determinaciji iste (kao veoma važan element u hronološkom evidentiranju), treba strogo povesti računa (Moorley 2011). Tako da geološki zapisi tefre iz prošlosti, na pojednim lokalitetima mogu biti u vidu debelih slojeva od po 2m, kakav je slučaj sa pojedinim lokalitetima u sjeverozapadnoj Grčkoj (tefra iz vremena srednjeg pleistocena, datovana oko 372 000 ± 7 000 g. BP) (Pyle et al. 1998).

Tokom gornjeg pleistocena izdvojene su po standardizaciji Kelera dvije prirodne zone tefre X i Y. U istočnom Mediteranu izdvojeno je šest slojeva koji pripadaju zoni X i osam slojeva koji pripadaju zoni Y. U Centralnom Mediteranu situacija je dosta složenija sa preko stotinu slojeva koji su identifikovani i hemijski okarakterisani. Tefra iz ovih zona potiče uglavnom od vulkanskih aktivnosti iz kampanjske provincije. Najrasprostranjeniju tefru u oblasti Mediterana predstavlja dokumentovani sloj Y5 tefre. Uslijed ogromne količine pepela koji potiče od iste erupcije, može se razmatrati njen ozbiljan uticaj na globalnom klimatskom poremećaju. (Narcisi

conditions. Tephra in the atmosphere after the eruption of Mount St. Helena on May 18, 1980, falling two days in a nearby territory, which led to a drop in temperature of up to 8 ° C (Ayris 2012). Tephra deposits that are not visible with the bare eye, can also be set aside for research, and therefore taken into consideration. They consist mainly of tiny pieces of glassy sediment (usually the size of about 150μm), and as such stand out in laboratory conditions. Usually tephra in the condition (micro tephra) can travel quite longer than that which is visible and forming large deposits (Lowe et al. 2012). Micro tephra in caves and sites can be a washed out due to torrents and floods and can pile up later at a much younger cultural deposits. Therefore, in determination of the abovementioned (as a very important element in chronological recording), should be strictly taken care of (Moorley 2011). Therefore the geological records of tephra from the past, on certain sites can be in the form of thick layers of at 2m, as is the case in certain regions in the north-west Greece (tephra from the time of the Middle Pleistocene, dating from around 372 000 ± 7000 g. BP) (Pyle et al., 1998).

During the Late Pleistocene two natural zones tephra X and Y were selected for standardization of Keller. In the eastern Mediterranean, the six layers within the zone X and eight layers within the zone Y. In the Central Mediterranean situation is quite complex with over a hundred layers that have been identified and chemically characterized. Tephra from these zones comes mainly from volcanic activity from campaigning Province. Most widespread tephra in the Mediterranean represents a documented Y5 tephra layer. Due to the huge amount of ash originating from the same eruption, her a serious impact on the global climate disruption can be considered. (Narcisi 1999) Tephra which descended from the CI eruption in the Mediterranean basin carries just mark C -13 or / -5 Y (Giaccio 2008).

Before it finishes on the land, tephra can be found on the treetops, and the lower vegetation. Due to the large accumulation of tephra, earlier breakout and fruit drop and the leaves may occur, as well as the collapse of entire branches. Vegetation affected by heavy tephra cannot survive. Lower plants covered with

1999) Tefra koja vodi porijeklo od CI erupcije u mediteranskom basenu nosi upravo oznaku C -13 ili / Y -5 (Giaccio 2008).

Prije nego završi na zemljištu tefra se može zaustaviti kako na krošnjama drveća, tako i na nižoj vegetaciji. Uslijed velikog nagomilavanja tefre, može doći do ranijeg otkidanja i opadanja plodova i lišća, te urušavanja čitavih grana. Vegetacija pogođena teškom tefrom može da izumre. Niže biljke zatrpane tefrom mogu da prežive ako sloj nagomilavanja nije predebeo. Neke biljke mogu da razviju određene mehanizme odbrane i prežive nekoliko godina ispod tefre.Voda i vjetar su glavni erozivni mehanizmi koji šire prisutvo tefre (Ayris 2012).

CI erupcija

Izvor CI erupcije je podzemni vulkan Kampi Flegrei, u Felegrejskim poljima zapadno od Napulja u južnoj Italiji. Procjenjuje se da je CI erupcija mogla prouzrokovati urušavanje kratera od oko 230km², što uključuje današnji Napulj, dok su piroklastični depoziti prekrili oblast od oko 30 000km². Visina stuba pri samoj erupciji mogla je doseći visinu i do 44km, dok je površina pokrivena pepelom izbačenim u erupciji mogla iznositi i do 5 000 000km². Hemijski sastav plavca (vulkansko staklo koje se formira na pojednim vrstama lava) i staklene ljušture reflektuju se na erupciji obrazujući dva hemijski različita sloja magme – više razvijeni sloj gornje magme i manje razvijeni sloj donje magme (Hoffecker 2008). Erupcija je svojim djelovanjem raščlanjena na dvije faze. Primarni talas u vidu izbacivanja piroklastičnih vulkasnkih depozita formiranjem stuba velike visine i drugi talas koji se sastojao od postepeng nagomilavanja depozita koji je išao radijalno opadajući sjevero – sjeveroistočno od mjesta erupcije. Formiranje ultra plinijskog stuba praćeno je serijom oslabljenih piroklastičnih struja. Vrste ignimbrita detektovane u vidu geološkog sloja, mogu biti: sivkasta tefra djelimično očvrsla ili žućkasti koherentni tuf sa primjesom zeolita (mineral složenih hidratisanih silikata natrijuma, kalijuma i kalcijuma) od kojih oba sadrže svijetli i tamni plavac u obliku izduženih vezikula (mehurova ili plihova) (Giaccio 2008).

tephra can survive if the accumulation layer is not too thick. Some plants can develop certain mechanisms of defense and survive for several years under the tephra. The water and wind are erosion mechanisms that spread presence of tephra (Ayris 2012).

CI eruption

Source of CI eruption of an underground volcano Campi Phlegraei, in Phlegraean Fields, west of Naples, in southern Italy. It is estimated that the CI eruption could cause a collapse of the crater of about 230km², which includes today's Naples, while the pyroclastic deposits could cover an area of approximately 30 000km². Maximum lift height caused by the eruption could reach a height of 44 kilometers, while the surface covered by ash thrown out in the eruption could reach up to 5,000 000km². The chemical composition of pumice (volcanic glass formed on certain types of lava) and glass shells are reflected on the eruption forming two chemically distinct layers of magma - more developed upper layer of magma and less developed layer lower of magma (Hoffecker 2008). The eruption by its effect is broken down into two phases. The primary wave in the form of expulsion volcanic pyroclastic deposits forming pillars of great height and the second wave, which consists of subsequent accumulation of deposits which was extended radially decreasing north - north-east from the eruption. The formation of ultra plinian pillars followed by a series of weak pyroclastic currents. Types of ignimbrite detected in the form of geological layers, can be: a grayish tephra partially cured or yellowish coherent tuff with an admixture of zeolites (mineral complex hydrated silicate of sodium, potassium and calcium), both of which contain bright and dark pumice stone in the shape of elongated vesicles (bubbles or blistering) (Giaccio 2008).

Due to an acute cooling followed by the release of Arctic ice, known as Heinrich Event 4 (Heinrich Event 4 - HE 4) that began around 40,050 BP, was followed by the eruption of enormous proportions. CI eruption is one of the largest in the past 200 000 years on the Earth's

Uslijed akutnog hlađenja propraćenog arktičkim oslobađanjem leda, poznatog kao Hajnrihov događaj 4 (Heinrich Event 4 – HE 4) koji je započeo oko 40.050 BP, uslijedila je erupcija enormnih razmjera. CI erupcija je jedna od većih u proteklih 200 000 godina na sjevernoj Zemljinoj hemisferi. Uslijed toga treba uzeti u obzir njenu bitnost i njen (posredni i neposredni) ekološki uticaj. Datovanje igra ključnu ulogu u ovoj stvari, to jest da precizno datovanje dva efekta (Hanjrihovog događaja 4 i CI erupcije) može dovesti do predpostavke o velikom pogoršavanju klimatskih prilika u određenom vremenskom intervalu (poznatom kao HE4 - CI kriza). Akcenat na datovanju ovog geološkog događaja, dodatno usložava stvar, jer za taj vremenski period nam je poznat koncept paleolitske kulturne i sociolške "tranzicije" (Fedele 2008). MIS3 faza je trajala 60 000 – 30 000. Prema grenlandskim i sjeverno atlanskim podacima, klima je u tom periodu bila vrlo nestabilna, okaraktersana serijom toplih i hladnih oscilacija. Najistaknutiji hladni interval je upravo HE 4 u čijim se hronolškim okvirima dogodila CI erupcija u južnoj Italiji (Hoffecker 2008).

Volumen izbačene magme približno je ekvivalentan 300 km³. Temperatura materijala prilikom erupcije iznosila je oko 1000 °C. U vremenskom intervalu kad je došlo do HE 4 i CI erupcije, događa se i Lašempova promjena (Laschamp excursion), pa se samim tim geofizička situacija erupcije dodatno komplikuje (Fedele 2008).

Raznolikost u hemijskom sastavu CI depozita koja je konstatovana dolazi iz različitih hemijskih sastava magme. Magma gornjih slojeva je izdužena u prvim fazama erupcije, upravo zbog inteziteta izbačena je mnogo dalje od donje, koja je uslijed smanjenog inteziteta erupcije raširena "samo na okolnu" površinu felegrejskih polja, to jest bliže izvoru lave (Giaccio 2008). Uzimajući u obzir da je istočna obala Jadrana relativno blizu centra erupcije, ne može se izostaviti da je veći dio priobalja (makar onaj na koji je nanošen piroklastični materijal uslijed struja vjetrova) i dobar dio apeninskog polustrva bio prekriven vulkanskim depozitom - što je dovelo do degradacije faune i vegetacije, a takva situacija rezultirala je privremenom depopulacijom

northern hemisphere. As a result, its importance and its (direct and indirect) environmental impact should be taken into account. The dating plays a key role in this matter, that is, to precisely date of the two effects (Heinrich event 4 and CI eruption) could lead to an assumption on a large deterioration of climatic conditions in a given time interval (known as HE4 - CI crisis). The emphasis on dating of the geological events, additionally makes the matter more complex, as for that period of time we are familiar with the concept of Paleolithic cultural and sociological "transition" (Fedele 2008). MIS3 phase lasted from 60,000 to 30 000. According to Greenland and North Atlantic data, the climate in this period was very unstable, characterized by the series of hot and cold fluctuations. Foremost cold interval is just HE 4 in whose chronological framework the CI eruption occurred in southern Italy (Hoffecker 2008).

The volume of magma ejected is approximately equivalent to 300 km³. The temperature of the material during an eruption was about 1000 ° C. In the period of time when HE 4 and CI eruption occurred, the Laschamp excursion happened as well (*Laschamp excursion*), and therefore geophysical situation is further complicated by the eruption (Fedele 2008).

The diversity in the chemical composition of CI deposits that was detected comes from the different chemical composition of the magma. Magma of the upper layer is elongated in the first stages of the eruption, due to the intensity of eruption happened much further than the lower magma, which is due to the reduced intensity of the eruption widespread " only on the local" area of Phlegrean Fields, that is, closer to the source of lava (Giaccio 2008). Having in mind that the eastern Adriatic coast is relatively close to the center of eruption, we cannot leave out that the larger part of the coast (at least the one that was applied pyroclastic material due to current winds) and a good part of the Apennine Peninsula was covered in volcanic deposit - which led to the degradation of fauna and vegetation, a situation which resulted in the temporary depopulation of the region (Mussi 2002).

HE4-VI event could affect Paleolithic population in many ways: 1) a shift from herbivores

čitavog regiona (Mussi 2002).

HE4-CI događaj je na paleolitske populacije mogao uticati mnogostruko: 1) pomjeranje herbivora od zagađenih pašnjaka 2) mjenjanje navike u korišćenju biljaka (koje su do erupcije bile dostupne) 3) mjenjanje dostupnosti vode 4) prisiljavanje promjena u nabavci kamenih sirovina 5) izazivanje raseljavanja stanovništva, depopulacije, smanjenja velikih grupa i ostalih demografskih posljedica 6) nametanje stresa u spoznaji u prenošenju informacija i u samim socijalnim strukturama (Fedele 2008).

