ORIGIN OF THE NEOLITHIC RAW MATERIALS IN CROATIA

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In the frame of the IGCP Project 442, recently started a petrographical analysis of the neolithic raw materials from the sites Samatovci and Vindija (Croatia). The preliminary results show a mixture of used materials of local origin (probably pebbles found in the river valleys). To define their sources, the geographical and geological characteristics of the wider area were analysed showing two possibilities of provenience. Majority of the raw materials derives: 1. - from the high cristalline shists of the Pannonian megastructures, and 2. - from the volcanic and metamorphic rocks of the Alps and Dinarides. On the other hand, the rare raw materials such as obsidian and jadeite were occasionally imported in limited quantities along the trading and/or migrating routes from Italy.

Key words: Neolithic, raw material, origin, Croatia

INTRODUCTION

Despite the fact that in Croatia there are many well known neolithic sites (Sarvaš, Vučedol, etc.), the systematic research of the raw materials was mainly oriented on the Mousterian and Upper Paleolithic lithic industry (Paunović et al 2001). Recently, in the frame of the IGCP Project 442, the petrographical study started with analysis of the polished stone artifacts from neolithic settlement Samatovci and neolithic level of the cave Vindija, and the first results show a mixture of used materials of local origin. In this paper the main geographical and geological characteristics of Croatia as well as of the wider area are discussed with the aim to define sources of the recently analyzed materials but also of the materials cited in the literature (Benac 1979).

GEOGRAPHY

In studying the Neolithic of Croatia one should keep in mind that its territory is characterized by variety of composition: 1. about 1/3 of Croatia is of a striking plain character surrounded and interrupted by a belt of small hills and hills which separate them from the mountainous regions of the Alps in the west and Dinarides in the south-west; 2. the Dinarides are characterized by chain mountains of steep slopes with karst phenomena and deeply incised river valleys; 3. all stream waters belong to the catchment areas of the Black Sea (79%) and Adriatic Sea (21%), but the density of the river net is the smallest in karst regions. The stream waters in mountainous regions are of the greatest fall and energy, especially upper and middle parts of their catchment areas. Closely to the Pannonian basin, the falls suddenly decrease and rivers assume appearance of plain rivers.