Efekat "vulkanske zime"

S obzirom na efekat, dinamiku i snagu erupcije, predpostavlja se da je događaj trajao 2 - 4 dana. Velike količine fluora, hlora, zajedno sa sumpor dioksidom su izbačene u troposferu i mogle su proizvesti snažne i obilne kisele kiše u geografskoj oblasti u kojoj je vjetar nanosio vulkanski materijal. S druge strane, teško je rekonstruisati smjer vjetra, bez obzira što se može napraviti obrazac prateći (odnosno mapirati) nagomilanu tefru (imajući u vidu lokalitete koji su sjeverno i sjeveroistočno od mjesta erupcije). Tefra je locirana i na udaljenosti od oko 2500km od vulkana. Erupcija je skoro nesumnjivo dovela do pojave "vulkanske zime", najhladnije i najsivlje od Hajnrihovih događaja. Većina istočnog Mediterana, Balkana i dijelovi kavkaskih oblasti pokriveni su sa više od 5mm pepela. Obnavljanje vegetacije je trajalo od jedne godine do nekoliko decenija (Costa 2012). Udar kakav je bio prilikom CI erupcije poremetio je ekosistem na mnogo većoj skali od zone u kojoj se sam vulkan nalazi, uključujući i sisteme u kojima se nalaze ljudske populacije. Takvi događaji su tipični pokazatelji kratkoročne promjene globalnog klimatskog sistema, sa jačim efektima na većim nadmorskim visinama na sjevernoj hemisferi. Velike erupcije mogu da budu uzročnici promjene klime na stogodišnjem ili čak hiljadugodišnjem vremenskom intervalu. Mogu da stvore ozbiljne ekološke krize, prouzrokujući taloženje tefre i isparljivih kiselina na ranjive ekosisiteme. U oblasti koja je najmanje široka koliko i istočni Mediteran, ne samo da se se CI kriza preklopila sa djelovanjem ljudi, već ga je donekle dovela

from polluted pastures 2) changing the habits in usage of the plants (that existed up to the moment of eruption) 3) changing of water availability 4) forcing the changes in the supplying of raw stone 5) causing displacement of population, depopulation, reduction of large groups and other demographic consequences 6) imposition of stress in the knowledge and the sharing of information within the social structures (Fedele 2008).

"Volcanic winter" Effect

Taking into consideration the effect, dynamics and force of the eruption, it is assumed that the event lasted two to four days. Large quantities of fluorine, chlorine, together with sulfur dioxide have been removed to the troposphere and could produce strong and heavy acid rain in the geographical area where the wind caused the volcanic material. On the other hand, it is difficult to reconstruct the wind direction, no matter what can be done by following the pattern (or mapped) accumulated tephra (bearing in mind the sites, which are north and north-east from the eruption). Tephra is located at a distance of about 2500 km from the volcano. The eruption has almost certainly led to the emergence of "volcanic winter", coldest and grayest of Heinrich events. Most of the eastern Mediterranean, the Balkans, and the parts of the Caucasus were covered with more than 5mm of ash. Restoring of the vegetation lasted from one year to several decades (Costa 2012). The impact as it was when the CI eruption disrupted the ecosystem on a much larger scale of the zone where volcano is located, including systems containing human population. Such events are typical indicators of short-term changes in the global climate system, with stronger effects at higher altitudes in the northern hemisphere. Large eruptions can be the causes of climate changes on the one hundred or even a thousand-year period of time. They can create serious environmental crisis, causing deposition of tephra and volatile acids to vulnerable ecosystems. In the area that is at least as wide as the eastern Mediterranean, not only that the CI crisis overlapped with people's actions, but it,

do poboljšanja ili ga pak značajno preorjentisala (Fedele 2002).

Poređenja radi, u sjevernoj Sumatri, erupcija supervulkana Toba, zbila se oko 74 ka BP i prepoznata je kao jedna od većih za vrijeme kvartara. Erupcijom su izbačene velike količine pepela, pa se taj materijal nataložio u Indiji, Maleziji, Indijskom okeanu, Arabiji i južnokineskim morima. Procjenjuje se da je količina izbačenog materijala iznosila ≈2800km³. Površina koja je obuhvaćena piroklastičnim ignimbritom iznosi oko 20 000 – 30 000km² sjeverne Sumatre. Uticaj na klimu bio je takođe globalnih razmjera. Hlađenje izazvano erupcijom bilo je kratkog ali devastirajućeg maha, gdje je prosječan pad temperature iznosio od 5 – 15 °C sa tendencijom da je takva situacija mogla da potraje nekoliko godina (Jones 2007). Šest godina vulkanske zime (od ove erupcije) dovelo bi do nekoliko veoma kriznih situacija, koje bi dovele u pitanje egzistenciju cijelih populacija (Oppenheimer 2002).

Datovanje Y5 tefre

Smještanje tefre u hronološke okvire, čini se krucijalno za razumijevanje problematike ovog ekološkog fenomena. S obzirom na to da i u hronološkom i u stratigrafskom smislu, predstavlja jednu vrstu graničnika za činioce koji imaju uloge (donekle) suprotnih krajeva jednog kružnog arheološkog problema, među kojima se ponekad ne može nazreti koji je od njih uzrok a koji posljedica.

Y5 tefra je tokom poslednjih 60-ak godina različito datovana, u zavisnosti od parametara koji su uzimani u obzir prilikom tog utvrđivanja, od 4 – 13 ka pa do pa 40/38 ka BP. Ar/Ar metodom tefra je datovana 36 ± 0.4 ka BP. Međutim, dostupni radiokarbonski datumi paleozemljišta i karbonizovanog drveta, koji su povezani sa CI erupcijom, su u stvari razasuti od 40 do 25 ka. Te s obzirom da pojedini autori vjeruju da su depoziti ove piroklastične formacije, rezultat mnogobrojnih eksplozivnih događaja, koji su pak odvojeni nezanemarljivim vremenskim hijatusom. (Narcisi 1999) Fedele iznosi da je CI erupcija datovana na ≈37 ka bp / metodom (37 100 ± 400 g. BP) i determinantama (32 300 ± to some extent, led to its improvements or reorientation to a certain extent (Fedele 2002).

In comparison, in northern Sumatra, Toba super volcano eruption, occurred in about 74 to BP and has been recognized as one of the biggest during the Quaternary. Eruptions have thrown large amounts of ash, so that material deposited in India, Malaysia, the Indian Ocean, Arabia and South China seas. It is estimated that the amount of erupted materials was ≈2800km³. Area covered by pyroclastic ignimbrites is about 20,000 to 30 000km² of northern Sumatra. The impact on the climate was also on a global scale. Cooling caused by the eruption was a brief but devastating, where the average temperature drop was 5-15 ° C with a tendency that such a situation could last several years (Jones 2007). The six years of volcanic winter (of the eruption) would lead to a very few crises, which would question the existence of entire populations (Oppenheimer 2002).

Dating of Y5 tephra

Placing tephra in the chronological framework, it seems crucial to understand the problems of ecological phenomena. Considering that in chronological and stratigraphic terms, it represents a kind of border for the factors who have roles (somewhat) opposite ends of one cycle of archaeological problems, among which sometimes cannot be discerned which of them is the cause and which is the effect.

Y5 tephra during the past 60 years, was dated back differently, depending on the parameters that are taken into account in this determination, 4-13 ka and until 40/38 ka BP. Ar / Ar method dated tephra from 36 ± 0.4 ka BP. However, available radiocarbon of Paleolithic land and carbonized wood, which are connected with CI eruption, are in fact scattered 40-25 ka. And considering that some authors believe that the deposits of pyroclastic formations, resulted in creation of a number of explosive events, which are separated with inconsiderable weather hiatus. (Narcisi 1999) Fedele states that CI eruption is dated on ≈37 ka bp / method (37 100 ± 400 g. BP) and determinants (32 300 ± 600 i 34 600 ± 150 ka BP); calibration of the date on

600 i 34 600 ± 150 ka BP); kalibracijom datuma na ≈37 000 – 40 000g. BP, (2002); odnosno 39 490 – 39 170 BP (2003). Kod Hofekera se sreću podaci da je u grenlandskim zapisima leda, CI erupcija predstavljena kao GISP2 sa sulfatnim maksimumom od 375 ppb () na granici od GI 9 grenlandskom stadijalu GS 9 sa datovanjem približno na 40 000 BP. Datovanje je izvršeno pomoću / metode, iz C-13 morskih depozita tefre u tirenskom moru. datumi za tefru daju podatke od oko 32 000 BP, i to uz pomoć modela kalibracije (Hoffecker 2008).

Radiokarbonski podaci dobijeni iz karbonizovanog drveta i karbonizovanog uglja umetnuti u CI piroklaste, koji su raštrkani između 42 000 i 27 000 godina, prepoznati su kao vrsta anomalije, koje se ne dovode u pitanje jer zavise od količine anomalnih fluktacija atmosferskog karbonizovanog sadržaja. Tako da je čest slučaj da se u slojevima ispod tefre pojavljuju anomalni podaci koji ukazuju na datovanje od 31 000 do 33 000 godina (Fedele 2008).

Debate se vode i oko samog porijekla CI erupcije; mnoge studije upućuju na to da potiče sa Felegrejskih polja, nakon čega je na tom području uslijedilo urušavanje kratera (što je dobrim dijelom formiralo reljefni izgled tog područja). Dok druge teze zagovaraju da je to bila erupcija naprslinskog tipa – označena kao jedna u nizu koje se povezuju sa kampanjskim masivom. Za razliku od CI erupcije jedna po intezitetu slabija erupcija mnogo je manje istraživana. Autori se ne slažu o porijeklu (odnosno o izvoru erupcije), pa jedni zagovaraju teoriju da ona potiče od Soma – Vezuv, a drugi da je izvor upravo u felegrejskim poljima. Depoziti koji potiču od ove erupcije su bjeličasti sa mehurastim (vezikularnim) plavcem, čija boja ide i do crnkaste sa manje mehurastim magmatičnim klastima. Radi se o Kodola erupciji koja se datuje na oko 25 100 ± 400 BP (Giaccio 2008). No, kada je u pitanju hronološko i geografsko determinisanje tefre, stvar se dodatno usložnjava čestom aktivnošću kampanijskih vulkana u pleistocenu, tako da sa felegresjkih polja, samo u zadnjih 18 ka, potiče veliki broj erupcija (Sianni 2004).

Hronologije koje se tiču CI erupcije, odnosno samih depozita koji u svom sastavu imaju geološki zapis kao posljedicu toga, uglav-

≈37 000 – 40 000g. BP, (2002); i.e. 39 490 – 39 170 BP (2003). Hoffecker has the data that in Greenland ice data CI eruption was presented as GISP2 with sulphur dioxide maximum of 375 ppb () on the verge of GI 9 Greenland stadia GS 9 by dating close to 40 000 BP. Dating was done using / method, from C-13 sea deposits of tephra in Tyrrhenian sea. dates for tephra show the data of around 32 000 BP, with the help of calibration model (Hoffecker 2008).

Radiocarbon data from carbonized wood and carbonized coal inserted into the CI pyroclasts, which are scattered between 42 000 and 27 000 years ago, have been identified as types of anomalies, which cannot be questioned as they depend on the amount of anomalous fluctuations of atmospheric carbonized content. So it is often the case that in the layers below the tephra, anomalous data appears indicating dating from 31,000 to 33,000 years old (Fedele 2008).

Debates have been led about the origin of the CI eruption; many studies suggest that it originates from the Phlegraean Fields, after which the area was followed by the collapse of the crater (which largely formed the appearance of the relief area). While others advocate the thesis that it was the eruption of crevice type - designated as one of a series that are connected with the campaign massif. Unlike the CI eruption one t lower intensity eruption is much less investigated. The authors do not agree on the origin (i.e. on the source of the eruption), therefore one are advocating the theory that it comes from Soma - Mount Vesuvius, and the other to the source in Phlegraean Fields. Deposits arising from these eruptions are whitish with bladder (vesicle) pumice, whose color goes up to blackish with less bubbling magma clasts. It is a Codola eruption, that has been dated at about 25 100 ± 400 BP (Giaccio 2008). But when it comes to chronological and geographical determination of tephra, matters are further complicated by frequent activity of Campania volcanos in the Pleistocene, so from the Phlegraean Fields, only in the last 18 ka, originate a large number of eruptions (Sianni 2004).

The chronologies concerning the CI eruption, or its very deposits that are composed of

nom su nesigurne i sa mogućim greškama. Čak i uz pomoć kalibracionih metoda datovanja, dobijaju se dosta mlađi datumi za ovu erupciju. To može izaći kao ozbiljan problem, s obzirom da dosta našeg znanja o samom prelazu sa srednjeg na gornji paleolit, zasnovano je upravo na datumima dobijenih analizom (Moorley 2011).

Stratigrafsko stanje Y5 tefre

Identifikacija CI erupcije u različitim stratigrafskim zapisima, omogućava ispitvanje kako ekoloških tako i kulturnih dinamičnih procesa prije i poslije erupcije. Na jugositoku Evrope i dobrim dijelom širom Mediterana, CI erupcija se manje ili više dramatično našla usred evropske kasno pleistocenske smjene: stratigrafski dokazi upućuju da je vulkanski događaj bio veoma bitan činioc srednje – gornje paleolitske problematike.

U južnim regijama Italije (u Kampaniji i Apulji), nekoliko lolaliteta je od značaja sa kulturno stratigrafskim pozicijama CI erupcije. Serino posjeduje debeo sloj piroklastičnog depozita na koji naliježe gornji paleolit, datovan na 31 200 ± 650 BP (Fedele 2003). Sa tri lokaliteta na visoravni Murđi (Murge) Vaneli, Traconara i Nuovo Kasete, podaci dokumentuju da se uslijed slične sedimentarne sukcesije sa efektom "geološke zamke", sreće situacija sa debljinom vulkanskog pepela od nekoliko decimetara do nekoliko metara. Na lokalitetu Tana Dele Lene depozit pepela je zapečatio sloj sa sporadičnim artefaktima musterijenske i/ili gornje paleolitske populacije. Paglići pećina predstavlja lokalitet, jedan od najkompletnijih koji je dao informacije o kasnom srednjem – gornjem paleolitu, ujedno obuhvatajući faze gravetijena i epigravetijena. Uzorci tefre, analizom, datovani su između 34 ka i 29 14C ka BP. Tefra je pokrivena sedimentom koji predstavlja gravetijensku industriju 28 ka – 26 ka, odnosno smještenu u vremensko razdoblje između ranog gravetijena i kasnog orinjasijena (Giaccio 2008). U Paglići pećini tefra je uglavljena između slojeva orinjasijena i ranog gravetijena. Mada se daljom hemijskom analizom utvrdilo da tefra sa ovog lokaliteta potiče od erupcije Kodola vulkana koja se zbila nekih 7000 - 8000 prije CI erupcije.

the geological record as a result, are generally uncertain and with possible errors. Even with the help of the dating method of calibration, much younger dates for this eruption were obtained. This may come as a serious problem, given that a lot of our knowledge about the transition from middle to upper Paleolithic, is based precisely on the dates obtained by analysis (Moorley 2011).

Stratigraphic state of Y5 tephra

Identification of the CI eruption in various stratigraphic records, enables testing of both environmental and cultural dynamic processes before and after the eruption. In the south east of Europe and a large part around the Mediterranean, the CI eruption is more or less dramatically caught in the mid of European late Pleistocene shifts: stratigraphic evidence indicates that the volcanic event was an important constituent of the middle - upper Paleolithic issues.

In the southern regions of Italy (Campania and in Apuglia), several sites is of cultural importance with stratigraphic positions CI eruption. Serino has a thick layer of pyroclastic deposits of the overlying upper Palaeolithic, dating back to 31 200 ± 650 BP (Fedele 2003). With three locations in the Plateau Murgia (Murge) Vaneli, Traconara and Nuovo Cassette, data documenting that due to similar sedimentary succession with effect " geological traps ", has the situation with thick volcanic ash from a few decimeters to several meters. At the site of Tana Dele Lene the deposit ash layer is sealed with sporadic Mousterian artifacts and / or upper Paleolithic populations. Paglići cave site represents one of the most complete sites that gave information about the late Middle - Upper Palaeolithic, also including phases Gravettian and Epigravettian.

The causes of tephra, analysis, are dated from 34 ka and 29 14C ka BP. Tephra is covered with sediment that represents Gravettian industry 28 ka - 26 ka, or placed in the period between the early and late Gravettian Aurignacian (Giaccio 2008). In Paglići cave, tephra is embedded between layers of Aurignacian and early Gravettian. While, in further chemical analysis it is determined that the tephra from this

To upućuje da ne treba olako uzimati radiokarbonske datume koji su priloženi iz ovih slojeva, jer oni u startu pomjeraju granicu orinjasijena za nekih ≈8000 godina. Tome u prilog ide i datovanje tefre na lokalitetu Frankti na 33000 BP, koja naliježe na sloj srednjeg paleolita. U Kampaniji se uglavnom radi o relativno debelim slojevima ignimbrita ili koignimbrita, a na lokalitetima u istočnoj Evropi tefra se javlja u dokumentovanim slojevima pepela. U slojevima iznad tefre javljaju se dobro dokumentovane industrije ranog orinjasijena ili gravetijena, stoga tefra kao sloj može da posluži kao dobar stratigrafski marker (Fedele 2008).

Temnata pećina je svrstana u lokalitete u kojima se mogu pratiti srednjepaleolitske, "tranzicionalne" i gornjepaleolitske industrije. Izdvojena stratigrafija: a) srednji paleolit 105 ka i 67 ka BP; b1) gornji paleolit 38 ka BP sa karakteristikama musterijena i gornje paleolitskih industrija; b2) rani orinjasijen datovan analizom između 46 ka i 32 ka BP; b3) gornji paleolit ili kasni orinjasijen datovan je između 32 ka i 28 ka BP; c) gravetijen 29 ka i 20 ka BP; d) epigravetijen između 20 ka i 13 ka BP. Konstatovano je da tefra iz pećine 16 (blizu Temnate) razdvaja slojeve ranog orinjasijena od gornjepaleolitskih (što je slučaj kao i kod Temnate) (Giaccio 2008).

Ispod CI tefre, na Kostjenki grupi lokaliteta, leže tragovi okupacije koji se po hronološko tipološkom obliku svrstavaju u gornji paleolit. Datovani su na 45 ka BP – 42 ka BP, radiokarbonskom i optičkom stimulacionom luminisencionom metodom a sadrže tipično gornje paleolitske forme alatki (mada sporadično ima i onih koji se mogu pripisati industrijama srednjeg paleolita), s tim da se pojedine forme ubrajaju kao dio asamblaža orinjasijena. Kultura konstatovana ispod same tefre pripisuje se ranim modernim ljudima (pored ustaljenih artefakata koji se vezuju za gornji paleolit pronađeni su i antropološko osteološki ostaci Homo sapiens-a u tom sloju), sa jakom tendencijom da nije "tranzicionalna" (Anikovich 2007) .

Protoorinjasijen i kombinovana industrija ulucijena nalaze se iznad tefre na jugositočnim evropskim lokalitetima. U Grčkoj izolovani gornji paleolitski artefakti u pećini Frankti, nalaze se takođe iznad, dok su karinirani bočni strugači i

site comes from the erupting volcano Codola which happened some 7000 - 8000 before the CI eruption. This indicates that we should not take lightly radiocarbon dates that are enclosed from these layers, because they already prove that the Aurignacian border was moved for some ≈8000 years. This is supported by the dating of tephra on the site Franchthi to 33000 BP, which rests on a layer of the middle Paleolithic. In Campania is mostly about a relatively thick layers of ignimbrite or coignimbrite and on sites in Eastern Europe tephra occurs in documented layers of ash. The layers above the tephra appear well-documented industries of Early Aurignacian or Gravettian, so tephra as a layer can serve as a good stratigraphic marker (Fedele 2008).

Temnata cave je placed among the sites that can follow the sites in which they can monitor the middle Paleolithic, "transitional between" and the upper Paleolithic industry. Featured stratigraphy: a) Middle Palaeolithic 105 ka and 67 ka BP; b1) the upper Paleolithic 38 ka BP with the characteristics of the Mousterian and Upper Paleolithic industry; b2), dating from the early Aurignacian (_^14) C analysis between 46 ka and 32 ka ka BP; b3) the upper Paleolithic or a late Aurignacian is dated to between 32 ka and 28 ka BP; c) Gravettian to 29 ka and 20 ka BP; d) Epigravettian between 20 ka and 13 ka BP. It was noted that the tephra from the cave 16 (near the Temnata) separates the layers of Early Aurignacian of the upper Paleolithic (which is the case as well as in Temnata) (Giaccio 2008).

Under CI tephra, the Kostjenski group of sites, there are traces of occupation that by the chronological typological form belong to the upper Paleolithic. Dated to 45 ka BP - 42 ka BP, with radiocarbon and optically stimulated luminescence dating method and contain typical upper Paleolithic forms of tools (although occasionally there are those that can be attributed to the Middle Paleolithic industries), having in mind that certain individual forms can be included as part of the Aurignacian assemblages. Culture is ascertained below the tephra itself is attributed to early modern humans (apart from the usual artifacts that are related to the upper Paleolithic, are found the anthropological, remains of

Fon t – Yves šiljci iz Temnata pećine u Bugarskoj, ispod slojeva CI tefre. Tefra na Kostjenki – Borščevo lokalitetima varira, ide i do 20cm debljine (Borščevo 5), dok na nekim lokalitatima sloj tefre nije primjetan golim okom. Horizont iznad tefre na Kostjenki – Borščevo lokalitetima odgovara orinjasijenu u centralnoj i zapadnoj Evropi, odnosno protoorinjasijenu u Mediteranu. Horizont ispod tefre ne odgovara u potpunosti industrijama zapadne i centralne Evrope (Hoffecker 2008).

Crvena Stijena, lokalitet na kojem je zabilježeno prisustvo Y5 tefre (sloj XI), može da predstavi bitne odgovre na pitanja "tranzicije" srednjeg ka gornjem paleolitu. Crvena stijena nalazi se oko 500km od CI mjesta erupcije. Idealno locirana, kao lokalitet najbliži apeninskom poluostrvu koji posjeduje dokumentovan sloj vulkanskog materijala kraćeg dometa, iz kasne faze vulkanske erupcije.

Lokalitet Crvena stijena / Crvena stijena site
+ Površinski sloj tefre / Surface layer of tephra
* Srednje paleolitski depozit / Middle Paleolithic deposit

Analize su pokazale da su vulkanske ljušture prisutne u sloju X (iznad tefre), na dubini od najmanje 1m od sloja XI (sloj tefre), odnosno njegove gornje površine. To je u stvari mikro tefra, ili kripto tefra, te je veoma važno da ona kao takva ne bude zamjenjena materijalom iz kasnijih erupcija. Otvor potkapine okrenut je ka jugu – jugozapadu, što je u odnosu na izvor erupcije čini izvanrednom lokacijom za nagomilavanje vjetrom nanošenog sitnog vulkanskog materijala. Na Crvenoj Stijeni, u sloju neposredno iznad tefre dokumentovana je uglavnom odsutnost

Homo sapiens in this layer), with a strong tendency not to be "transitional" (Anikovich 2007).

ProtoAurignacian and combined industry of Uluzzian are located above the tephra on the south east European locations. In Greece, an isolated upper Paleolithic artifacts in a cave Frankti, which are also placed above, while cari nated end-scrapers and *Fon t - Yves* spikes from Temnata caves in Bulgaria, under the layers of CI tephra. Tephra on Kostjenka - Borshchevo sites varies, going up to 20cm thickness (Borshchev 5), while in some sites, tephra layer is not noticeable with the naked eye. Horizon over the tephra on Kostjenki - Borshchev corresponds with Aurignacian sites in central and western Europe, protoaurignacian in the Mediterranean. Horizon below tephra does not exactly matches the industries of Western and Central Europe (Hoffecker 2008).

Crvena Stijena, the site where Y5 tephra (layer XI) was noted, may present important answers to questions of "transition" from medium to upper Paleolithic. Crvena Stijena is located about 500 km from the CI place of the eruption. Ideally located, as the site closest to the Apennines Peninsula, which has a documented layer of volcanic material of a shorter-range, from the late stages of a volcanic eruption.