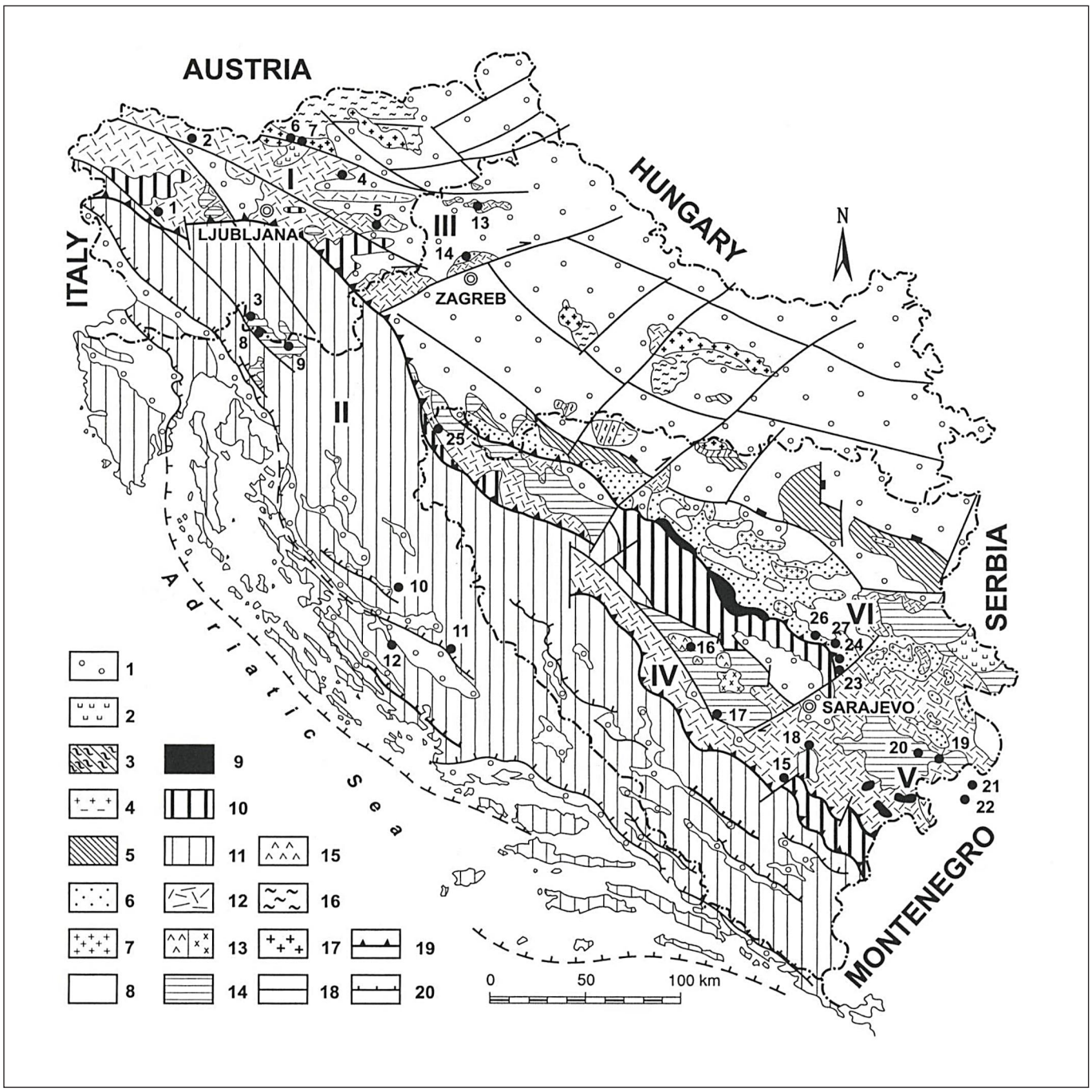

Fig. 1. Compiled sketch map of the northwestern and central Dinarides showing position of main Alpine mineral deposits (I. Jurković, J. Pamić 1999.)

Legend: *1 Tertiary and Quaternary sediments; 2 Tertiary volcanics; 3 Paleogene metamorphic rocks; 4 Paleogene granitoids; 5 Upper Cretaceous-Paleogene flysch; 6 Dinaric Ophiolite zone, mostly melange; 7 Lower to Upper Cretaceous sequences uncoformably overlying ophiolites; 8 Larger ultramafic massifs; 9 radiolarites; 10 Jurassic to Upper Cretaceous sequences of the passive massifs; 11 Adriatic-Dinaridic carbonate platform; 12 allochthonous Triassic sequences-small Paleozoic masses; 13 larger bodies of Triassic volcanic (a) and plutonic (b) rocks; 14 allochthonous Paleozoic sequences; 15 larger bodies of Paleozoic volcanics; 16 Paleozoic metamorphic rocks of the Eastern Alps and Tisia; 17 Paleozoic granitoids, and migmatites; 18 strike-slip fault; 19 interterrane thrust; 20 interterrane thrust;* ***I -VI*** *Magmatic-metallogenic subprovinces.*

GEOLOGY

Also, to understand the reasons of Neolithic raw material exploitation, the geology of Croatia must be considered in the context of wider area which is, thanks to its position in European part of the Alpine orogen, i.e. Mesozoic carbonate platform, characterized by a complicated geological composition. Paleogeographically and geotectonically, this area can be divided into two main parts: the External Dinarides (Adriaticum, Epiadriaticum and Dinaricum) composed of Mesozoic limestones and dolomites and the Internal Dinarides (Supradinaricum) consisting mainly of Mesozoic ophiolites and formations of the Tethyan active and continental margins (Herak 1986, Drobne & Trutin 1997). Its earliest evolutionary phases during the Alpine cycle were probably related to rifting processes which started in the Late Permian/Early Triassic (Pamić 1984).