Analysis showed that the volcanic shells presented in the layer X (above tephra), at a depth of at least 1m of the layer XI (tephra layer), that is, the upper surface. It is in fact a micro tephra, or crypto tephra, and it is very important that as such it cannot be replaced with material from later eruptions. The opening notches are facing towards the south - southwest, as compared to the source of the eruption, seems extraordinary location for the accumulation small volcanic material brought by wind. At the Red Rock, in the layer immediately above the tephra, there has been documented mainly the absence of archaeological material, which can lead to the conclusion that the use of the cave was not intense in a certain period after the eruption (Moorley 2011). Some small materials which falls in the layer, has the characteristics of the late Middle Paleolithic, and is assumed that it comes from a lower layer XII by explaining that artifacts from the original high-

arheološkog materijala, što može dovesti do zaključka da upotreba pećine nije bila intezivna u određenom periodu nakon erupcije (Moorley 2011). Nešto malobrojnog materijala koji je dospio u sloj, ima karakteristike kasnog srednjeg paleolita, pa se predpostavlja da je je dospio iz nižeg XII sloja objašnjenjem da su artefakti sa prvobitno višeg položaja skliznuli do nivoa na kom se nataložila tefra. Kraj musterijena u XII sloju Basler objašnjava opadanjem gabarita samog sloja. Razlog za to navodi da bi mogle biti migracije lovaca zbog iscrpljenog lovnog prostora (klimatsko – vegetacionih uslova koji su tome doprinijeli), ili je populacija hominina zdravstveno slabila i brojčano opadala. Radiokarbonski nalaz iz sloja XII pokazao je starost uzorka na 40 777±900BP. Autor je, s obzirom na arheološku situaciju u sloju XII sklon da upravo slojeve XII i XI pripiše gornjem paleolitu (Баслер 1975). U sloju X na Crvenoj Stijeni konstatovana je laminarna industrija gornjeg paleolita, koja nema elemente srednjeg paleolita, sa izuzetkom jednog retuširanog šiljka. Autor ne isključuje mogućnost da se radi o orinjasijenu, odnosno sa tendencijom da je bliže proto – orinjasijenu. Precizno razumijevanje upravo sloja X riješilo bi situaciju na Crvenoj Stijeni, ali na žalost u ovom sloju nije nađeno oruđe koje bi je direktno okarakterisalo kao orinjasijen. Ova industrija umnogome je slična industriji konstatovanoj u slojevima X i IX na lokalitetu Medena stijena (Mihailović 2009).

Mikrotefra

Veliki broj mediteranskih lokaliteta je spreman za proučavanje mikrotefre (kriptotefre), što bi usložilo brojnost podataka o tefri i tefrohronologiji jer su najsitnije čestice tefre mogle dospjeti do lokaliteta udaljenih hiljadama kilometara od mjesta erupcije (Blockley 2008)[2]. Pored dobro poznatih lokaliteta na kojima je pronađena fizički evidentna tefra, podaci dobijeni proučavanjem mikrotefre pristupačni su sa lokaliteta: Tenagi Filipon (Grčka), morska jezgra LC21 u egejskom moru, Hanah Fteah (Libija), Golema Pešt (Makedonija), Trajanova tabla (Sr-

2 Za detaljnije tehnološke podatke o mikrotefri pogledati kod Blockey et al. 2005 i Pyne-O'Donnell et al. 2008

er position slipped to the level at where tephra precipitated. End of Mousterian in the XII layer Basler explains with the decline in the dimensions of the layer. The reason for this could be due to the migration of hunters and devastated hunting area (climate - the growing conditions that have contributed to the devastation), or hominin population has weakened in health and it was outnumbered. Radiocarbon findings from the layer XII showed the age of the sample at 40 777 ± 900BP. The author, with regard to the archaeological situation in the layer XII is inclined to claim that layers XII and XI are attributed to upper Palaeolithic (Баслер 1975). In the layer X at the Red Rock laminar industry of Upper Palaeolithic was found, which has no elements of the Middle Paleolithic, with the exception of one retouched tip. The author does not exclude the possibility that this is Aurignacian, or with a tendency that is closer to the proto - Aurignacian. The precise understanding of layer X would resolve the situation in the Red Rock, but unfortunately in this layer a tool that was found that is directly characterized as Neandertals. This industry is largely similar industry ascertained in layers IX and X on the site Medena stijena (Mihailović 2009).

Microtephra

A large number of Mediterranean sites is prepared to study microtephra (cryptotephra), which would made a complex number of data of tephra and tephra chronology because the smallest particles of tephra could reach remote locations thousands of kilometers away from eruptions (Blockley 2008)[2]. In addition to well-known sites on which physically evident tephra was found, data obtained by studying microtephra are accessible from the sites: Tenaga Filipon (Greece), sea core LC21 in the Aegean Sea, Hanah Fteah (Libya), Golema Pest (Macedonia), Table of Traian (Serbia). In that way, the particles of microtephra documented above early Upper Paleolithic layers at the sites: Kozarnik, Tabula Traiana, Golema Pest. At the site Klisura below the tephra there is an industry

2 For further technical data on microtephra see Blockey et al. 2005 and Pyne-O'Donnell et al. 2008

bija). Tako da su čestice mikrotefre dokumenovane iznad ranih gornje paleolitskih slojeva na lokalitetima:Kozarnika, Tabula Traiana, Golema Pesht. Na lokalitetu Klisura ispod tefre se nalazi industrija koja je slična ulucijenu, dok tefra na lokalitetu Hanah Fteah dijeli gornji paleolitski sloj u kojem je dokumentovana Daban kultura (lokalna gornje paleolitska kultura ispod koje se nalazi musterijen) (Lowe et al. 2012).

Jedino tri lokaliteta pored Crvene Stijene posjeduju jasno definisane slojeve koji naliježu na tefru i na kojima je tefra akumulirana (Frankti, Kastelćevita i Temnata) (Moorley 2011).

Kasni srednji paleolit i rani gornji paleolit na istočnoj obali Jadrana

Vindija

Iz sloja G1 na Vindiji potiču alatke koje se mogu pripisati orinjasijenu, a ujedno i alatke koje se mogu pripisati i kasnoj idustriji musterijena. Radiokarbonski datumi iz sloja G1 iz Vindije i iz Velike pećine upućuju na to da su individue Neandertalaca i modernog čovjeka bile do nekle istovremene u ovoj oblasti. Tako da je moguće da neke gornje paleolitske alatke budu povezane sa Neandertalcima iz sloja G1 na Vindiji (primjera radi, koštane alatke), koje su mogle nastati kao rezultat imitacije ili razmjene sa modernim ljudima (Karavanić 1998a). U periodu između srednjeg i gornjeg paleolita veća upotreba rožnaca kao sirovine, te su kredaste kvržice rožnaca mnogo češće u gornjem dok su u srednjem paleolitu u generalnoj upotrebi rječni oblutci (Blaser 2008). Individue Neandertalaca koje se povezuju sa slojem G3 su birale materijal za obradu oruđa, što se ne bi moglo konstatovati za individue iz starijih musterijenskih slojeva. Takva vrsta selekcije, kada je odabir sirovine u pitanju, slična je ponašanju gornje paleolitskih zajednica. U istom stratigrafskom nivou (G1) pronađeni su fosili Neandertalca i asamblaž koji je sličan orinjasijenu, tačnije klasični musterijenski artefakti zajedno sa gornje paleolitskim oruđem (koštani šiljci raskoljene baze, šiljci tipa Mladeč). Iz ovog sloja potiču primjeri jednih od najmlađe datovanih fosila Neandertalaca 29080 ± 400 ka BP i 28020 ± 360 ka BP (Ahern 2004),

that is similar to Uluzzian while tephra on the site Hanah Fteah divides the upper Paleolithic layer in which Daban culture was documented (local Upper Paleolithic culture, below which the Aurignacian) (Lowe et al. 2012).

Only three sites in addition to the Red Rock have clearly defined layers that adjoin the tephra and where the accumulated tephra is (Franchthi, Castelcivita, Temnata (Moorley 2011).

Late Middle Paleolithic and early Upper Paleolithic on the eastern Adriatic coast

Vindija

From the layer G1 in Vindija, there are tools that can be attributed to the Aurignacian, and also the tools that could be attributed to the late Mousterian industries. Radiocarbon dates from layer G1 of Vindija from Velika cave indicate that the individuals of Neanderthals and modern humans were to some extent simultaneous in this area. Consequently, it is possible that some of the upper Paleolithic tools are associated with Neanderthals from layer G1 in Vindija (for instance, bone tools), which may have arisen as a result of imitation or exchange with modern humans (Karavanić 1998a). In the period between the Middle and Upper Paleolithic the greater use of hornfels as a raw material, and the chalky lumps of hornfelsc are more often in the top while in the Middle Paleolithic in the general use of river pebbles (Blaser 2008). Individuals of Neanderthals that are associated to the G3 layer had chosen the materials for processing tools, which could not be concluded for individuals from older Mousterian layers. This kind of selection, when the selection of the raw materials is in question, is similar to the behavior of the upper Paleolithic communities. In the same stratigraphic level (G1) the fossils of Neanderthals were found and assemblage similar to the Aurignacian, namely classic Mousterian artifacts along with the upper Paleolithic tools (bone points of splintered base, spikes of Mladeč type). From this layer examples of some of the youngest Neanderthal fossils originate and are dated to 29080 ± 400 ka BP and 28020 ± 360 ka BP (Ahern 2004), that were later redated

koji su kasnije redatovani na ≈32 000 BP i ≈33 000 BP (Higham 2006).

Karavanić nudi četiri moguća objašnjenja koja bi mogla da daju odgovor na pitanje kako su koštani šiljci sa raskoljenom bazom dospjeli uz sloj G1 na Vindiji: 1) da su proizvedeni od strane ranih modernih ljudi i dospjeli do Neandertalaca; 2) Neandertalci su usvojili tehnološki proces izrade koštanih šiljaka od ranih modernih ljudi; 3) rani moderni ljudi su usvojili tu tehnologiju od Neandertalaca; 4) obije grupe su razvile tehnologiju izrade te vrste šiljaka. Treća i četvrta mogućnost se čine malo vjerovatnima jer većina neandertalskih lokaliteta ne posjeduje dokaze te vrste. Postoji mogućnost da se radi o primjerima koji su kopirani (efekat imitacije), s obzirom da pojedini komadi imaju vrlo tanku bazu što bi uslijed korišćenja dovelo brzo do lomljenja same alatke. Bilo da se radi o imitaciji ili o razmjeni, to upućuje da se u tom geografskom regionu radi o složenoj interakciji dvije grupe hominina (Karavanić 1998b).

Mujina pećina

Mujina pećina je locirna na potencijalnom koridoru na kojem su populacije hominina emigrirale u Evropu. Slična i moguća su poklapanja u radiometrijskim datumima na Mujinoj pećini i kontekstima ranog gornjeg paleolita u Evropi (Miracle 2005). Sve stratigrafske jedinice sadrže musterijen, na lokalietu nisu prisutni mlađi slojevi. Na osnovu arheološkog materijala u najstarijim slojevima E2 i E1 predpostavlja se da je priroda lokaliteta bila sezonskog karaktera, dok mlađi musterijenski periodi upućuju da je pećina poslužila kao sklonište za kraće lovne epizode (D2 i D1a slojevi sadrže veće musterijenske alatke među kojima ima i levaloazijenskih primjeraka, koji nisu česti u prethodnim slojevima, te se smatra da su donešeni na lokalitet) (Karavanić 1997),

Rezultati upućuju da su stariji slojevi Mujine pećine bili duže nastanjeni sa intezivnijom aktivnošću (E3; E2 datovan na 45 170 ± 2700BP; E1 datovan na ≈44 000 BP) od mlađih slojeva iz hladnijeg perioda musterijena (D1 datovan na 40 430 ± 1400; D2 datovan na 41 820 ± 1700). Bitno je zapažanje da je musterijen iz sloja B

to ≈32 000 BP and 000 BP ≈33 (Higham 2006).

Karavanić provides four possible explanations that could answer the question on how the bone points with splintered base ended in layer G1 in Vindija: 1) that are produced by early modern humans and ended up to Neanderthals; 2) Neanderthals have adopted technology process of bone spikes from early modern humans; 3) early modern humans have adopted the technology from Neanderthals; 4) both groups developed the technology for these types of spikes. The third and fourth possibility seem questionable since most Neanderthal sites has no evidence of that kind. There is a possibility that the examples are copied (the imitation effect), given that some pieces have a very thin base which would lead to quick breaking of the tool itself. Whether it was an imitation or exchange, this suggests that in this geographic region there was a complex interaction of two groups of hominin (Karavanić 1998b).

Mujina Cave

Mujo's Cave is located on potential corridor where the populations of hominin immigrated to Europe. A similar, and possibly matching in radiometric dates in Mujina cave and contexts of early Upper Palaeolithic in Europe (Miracle 2005). All stratigraphic units have Mousterian, the site of the younger layers were not found. On the basis of archaeological material, in the oldest layers of E2 and E1 is assumed that the nature of the site was of a seasonal character, while younger Mousterian period indicate that the cave served as a shelter for shorter hunting episodes (D2 and D1a layers contain higher Mousterian tools ranging from the Levallois samples, which are not common in previous layers, and are believed to be brought on site) (Karavanić 1997).

The results indicate that older layers of Mujina cave were accommodated longer with more intensive activity (E3, E2, dated to 45 170 ± 2700BP; E1, dating to ≈44 000 BP) and of younger layers from colder periods of Mousterian (D1, dating to 40 430 ± 1400; D2 dated back to 41 820 ± 1700). It is important to remark that the Mousterian from the layer B from Mujina cave

sa Mujine pećine (datovan uzorkom kosti na 39 200 ± 1200BP) veoma sličan, musterijenu na lokalietima Ražnac i Panđerovica u Dalmaciji i sloju XIII na Crvenoj Stijeni u Crnoj Gori. Asamblaž oruđa sa ovih lokaliteta karakteriše se prisutnošću nazubljenih komada i komada sa udubljenjima (Rink 2002).

Crvena Stijena

Kulturni depozit sa 20m dubokim slojem, zub neandertalca, dugotrajna musterijenska sekvenca koju pokrivaju slojevi gravetijena i orinjasijena. Lokalitet se nalazi na oblasti za koju se smatralo da je jedna od ruta kojom su moderni ljudi naselili Evropu sa Bliskog Istoka, između 50 – 30 ka (Baković 2009). U sloju XII, okarakterisan kao kasni musterijen, nađena je probušena falanga koze, interpretirana kao zviždaljka (Баслер 1975). U sloju X iznad tefre dokumentovana je lamelarna industrija gornjeg paleolita, koja nema elemenata srednjeg paleolita, sa izuzetkom jednog retuširanog šiljka. Mihailović ne isključuje mogućnost da se radi o orinjasijenu, mada navodi da ima više tedencija da je industrija bliža proto-orinjasijenu (Mihailović 2009).

U sloju neposredno iznad tefre nije zabilježena velika prisutnost arheološkog materijala, što upućuje na zaključak da upotreba pećina nije bila intezivna u određeneom periodu nakon CI erupcije (Moorley 2011). Tokom iskopavanja iz 60' godina prošlog vijeka, radiokarbonski datum dobijen iz sloja XII, neposredno ispod tefre, iznosio je 40 777 ± 9 000 (Баслер 1975).

Tranzicija, inovacija, akulturacija, disperzija?

Razgraničavanje i datovanje orinjasijena

U cilju rješavanja fundamentalnih pitanja koja se nameću u vezi problematike ranog gornjeg paleolita Evroazije, neophodno je konstatovati stratigrafske dokaze i definisati "orinjasijen". To će se postići tako što se trebaju analizirati podaci koji su poslužili kao spona između fosila ljudi i njihovog arheološkog konteksta, pa i u okviru šatelperonijena definisanog kao jedne od prvih industrija gornjeg paleolita

(dated from the sample of bone to 39 200 ± 1200BP) very similar to the Mousterian from the site of the Ražnac and Panđerovica in Dalmatia and to the layer XIII at Red Rock in Montenegro. The tool assemblage from these locations is characterized by the presence of jagged pieces and pieces with the grooves (Rink 2002).

Crvena Stijena

Cultural deposit with 20m deep layer, the tooth of Neanderthal, Mousterian long sequence covered by layers of Gravettian and Aurignacian. The site is located in the area which was considered to be one of the routes by which modern humans settled in Europe, the Middle East, between 50 to 30 ka (Bakovic 2009). In the layer XII, is described as a late Mousterian, punctured phalanx of a goat was found, interpreted as Whistle (Баслер 1975). In the layer X above the tephra lamellar industry of Upper Palaeolithic documented, which does not have elements of the middle Palaeolithic, with the exception of one retouched tip. Mihailovic does not exclude the possibility that this is Aurignacian, but notes that there is more tendency that the industry is closer to the proto-Aurignacian (Mihailovic 2009).

In the layer immediately above the tephra large presence of archaeological material was reported, which suggests that the use of the cave was not intensive in certain period after the CI eruption (Moorley 2011). During the excavation from 60's of the last century, radiocarbon date was obtained from layer XII, directly below the tephra, was 40 777 ± 9000 (Баслер 1975).

Transition, innovation, acculturation, dispersion?

Delimitation and dating of the Aurignacian

In order to address the fundamental questions posed in relation the issues the early Upper Palaeolithic of Eurasia, it is necessary to ascertain and define the stratigraphic evidence "Aurignacian". This will be achieved by the need to analyze the data that served as a link between fossils of people and their archaeological con-

u zapadnoj Evropi (Bar-Yosef 2006). Jedan od najranijih dokaza ranih modernih ljudi u Evropi, je grupa od nekoliko asamblaža (okarakterisanih kao industrija koja pripada bohunicijenu) locirana u jugo-centralnoj i možda istočnoj Evropi. Datuju se kalibriranim datumima na oko 48 ka BP i po sličnosti se upoređuju sa kulturom Emiran (na Levantu), te da je prva grupa dospjela na Balkan tokom toplog klimatskog intervala (GI 12). Drugi talas pomjeranja populacije predstavlja grupu od različitih setova litičkog materijala (ponekad nazvan i proto-orinjasijen). Facijesi koji spadaju u ovu grupu locirani su na Balkanu, jugo-zapadnoj Evropi i možda istočnoj Evropi, datovani za nekoliko kratkih interstadijala (GI 11 – 9) koji su prethodili hladnom Hajnrihovom događaju HE 4) (Hoffecker 2009). Za dalje bavljenje složenom problematikom ranog gornjeg paleolita, pa i samog "prelaza" (koliko god da je taj termin nezahvalan), čini se veoma bitnim razgraničenje ranog orinjasijena od proto-orinjasijena, u tehnološkom, geografskom, a ponegdje i u hronološkom smislu, premda se za pojedine geografske okvire ne isključuje mogućnost istovremene prisutnosti (Bon 2006). A u zavisnosti od geografskih oblasti, "tranzicionalne kulture" (šatelperonien, ulucien, bohunicien, seletien), mogu biti rezultat lokalne promjene među neandertalskim grupama ili promjene uslijed spoljnih uticaja (Moncel & Voisin 2006).

Dejvis uvodi dva termina za orinjasijen, odnosno za njegove dvije faze. Nešto jednostavniji facijes orinjasijena nazvao je "pionirski" datovan od oko 45 000 – 37 000 BP, a kasniji koji ga preklapa "razvijeni" 37 000 – 27 000 BP. Tako da prvu fazu karakteriše kao: facijes sa ne mnogo tipova alatki; sa razbacanom gegrafskom distribucijom; niskom gustinom naseljenosti; slabiju upotrebu loklanih litičkih sirovina; slabu prisutnost (ili prisutnost uopšte) simboličkih aktivnosti. Drugi, mlađi, facijes je okarakterisao: većim i kompleksnijim asamblažom artefakata; konstantnijom i gušćom distribucijom lokaliteta; većom gustinom naseljenosti; takođe slabom upotrebom lokalnih litičkih sirovina ali sa nešto većom mogućnošću korišćenja egzotičnih sirovina; češćim dokazima ritualne aktivnosti (Davies 2001).

Zbog svoje osobitosti, to jest raznolikosti,

text, but also in the context of Châtelperronian defined as one of the first industry Upper Palaeolithic in Western Europe (Bar-Yosef 2006). One of the earliest evidence of early modern humans in Europe, a group of several assemblages (characterized as an industry that belongs Bohunician) located, possibly, in south-central and eastern Europe. They had been dated with calibrated dates to about 48 ka BP and the similarities are compared with culture Emiran (Levant), and the first group reached the Balkans during the warm climate interval (GI 12). The second wave of movements of the population represents a group of different sets of lithic material (sometimes called the Proto-Aurignacian). Facies which fall into this group are located in the Balkans, south-western Europe and possibly Eastern Europe, dated by a few short interstadials (GI 11-9) that preceded the cold Heinrich event 4 HE) (Hoffecker 2009). For the further dealing with complex matter of early Upper Palaeolithic, including the "transition" (however that term is ungrateful), it seems very important to separate the demarcation of early Aurignacian from proto-Aurignacian, in the technological, geographical, and in some places in the chronological sense, although for specific geographic framework this does not preclude the simultaneous presence (Bonn 2006). And depending on the geographical area, "transitional culture" (Châtelperronian, Uluzzian, Bohunician, Szeletian), may be the result of local changes in the Neanderthal groups or changes due to external influences (Moncel & Voisin 2006).

Davis introduces two terms for Aurignacian, that is, for its two phases. Somehow simpler facies of Aurignacian he calls "pioneering", dating from about 45,000 to 37,000 BP, and later that overlaps with "developed" 37,000 to 27,000 BP. Thus, the first stage is characterized as: facies with not a lot of tool types; with scattered geographical distribution; low population density; lower use of local lithic raw materials; weak presence (or presence generally) of symbolic activities. Another, younger, facies is characterized as: large and complex assemblages of artifacts; constancy and denser distribution of sites; higher population density; also poor use of local lithic raw materials but with a higher

termin "orinjasijen" treba razgarničiti (termin "proto-ornjasijen" sa lokliteta Bačo Kiro, "levantinski orinjasijen" sa Levanta, "orinjasijen V" u jugozapadnoj Evropi itd.), te da se industrije detaljno redefinišu i da se dosljedno preimenuju (Zilhão 2006).

Datume, koji su fundament svake rasprave o orinjasijenu, neophodno je posmatrati pod lupom uz veliku dozu opreznosti. Bilo da su grupisani i idu u prilog kontinuitetu (širenju ranih gornje paleolitskih industrija) opadanja od istočne ka zapadnoj Evropi, bilo da su svojstveni u odvojenim geografskim regijama. Treba vrlo oprezno navoditi rezultate kasno datovanih individua Neandertalaca sa Vindije i Zafarraya pećine. S druge strane, moderna arheologija koja se bavi pitanjima gornjeg paleolita, se u velikoj mjeri oslanja upravo na rezulate datovanja (Mellars 2006). datumi u rasponu do 30 000BP "reprezentuju" statistički precizne ili "realne" godine. Problem kod datovanja javlja se kod takozvanog Event horizon koji se datuje oko 40 000 BP. Niži endogeni nivoi i preostala kontaminacija uzoraka bliži su tome da se takvi rezultati grupišu oko ovog perioda (Petitt 2000). Radiokarbonski datumi koji hronološki pripadaju periodu od 30 ka BP do 50 ka BP, mogu biti precjenjeni te ih stoga treba veoma oprezno uzimati u obzir prilikom zaključaka. Problem može biti još komplikovaniji kod interpretacija datuma koji su blizu 40 ka BP, u vremenu Lašampove magnetske promjene i vremenu mogućeg dolaska ranih modernih ljudi u pojednim dijelovima Evrope (Conard & Bolus 2003). Tako da iz navedenog proizilazi da demografski obrazci koji se tiču tranzicije iz srednjeg ka gornjem paleolitu, a bazirani su na opusu "dobro" datovanih horizonata, mogu se dovesti u ozbiljno pitanje ako se ustanovi da su predmet nesigurnih datovanja (Blockley 2008). Klasični orinjasijen se u zapadnoj Evropi javlja najranije oko 37 000 –36 500 BP i razvio se kasnije od šatelperonijena i ekvivalentnih industrija centralne i istočne Evrope (d'Erico & Sanchez Goni 2003).