Because Late Permian and Triassic magmatism produced basalts, andesites and dacites in extrusive level, and gabbro, diorite, granosyenite and granite in intrusive level, and because of the great diversity within the Dinarides (Jurkovic and Pamic 1999) the following magmatic groups are defined by different rock types (Fig. 1):

I - the dacite-quartz keratophyre (with subordinate andesite and basalt) magmatic group of Slovenia mainly included within the Sava nappe,

II - the basalt-spilite-andesite magmatic group of Gorski Kotar, Lika and Dalmatia,

III - the basalt-spilite magmatic group of Hrvatsko Zagorje and SE Slovenia: small group composed of basalts, largely transformed into spilites with some andesites associated with pyroclatsic rocks,

IV - the basalt-spilite-andesite-keratophyre-quartz keratophyre magmatic group associated with gabbro, diorite and granosyenite of SW Middle Dinarides. The volcanics are accompanied by larger plutonic bodies in some places in association with numerous swarms of diabases. Middle Triassic volcanic-sedimentary formation is in this area represented with tuff, tuffite, tuffitic sandstone, iron-manganese schist, shale, chert, and volcanic rocks,

V - the andesite-keratophyre- quartz keratophyre magmatic group with subordinate diorite and granosyenite of SE Bosnia and N Montenegro,

VI - the basalt-spilite magmatic group of SE and Central Bosnia.

At the same time, metamorphic rocks of this area (Central Dinaride Ophiolite Belt = CDOB) are represented by low-grad metamorphism, or by lower part of greenschist facies and by higher or high-pressure metamorphism: phyllites, chloritoid schists, chlorite schists, greenschists, calcschists, metapsamites, quartz micaschists, eclogites etc (Majer et al. 1993). The ophiolite belt contains also the greatest masses of spinel lherzolites known by now in the world (Garašić & Majer, 1993), while alkali amphibole bearing metamorphic rocks (blueschists) are mostly encountered in the collision area between Dinarides and bordered geotectonic units of the Pannonian basin, and only a few occurences are connected with the ophiolite belt (Majer & Lugović 1991).

CONCLUSION

Thus, because among neolithic tools found at Croatian sites most common are diabases, gabbros, amphibolites, quarz, quarzite, chert, etc., sporadically nephrite, obsidian, jasper, jadeite and opal (Benac 1979), with exception of obsidian and jadeite (origin: ?Italy), the raw materials are autochtonous and not imported. Namely, regarding the mentioned geological and geographical characteristics of the area, the sources of raw materials in Croatia are prevailingly formations which occur as raised eroded cores of megastructures represented by high christalline schists (two-mica gneisses, amphibolites and micaschists) encountered below a thick cover of the Tertiary and Quaternary sediments in Pannonian basin as well as the magmatic group of Hrvatsko Zagorje. Also the raw materials are brought by water courses rich in pebbles and rocks (Soča, Sava, Drava, Una, Bosna, Neretva etc.) directly from outcrops of volcanic and metamorphic rocks of Slovenia and Bosnia.

The main characteristic of the neolithic settlements in Croatia is their position along the interfluvial regions on elevated river banks or on natural rises near streams. Thus, depending on all natural sources, the neolithic population in each specific region used the raw material found in vicinity of the settlement without long distance search. At the same time, the tools made from the rare raw materials, such as obsidian or jadeite, probably represent luxury items or presents occasionally imported in limited quantity along the trading or migrating routes.

REFERENCES

Benac 1979 A. Benac: Praistorija jugoslavenskih zemalja. II Neolitsko doba, Akademija nauka i umjetnosti Bosne i Hercegovine, 705 p., Sarajevo.

Drobne & Trutin 1997 K. Drobne i M. Trutin: Alveolinas from the Bunić Section (Lika, Croatia). Geol. croatica, 50/2, 215-223, Zagreb.

Garašić & Majer 1992/1993 V. Garašić i V. Majer: Heterogenitet ultramafita iz masiva planine Ozren u zoni Centralnih Dinarida (CDOB), Bosna. RAD HAZU, 463, 91-108, Zagreb.

Herak 1986 M. Herak: A new concept of geotectonics of the Dinarides. Acta geol., 16, 1-42, Zagreb.

I. Jurković & J. Pamić 1999 I. Jurković i J. Pamić: Triassic rifting-related magmatism and metallogeny of the Dinarides. Acta geol., 26/1, 1-26, Zagreb.