Porijeklo orinjasijena i njegovi nosioci

Srednji paleolit nije samo nedovršena verzija gornjeg. Upkos istorijskom kursu tranzicije

possibility of using exotic raw materials; more frequent evidence of symbolic activity (Davies 2001).

Because of their characteristics, that is, diversity, the term "Aurignacian" should be distinguished (the term "proto - Aurignacian" from the site Bacho Kiro, "Levantine Aurignacian" from the Levant, "Aurignacian V" in southwestern Europe, etc.), and to redefine the industries in detail and to consistently rename them (Zilhão 2006).

The dates, which are the foundation of any discussion on the Aurignacian, are necessary to be looked at with a magnifying glass and with a large dose of caution. Whether they are grouped and are in favor of continuity (the spread of early Upper Paleolithic industry) of decrease from eastern to western Europe, whether they are inherent in separate geographical regions. The results of late dated individuals of Neanderthals from Vindija and Zafarraya cave should be very carefully cited. On the other hand, modern archeology that deals with issues of the Upper Palaeolithic, relies heavily on the results of dating (Mellars 2006). dates are in the range up to 30 000BP "represent" satistically correct or "real" years. The problem with dating appears withso called *Event horizon* that is dated in 40 000 BP. Lower endogenous level and remaining contaminisation of samples are closer in a way to become grouped as such around this period (Petitt 2000). Radiocarbon dates that chronologically belong to the period of 30 ka BP to 50 ka BP, may be estimated and should therefore be very carefully taken into account when concluding. The problem can be even more complicated with the interpretation of the events that are rclose to 40 ka BP, in time of Lachamp magnetic changes and time of possible arrival of the early modern humans in certain parts of Europe (Conard & Bolus 2003). Therefore, it follows that demographic forms concerning the transition from the middle to the upper Paleolithic, and are based on the opus "good" dated horizons, can be brought into serious question if we conclude that is the object of the unsafe dating (Blockley 2008). Classic Aurignacian, in western Europe can be at earliest found around 37 000 - 36 500 BP and developed later than Châtelperronian

od srednjeg ka gornjem paleolitu, populacije srednjeg paleolita su imale dosta različitih evolucionarnih putanja koje su mogle pratiti. Musterijen kao najrasprostranjenija srednje paleolitska industrija je, kao i industrije ranog gornjeg paleolita, dinamičan i promjenljiv. Musterijen se kao kultura mogao promjeniti, a da nije bilo neophodno da postane gornji paleolit. Promjena u srednjem paleolitu se posmatra često sa distance gornjeg paleolita i "ponašanja modernih ljudi", odnosno sagledavanje kompleksnog problema "prelaza" iz ugla samo gornjeg paleolita (Kuhn 2006). Intrigantni fenomen kasnog srednjeg paleolita je sporadično pojavljivanje tragova koji su uobičajno povezivani sa ponašanjem ranih modernih ljudi. Arheološki dokazi često korišćeni kao indikatori "modernog ponašanja" povezuju se sa tehnološkom efikasanošću (upotreba koštanih alatki i kompozitnog oruđa) i ritualnim kontekstom koji se ne reflektuje direktno na dnevne "poslove neophodne za život" (Hovers & Belfer-Cohen 2006). Tako da se za orinjasijen vežu arheološke situacije koje su vrlo često pripisivane isključivo ranim modernim ljudima (pećinsko oslikavanje; figure i figurine od kosti, roga i mamutovih kljova; izrada koštanog oruđa; izrada perli) (Mellars 2004).

Ne postavlja se pitanje da li su ljudi naselili teritoriju Evrope došavši iz Afrike, već kojim su rutama i u kojim vremenskim intervalima migrirali na evropsko tlo. Pogodnost prepoznavanja u hipotezi koja objašnjava da je rani gornji paleolit donešen u centralnu Evropu dunavskim koridorom, jer: a) radiokarbonski datumi idu u prilog tom shvatanju; b) grupe ljudi se lakše mogu kretati dolinom uz rijeku nego brdovitim i planinskim predjelima unutar jugoistočne Evrope u klimatskim uslovima koji otežavaju kretanje (Conard & Bolus 2003). Put širenja ranog gornjeg paleolita u centralnu Evropu se mogao odvijatipomenutom trasom, a korijeni orinjasijena nisu usađeni u šatelperonijen, već su oni odraz posebnog entiteta koji je (prvobitno) nastanjivao prostor izvan zapadne Evrope (Bar – Yosef2002).

Sa druge strane, jedan broj autora predlaže da se put proto-orinjasijena u Evropu odvijao nešto drugačijim geografskim trasama. Pa

and equivalent industries in Central and Eastern Europe (d'Erico & Sanchez Goni 2003).

The origin of the Aurignacian and its bearers

Middle Paleolithic is not only an early version of the upper. Despite the historical course of the transition from the middle to the upper Paleolithic, Middle Paleolithic population had quite different evolutionary paths that could follow and that are followed. The Mousterian as the most widespread middle Paleolithic industry, as well as the industry of the early Upper Palaeolithic, was dynamic and changeable. Mousterian as culture might have changed, and that it was not necessary to become an upper Palaeolithic. Change in the Middle Paleolithic is often viewed from a distance on Upper Paleolithic and the "behavior of modern humans", ie understanding of the complex problem of "transition" from the perspective of only the Upper Palaeolithic (Kuhn 2006). The intriguing phenomenon of the late Middle Palaeolithic is a sporadic appearance of traces that are normally associated with the conduct of early modern humans. Archaeological evidences are often used as indicators of "modern behavior" associated with technological efficiency (use of bone tools and composite tools) and ritual context, which is not reflected directly in the daily "tasks necessary for life" (Hovers & Belfer-Cohen, 2006). Thus the Aurignacian can be bind to archaeological situations that are often attributed exclusively to early modern humans (cave painting, figures and figurines made of bone, horn and mammoth tusks, making bone tools; making beads) (Mellars 2004).

The question is not whether the people settled in the territory of Europe coming from Africa, but which are the routes and the intervals when they have migrated to the European continent. The benefit of recognizing is the hypothesis that explains how the early Upper Palaeolithic was brought to Central Europe by Danube corridor, as: a) radiocarbon dates are in favor of this view; b) groups of people are more easily able to move through the valley of the river than hilly and mountainous regions in the South East Europe and in climatic conditions that make it

tako, pored proto-orinjasijena i bohunicijen je okarakterisan kao industrija koja predstavlja kretanje populacija ljudi sa Bliskog istoka, preko Balkana u Evropu (Hoffecker 2009). Moguće razriješenje problema pojedini autori vide kao širenje klasičnog orinjasijena kopnenom, a proto-orinjasijena mediteranskom trasom, s tim da se asamblaž proto–orinjasijena dosta razlikuje od klasičnog te da u mnogome liči nekim blisko-istočnim industrijama (Mellars 2004). Mediteranski koridor u obalskoj zoni, obezbjeđuje mogućnost da se koriste resursi koji su direktno ili indirektno vezani za njega. Korišćenje konkretno morskih dobara zahtijeva poseban paket potrebnih alata, koji su teško vidljivi u arheološkom materijalu (mreže, udice, konopci). S druge strane, lov na ptice kojima je prirodno stanište upravo morska blizina, sve je češće evidentiran na lokalitetima koji se povezuju sa kulturnom zaostavštinom ranih modernih ljudi (Bailey 2008).

Nije dokumentovana ubjedljiva preteča orinjasijena van Evrope, već postoji i mišljenje da je kao industrija nastao od pojedinih regionalnih varijanti srednjeg paleolita. Ni jedan od modela nije u potpunosti ubjedljiv kada se raspravlja o ranom gornjem paleolitu, čak ni model asimilacije. Model koji bi upravo mogao biti objašnjenje za porijeklo modernih ljudi, koji po svojoj strukturi negira model totalne zamjene (Smith 2005).

Kada je riječ o široj slici prelaza iz srednjeg paleolita ka gornjem (uzimajući u obzir centralnu i istočnu Evropu i Levant), način okresivanja promjenjen je od jednog regiona do drugog kao rezultat ili pomjeranja populacije i/ili difuzije izolovanog ponašanja koje se čini prije mogućim nego da se način okresivanja promjenio in situ što bi značilo da je došlo do nezavisne inovacije (Tostevin 2000). Brojni ostaci faune govore da su Neandertalci bili veoma uspješni lovci, no upoređujući litički asamblaž srednje paleolitskih i ranih gornje paleolitskih zajednica, nameće se zaključak da je u proces lova uključena drugačija strategija. Tehnike presretanja lovine koje zahtijevaju da se lovac približi nadomak plijena odgovaraju srednje paleolitskom opusu oruđa, nasuprot tehnikama koje uključuju upotrebu projektila (upotreba luka i strijele,

difficult to travel (Conard & Bolus 2003). Path of spreading of early Upper Paleolithic in Central Europe could take place in the aforementioned route, and the roots of Aurignacian are not implanted in the Châtelperronian, but they are a reflection of a separate entity that (originally) inhabited the area outside of Western Europe (Bar - Yosef 2002).

In contrast, a number of authors propose that the way of the proto-Aurignacian in Europe took place with somewhat different geographical routes. Hence, in addition to the proto-Aurignacian, Bohunician itself is characterized as an industry that represents the movement of the population of people from the Middle East, via the Balkans to Europe (Hoffecker 2009). Possible solution to the problem is viewed by some authors as the expansion of the classical Aurignacian by land, and proto-Aurignacian by Mediterranean route. By noticing that the proto-Aurignacian assemblage differs from the classic and that it very much resembles some Near East Industries (Mellars 2004). Mediterranean Corridor in the coastal zone, provides the ability to use the resources that are directly or indirectly linked to it. Using specific marine resources requires special package of tools, which are difficult to be found in the archaeological material (nets, hooks, ropes). Alternatively, hunting of birds, with a natural habitat of sea proximity, is often documented at the sites that are linked to the cultural legacy of early modern humans (Bailey 2008).

Actual forerunner of the Aurignacian outside Europe has not been documented, but there is a view that the industry emerged from some regional variations of Middle Paleolithic. None of the models is entirely convincing when discussing the early upper Paleolithic, even a model of assimilation. The model that might be the explanation for the origin of modern humans, in fact negates the model of total replacement (Smith 2005).

When it comes to a larger picture of the transition from the Middle Palaeolithic to the upper (taking into account the Central and Eastern Europe and the Levant), pruning method is changed from one region to another as a result of population shifts and / or the diffusion

kao i koplja za bacanje) (Bar-Yosef 2002). Na osnovu podataka dobijenih proučavanjem karbonskih i nitrogenskih izotopa u kolagenu ranih modernih ljudi i Neandertalaca, došlo se do zaključka da je ishrana kod obije grupe ljudi bila slična. Naime, u oba slučaja (makar u obimu u kojem je istraživanje sprovedeno) podaci dobijeni iz izotopa upućuju da se radi o konzumaciji proteina, dobijenih iz mesa kopnenih biljojeda sa malom mogućnošću konzumacije mesa slatkovodnih riba. Ako bi se ova vrsta studije potvrdila u većoj razmjeri, kopneni resursi Neandertalaca i ranih modernih ljudi u Evropi, doveli bi do moguće direktne konkurencije među ovim dvijema vrstama hominina (Drucker & Bocherens 2004). Naseljavanje u orinjasijenu je iziskivalo određenu dozu logističke organizovanosti, te su istovremeno bile nastanjene regije i u riječnim dolinama i u brdsko-planinskim zaleđima (Mihailović 2014).

Diskusija

"Kratka" hronologija "klasičnog" orinjasijena (36 500 – 27 000) nije bazirana na stilističkom, tehnološkom i hronometrijskom utemljenju. Orinjasijen je tehnološki i tipološki konstantan kroz vrijeme i prostor. Nije etnička grupacija ili "kultura" u pravom smislu te riječi, već sistem generalisanih i često fleksibilnih ponašanja (Davies 2001). Ponašanje postaje arheološki vidljivo jedino nakon adekvatnih aluzija u socijalnom i psihološkom okruženju koji su napravili stazu od latentnog potencijalnog, preko aktuelnog ponašanja, do ustaljenih normi (Hovers 2006). Promjena tokom gornjeg paleolita je jasno evidentirana. Širom teritorije Evoazije grupe ranih modernih ljudi su karakterisane brzom promjenom u pravljenju svojih alatki, ujedno i većim geografskim opsegom tipoloških mogućnosti. Ovo je moglo da naglasi pojavu etno-lingvističkih kultura na dobro definisanim teritorijama, protivno velikim teritorijama gdje je asamblaž srednjeg paleolita pripisan i Neandertalcima i ranim modernim ljudima (Bar-Yosef 2006). U vremenu između 45 000 i 35 000 godina BP, evropske paleolitske zajednice mijenjaju svoje industrije, pogotovo gdje dolazi do eksperimentisanja tehničkih riješenja za pravljenje

of isolated behavior that seems more probable than that the method of pruning changed *in situ*, which would mean that there was an independent innovation (Tostevin 2000). Numerous faunal remains suggest that Neanderthals were very successful hunters, nevertheless comparing lithic assemblage of middle Paleolithic and early Upper Palaeolithic communities, it can be concluded that the process of hunting included different strategies. Techniques of interception of the prey which require the hunter to approach near prey correspond to the middle Paleolithic opus tools, as opposed to techniques that include the use of projectile (the use of ports and javelins) (Bar-Yosef 2002). Based on data obtained by studying the carbon and Nitrogen isotopes in collagen of early modern humans and Neanderthals, it was concluded that the nutrition in both groups was similar. In fact, in both cases (at least to the extent within the research) data from isotopes indicated that this was the consumption of protein, obtained from the meat of terrestrial herbivores with small possibility of eating meat of freshwater fish. If these types of studies were confirmed in a larger scale, the land resources of Neanderthals and of early modern humans in Europe, would lead to a potential direct competition between both of types of hominin (Drucker & Bocherens 2004). The settling of the Aurignacian had required a certain amount of logistical organization, and at the same time should have been housed in the region and in the river valleys and mountainous hinterland (Mihailovic 2014).

Discussion

"Short" chronology of "classic" Aurignacian (36 500-27 000) is not based on stylistic, technological and chronometer bases. Aurignacian is technologicaly and typologicaly constant through time and space. It is not an ethnic group or "culture" in the true sense of the word, but a system of generalized and often flexible behaviors (Davies 2001). Behavior becomes archaeologically visible only after adequate allusion in social and psychological environment that have made the path of latent potential, actual behavior, to established standards (Hovers 2006).

projektila. To je zauzelo veoma bitno mjesto u preokupaciji paleolitskih zajednica, što je moglo u ovim relacijma dovesti do novih tipova oruđa (npr. bacača koplja). Ako je tako, ove promjene u litičkim industrijama su moguće povezane sa nuždom pa i sa potrebom izrade koštanih projektila. Arhaični ili proto-orinjasijen bi mogla biti "prelazna" industrija, za koju se može konstatovati da se unutar nje razvila tehnološka inovacija- mikroliti (Bon 2006).

Balkan kao zona je više okrenuta ka jugu, prema Maloj Aziji i Bliskom istoku, stoga i klima je dosta umjerenija u odnosu od one koja je bila prisutna u Zapadnoj Evropi tokom kraja pleistocena. Pa se Balkan dosta često uzima kao refugium za mnoge biljne, životinjske pa i ljudske grupe. Kraj srednjeg paleolita se u jadransko - jonskoj regiji veže za približan datum od oko 40 ka BP. S druge strane datumi za rani gornji paleolit počinju od oko 34 ka BP (Mihailović 2009). To bi moglo da ide u prilog ekološkoj krizi šire okoline, koja je uslijedila nakon jake vulkanske erupcije (Moorley 2011).

Vindija je jedan od rijetkih evropskih lokaliteta koji sadrži skeletne ostatke Nenadertalaca i alatke koje se pripisuju gornje paleolitskoj industriji. Izradu koštanih alatki iz sloja G1 u Vindiji treba pripisati Neandertalcima, ako se isključi mogućnost mogućnost krioturbacije. Sam termin orinjasijen ne odgovara u potpunosti hrvatsko slovenskim lokalitetima, jer je litička industrija na njima jedinstvena, jeste gornje paleolitska ali sa mogućim korjenima iz srednjeg paleolita. Moguće je da se neki od ovih uticaja mogu povezati sa pojavom ranih modernih ljudi u ovom regionu, ali je važno imati na umu da su se neki aspekti ranog gornjeg paleolita razvili i prije njihove pojave (Karavanić 1998b). Nestajanje Neandertalaca se, kao veoma složen proces, zbog svoje prirode i uzoraka ne može vjerovatno nikad u potpunosti rekonstruisati. Kao jedan veći proces, razlikuje se od od regiona do regiona po svojoj osobenosti. Malo je vjerovatno da su moderni ljudi igrali bitnu ulogu u samom nestajanju Neandertalaca, makar na cijeloj teritoriji njihovog bivstvovanja (Petitt 1999).

U srednjepaleolitskim slojevima (sjeverozapadne Hrvatske) među faunističkim ostacima procentualno dominiraju ostaci

Change during the Upper Palaeolithic is clearly documented. Across the territory of Eurasia group of early modern humans are characterized by rapid change in making their tools, equally with a larger geographic scope of typological features. This may have to highlight the emergence of ethno-linguistic culture on well-defined territories, contrary to the large territories where the assemblage of Middle Palaeolithic attributable to the Neanderthals and early modern humans (Bar-Yosef 2006). In the time between 45 000 and 35 000 years BP, Europe's Paleolithic communities changed their industries, particularly where there is experimentation of technical solutions for making missiles. It has taken a very significant place in the preoccupation of Paleolithic communities, which could in this relations to lead to new types of tools (eg, javelin throwers). If so, this change in the lytic industries are possibly associated with the necessity and even the need for making bone projectiles. Archaic or proto-Aurignacian could be "transitional" industries, for which it can be concluded that within it, has developed the technological innovation -microlites (Bonn 2006).

The Balkans as a zone, is more oriented towards the south, towards Asia Minor and the Middle East, therefore the climate is quite moderate compared to the one that has been present in Western Europe during the end of the Pleistocene. Hence the Balkans quite frequently had been taken as refugium for many plant, animal and even human groups. End of the Middle Paleolithic, in the Adriatic - Ionian region, is bound to the approximate date of 40 ka BP. On the other hand, the dates to the early Upper Paleolithic start at about 34 ka BP (Mihailovic 2009). This could go in favor of the environmental crisis of spread environment, which followed the strong volcanic eruptions (Moorley 2011).

Vindija is one of the few European sites containing skeletal remains of Neanderthals and tools that are attributed to the upper Paleolithic industry. The production of bone tools from layer G1 in Vindija should be attributed to Neanderthals, if we exclude the possibility of Cryoturbation. The term Aurignacian itself, does not fully fit within Croatian Slovenian sites, because the lithic industry at them is unique, the

pećinskog medvjeda, koji se mogu objasniti konstantnim korišćenjem pećina kao jezbine, što bi iziskivalo da je ljudsko prisustvo u srednjem paleolitu bilo kratko i sporadično. U jadranskoj regiji je prisutan "mikromusterijen" u svojoj (hronološki) završnoj fazi (Karavanić 2004). Uprkos takozvanom "mikromusterijenu" koji je konstatovan na lokalitetima širom Balkana, te prisutnost upravo velikog broja tih artefakata i heterogenost ostalih nalaza, upućuju na to da su se potkapine koristile uglavnom kao bazni kampovi (Mihailović 2009).Arheološki, paleoklimatski i hronološki zapisi tranzicije su jednostavno nejasni zbog: ograničenja radiokarbonskog datovanja i metode kalibracije, nesigurnosti kulturnog opredjeljenja mnogih arheoloških slojeva i nedostatak neprekidnih dobro datovanih paleoklimatskih sekvenci (d'Erico 2003).

Određena količina AMS datovanja daje mogućnost da se donese probni zaključak da je proces izumiranja Neandertalaca počeo u predjelu centralne Evrope najranije oko 40 ka BP, te da su se talasi istog nastavili Evropom u narednih 12 ka ili više (Petitt 2000). Mali broj populacije Neandertalaca je opstao, ali na kraju je "izguran" kapacitetom ljudi (Lowe et al. 2012).

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Veoma važno za mnoge aspekte CI erupcije, klime i paleolitske promjene, je upravo precizno determinisanje erupcije arheološkim i ekološkim podacima. S druge strane, nije za očekivati da detaljno proučavanje CI erupcije može proizvesti podatke koji su relevantni za rješenje biološkog problema, jer razmjere problema i podaci jednostavno nisu mogući za upoređivanje. CI erupcija klasifikovana je kao događaj sa kratkoročnim atmosferskim efektima i mogućim dugoročnim atmosferskim preturbacijama.

Oslanjajući se na empirijske istorijske događaje, može se konstatovati da je sumpor glavni uzročnik za globalno spuštanje temperature. Stepen hlađenja zavisi od količine sumpora izbačenog u stratosferu. Količina sumpora izbačena ovom erupcijom mogla bi biti geološki

upper Paleolithic but with possible roots of the Middle Paleolithic. It is possible that some of these impacts could be correlated with the arrival of early modern humans in the region, but it is important to note that some aspects of the early Upper Palaeolithic were developed before their appearance (Karavanić 1998b). The disappearance of Neanderthals, as a very complex process, because of its nature and patterns can probably never be fully restored. As a larger process, it differs from region to region according to their characteristics. It is unlikely that modern humans played a vital role in the disappearance of Neanderthals, at least on the whole territory of their existence (Petitt 1999).

In the middle Paleolithic layers (northwestern Croatia) the percentage of animal remains are dominated by the remains of cave bears, as it can be explained by the constant use of caves as shelters, which would require that the human presence in the Middle Palaeolithic to be short and sporadic. In the Adriatic region "micro Mousterian " is present at its (chronologically) final stage (Karavanić 2004). Despite the so-called "micro Mousterian" as identified in the sites throughout the Balkans, and the presence of a large number of these artifacts and heterogeneity of other findings, indicate that the caves were mainly used as a base camp (Mihailovic 2009). Archaeologically, paleoclimatic and chronological records of transition are simply unclear due to: the limitations of radiocarbon dating methods and calibration, uncertainty of cultural commitment of many archaeological layers and the lack of continuous climatic sequences well dated (d'Erico 2003).

A certain amount of AMS dating gives the opportunity to bring the probe conclusion that the process of extinction of Neanderthals began in the region of central Europe at the earliest about 40 ka BP, and that the waves of the same background continued troughout Europe in the next 12 ka or more (Petitt 2000). A small number of the Neanderthal population survived, but in the end was " pushed " by the capacity of people (Lowe *et al.* 2012).

rekord. S obzirom da je globalna temperatura mogla opasti i do 3 - 4C°, ova petrurbacija je mogla trajati i 3 – 4 godine – što je vrlo vrijedno pažnje. Autor predviđa da je sistem klima-okean-vulkan efikasno ustanovio uslove za "vulkansku zimu", što je moglo imati višedecenijske ili vjekovne posljedice. Kombinovani HE4 - CI događaj mogao je bitno uticati na veći dio sjeverne hemisfere, posebno na Evroazijski region. Ako je to bila vulkanska zima koja ja pogodila zemlju i ljude na bazi hemisfere, predpostavka je da se miješanje ekosistema i ljudi događalo mnogo dalje od samog pada pepela (kako istočno tako i zapadno) (Fedele 2008).

Mala je vjerovatnoća da je CI erupcija imala direktan uticaj na opadanje i degradaciju populacije, sa druge strane veliki direktan uticaj na ljudske resurse (voda, biljke, lovine, kamen), mogao je znatno poremetiti biom u kojem je čovjek igrao značajnu ulogu. Za opadanje broja populacije i njenu distribuciju erupcija je bila važan faktor, a dovela je takođe i do kulturne transmisije. U periodu od nekoliko godina, mnoge paleolitske grupe u zonama pogođenim posljedicama erupcije, su se suočile sa alternativnim okruženjem i uslovima bioloških resursa i distribucijom vode. Takve nagle promjene mogle su stvoriti uslove za selektivno transformisanje ljudskih obrazaca mobilnosti i strategije opstanka.

Čitave serije musterijenskih i srednjepaleolitskih nalazišta su zatvorene CI eruptivnim depozitom, nakon čega je uslijedilo napuštanje lokaliteta i prolongirana odsutnost ljudi. Sa ponovnom okupacijom staništa zapažaju se drugačije ili potpuno nove kulture (Fedele 2007).

U cilju boljeg shvatanja ranog, odnosno, proto-orinjasijena, pitanje je da li su rani moderni ljudi, prije migracije na evropsko tlo, posjedovali znanje koje je odraz orinjasijena ili je ono proizišlo u kasnijem vremenskom intervalu? Za razumijevanje problematike ranog gornjeg paleolita, čini se da su industrije koje poznajemo kao bohunicjen, šatelepronijen, te ulucijen i seletijen (u geografskim regionima svog djelovanja), su podjednako bitne.

Ako orinjasijen predstavlja (u organizacionom i kulturološkom smislu) odstupanje od ustaljenih gornje paleolitskih industrija

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Highly important for many aspects of the CI eruption, climate and Paleolithic change, is precise determination of eruption in archaeological and ecological data. Alternatively, it is not expected that a detailed study of the CI eruption can produce information that is relevant to the solution of biological problems, since the scale of the problem and the data are simply not possible to compare. CI eruption is classified as a short-term event with atmospheric effects and possible long-term atmospheric perturbations.

Relying on the empirical historical events, it can be concluded that the main cause of global drop of the temperature is sulfur. The degree of cooling depends on the amount of sulfur emitted into the stratosphere. Sulphur ejected with this eruption could be the geological record. Considering the fact that the global temperature could drop to 3 - 4C °, this perturbation could last for 3 - 4 years - which is very remarkable. The author predicts that the system of air-ocean-volcano effectively established the conditions for "volcanic winter", which may have decades or centuries - long consequences. The combined HE4 - CI event could have a significant impact on most of the northern hemisphere, chiefly in the Eurasian region. If that was a volcanic winter that hit the ground and the people on the basis of the hemisphere, the assumption is that the mixing of the ecosystem and people happened much further than simple ash falling (both on east and west) (Fedele 2008).

It is unlikely that the CI eruption had a direct impact on the decline and degradation of the population, alternatively a large direct impact on human resources (water, plants, prey, rock), could significantly disrupt the biome in which the man played a significant role. For decrease in the number of population and its distribution, the eruption was an important factor, but also led to cultural transmission. In a few years, many Paleolithic groups in the areas affected by the consequences of eruption, are faced with the alternative environment and conditions of biological resources and water distribution. Such a sudden change could create conditions for the selective transformation of human mo-

(šateleperonien, ulucien, seletien i bohunicien), te se uprkos postavljenim hronološkim datumima između 36 ka BP i 28 ka BP upravo dovodi u pitanje ko bi mogli biti njihovi kulturni nosioci? Nije zadovoljavajuće dati samo odgovor na to pitanje, koja populacija je, ili je u većim dijelom slučajeva, mogla biti nosioc istih, već koje mjesto u slagalici razvijenog gornjeg paleolita one pojedinačno ili grupno zauzimaju.

Sa tehnološkom dostupnošću koju prepoznajemo u ranom gornjem paleolitu, mijenja se način lova koji je manje-više nepromjenjen desetinama hiljada godina tokom trajanja srednjeg paleolita (makar u onoj mjeri koliko smo u prilici da to prepoznamo kroz arheološke situacije). Dislociranjem, migracijom, kompletnom zamjenom ili čak totalnim nestajanjem pojednih faunističkih vrsta nakon velike globalne ekološke promjene, tehnološke inovacije koje mijenjaju način lova dolaze kao posljedica takvih uzročnih stanja.

Kada mreže deponovanih sirovina nisu dostupne ili nisu na raspolaganju uslijed iznenadnih, neočekivanih kriza, kod grupe se javljaju inovativni postupci u ponašanju, jer se egzistecija dovodi u pitanje (Hovers 2006).

Nemogućnost da se vidi u arheološkoj situaciji, a u percepciji stvari moguće je upravo da je izumiranje Neandertalaca dovelo do širenja ranih modernih ljudi prije nego da je širenje modernih ljudi bilo uzrok nestajanja Neandertalaca (Petitt 1999).

Tranzicija srednji paleolit – gornji paleolit je počela prije erupcije i u sjevernoj Africi i u Evropi, što upućuje da ni erupcija CI ni HE4 događaj nisu bili primarni njeni uzroci. Nestajanje neanderstalskih populacija u istočnoj Evropi se već počelo odvijati prije CI erupcije.

Iz navedenog, sklon sam da mislim u pravcu hipoteze da CI erupcija kao jedan klimatološki feonomen, nije glavni uzročnik nestajanja populacije Neandertalaca. U dobroj mjeri je uslovila njihovu dalju strategiju opstanka i dalje migracije, jer su populacije bile prinuđene da se prilagode svojim raspoloživim resursima, ali smatram da nije bila primarni faktor totalnog njihovog nestajanja. Oslanjajući se na, često diskutovanu pouzdanost nalaza iz Vindije, može se zaključiti da je taj predio istočno jadranske

bility patterns and survival strategies.

Entire series of Mousterian and medium Paleolithic sites are closed with volcanic deposit, followed by the abandonment of the site and the prolonged absence of people. With the re-occupation of habitats, different or entirely new cultures were noticed (Fedele 2007).

For the purpose of better understanding of early, ie, proto-Aurignacian, the question is whether the early modern humans, before migrating to the European continent, possessed the knowledge that is a reflection of Aurignacian or it has emerged in the later period of time? To understand the problems of the early Upper Palaeolithic, it seems that the industry we know as Châtelperronian, Uluzzian, Bohunician, Szeletian (in geographic regions of its activity), are equally important.

If Aurignacian represents (in organizational and cultural sense) deviations from established upper Palaeolithic industries (Châtelperronian, Uluzzian, Bohunician, Szeletian), and despite the chronologically set dates between 36 ka BP and 28 ka BP, it precisely leads to the question of who could be their cultural holders? It is not sufficient to give only the answer to that question, of what that population was, or in most of the cases, it could be a carrier of themselves, but what place in the puzzle of the developed Upper Palaeolithic they individually or collectively occupy them.

With technological accessibility that we recognize in the early upper Paleolithic, the way of huntingis changed, which was more or less unchanged tens of thousands of years during the Middle Palaeolithic period (at least to the extent that we are able to recognize through archaeological situation). Dislocation, migration, complete replacement or even a total disappearance of certain faunal types after a major global environmental changes, technological innovations that are changing the hunting process, came as a result of such causal conditions.

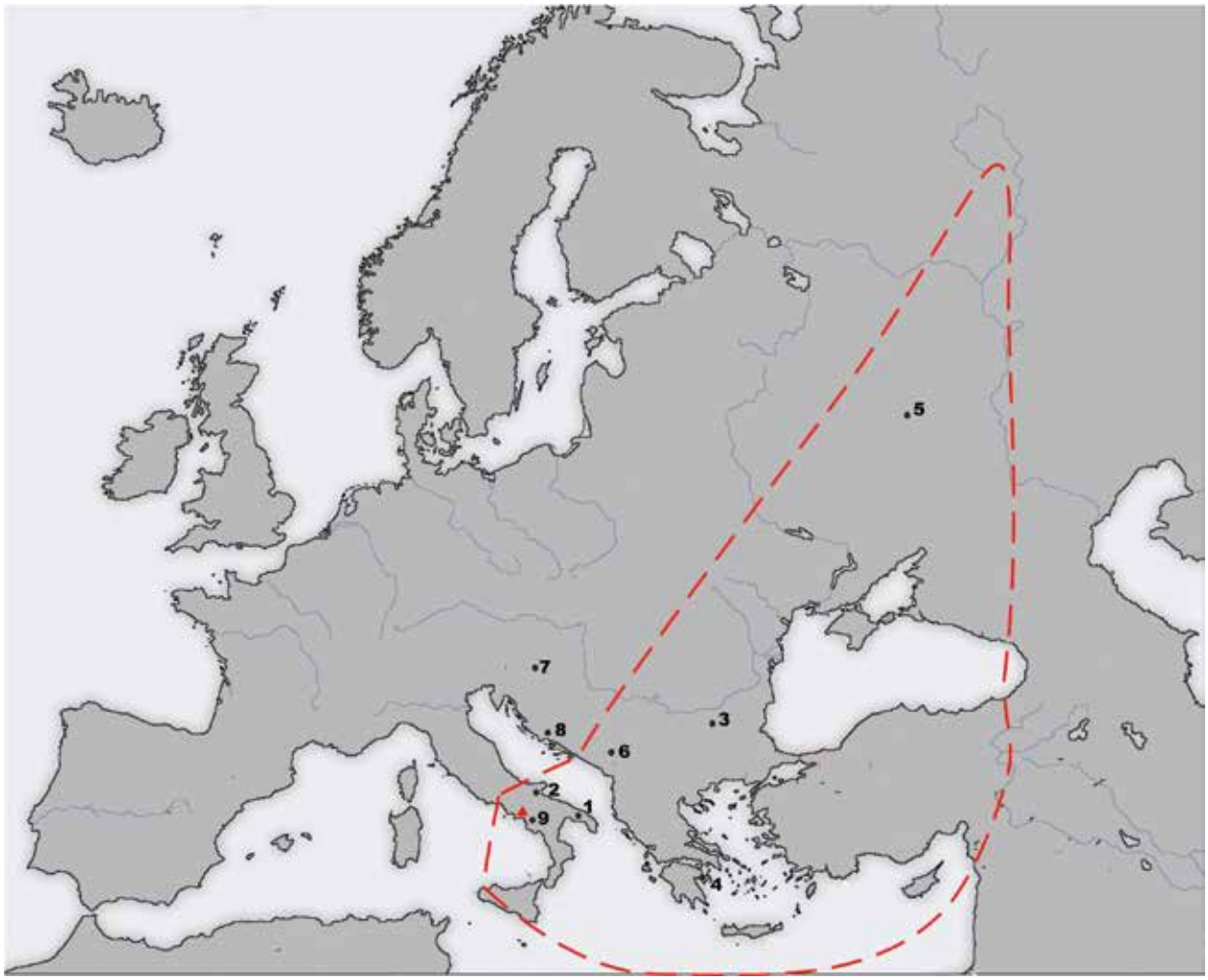
When the networks of deposited materials are not available or are not accessible due to sudden, unexpected crises, the group appears to have innovative processes in behavior, because theexistance has been called into question (Hovers 2006).

oblastio čak bio i jedan od regiona u kojem su Neandertalci na posletku pronašli "poslednje" utočište.

Inability to see within the archaeological situation, but the perception of things can be just to show that the extinction of Neanderthals led to the spread of early modern humans before the dispersal of modern humans were the cause of the disappearance of Neanderthals (Petitt 1999).

The transition of the Middle Palaeolithic - Upper Palaeolithic began before the eruption in North Africa and in Europe, suggesting that there is no eruption CI or HE4 event were the primary causes of it. Neanderthal diminishing in Eastern Europe was already underway before the CI eruption.

To conclude, I am inclined to think in the direction of the hypothesis that the CI eruption as one climatology pheonomenon, and that is not the main cause of the disappearance of the Neanderthal population. To a large extent it further conditioned their strategy of survival and further migration, as the populations were forced to adapt to their viable resources, however I think that was not the primary factor of their total disappearance. Drawing attention to the often discussed reliability of findings from Vindija, it can be concluded that the eastern area of Adriatic was one of the regions where Neanderthals eventually found their " last " refuge.



Karta: 1. Visoravan Murđi (*Murge area*); 2. Paglići (*Paglicci*); 3. Temnata (*Temnata*); 4. Frankti (*Franchthi*); 5. Kostjenki (*Kostenki*); 6. Crvena Stijena (*Crvena stijena*); 7. Vindija (*Vindija*); 8. Mujina pećina (*Mujina pećina*); 9. Kastelćevita (*Castelcivita*)

▲ Felegrejska polja (*Phlegrean fields*)

------- Oblast zahvaćena tefrom (*Area overtaken by tephra*)

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