Majer & Lugović 1991 V. Majer i B. Lugović: Metamorfne stijene s alkalnim amfibolima ("glaukofanski škriljci") u Jugoslaviji. RAD HAZU, 458, 103-129, Zagreb.

Majer, Lugović & Vragović 1992/1993 V. Majer, B. Lugović & M. Vragović: Kloritoidni škriljci Dinarida i susjednih oblasti. RAD HAZU, 463, 159-194, Zagreb.

Pamić 1984 J. Pamić: Triassic magmatism of the Dinarides in Yugoslavia. Tectonophysics, 226, 503-518.

Paunović, Jambrešić, Brajković, Malez & Mauch Lenardić 2001 M. Paunović, G. Jambrešić, D. Brajković, V. Malez & J. Mauch Lenardić: Last Glacial settlement of Croatia: Catalogue of fossil sites dated to the OIS 2&3. Acta geol., 26/2, 27-70, Zagreb.

SAŽETAK

PORIJEKLO SIROVINSKOG MATERIJALA U NEOLITIKU HRVATSKE

Ključne riječi: neolitik, sirovinski materijal, porijeklo, Hrvatska

UVOD

Unatoč brojnim neolitičkim nalazištima Hrvatske (npr. Sarvaš, Vučedol), dosadašnje analize alatki bile su usmjerene na odredbu sirovinskog materijala korištenog u izradi musterijenske i gornjopaleolitičke kamene industrije (Paunović et al. 2001.). Tek nedavno, a u okviru realizacije projekta IGCP 442, započela je i petrografska analiza poliranih kamenih sjekira iz Samatovaca i Vindije pri čemu prvi rezultati ukazuju da je za njihovu izradu upotrebljavan raznorodan sirovinski materijal lokalnog porijekla (valutice iz obližnjih rijeka). Stoga se, u cilju odredbe izvorišnog područja sirovinskog materijala, u ovom radu ukratko daje pregled geografskih i geoloških značajki Hrvatske i šireg područja.

GEOGRAFSKE ZNAČAJKE

Prilikom proučavanja neolitičkih naselja u prvom redu treba imati u vidu da je područje Hrvatske imalo sve recentne značajke, odnosno da je:

1. trećina područja Panonska nizina s lancem brda koja ju presijecaju ili odvajaju od gorskog područja Alpa na zapadu i Dinarida na jugu;
2. da su Dinaridi gorsko područje s krškim fenomenima i duboko usječenim riječnim dolinama;
3. da sve tekućice pripadaju crnomorskom (79%) i jadranskom (21%) slivu, ali da je gustoća riječne mreže najmanja u krškim područjima. Tekućice imaju najveću snagu i pad u gorskim predjelima, naročito u gornjem i srednjem toku dok u blizini Panonskog bazena poprimaju karakter sporotekuće nizinske rijeke.

GEOLOŠKE ZNAČAJKE

Geologija Hrvatske mora biti promatrana u kontekstu šireg područja zbog njenog položaja u europskom dijelu alpskog orogena, odnosno mezozojske karbonatne platforme čija je značajka kompliciranigeološki sastav. Paleogeografski i geotektonski područje može biti podijeljeno na:

1. vanjske Dinaride (Adriaticum, Epiadriaticum, Dinaricum) izgrađene iz mezozojskih vapnenaca i dolomita;
2. unutrašnje Dinaride (Supradinaricum) koji se uglavnom sastoje od mezozojskih ofiolita i formacija aktivnih i kontinentalnih rubova Tetisa (Herak 1986, Drobne & Trutin 1997). Najranija evolucijska faza Dinarida vjerojatno je u uskoj vezi s procesima koji su započeli u kasnom permu/ranom trijasu (Pamić 1984).

Zbog velike raznolikosti u građi Dinarida, ali i zbog činjenice da su kao produkt kasnopermskog i trijaskog magmatizma nastali bazalti, andeziti i daciti (ekstruzivne stijene), odnosno gabri, dioriti, granosijeniti i graniti (intruzivne stijene), na ovom su području definirane sljedeće magmatske grupe (Jurković & Pamić 1999) prikazane na slici 1:

I. magmatska grupa - dacit-kvarckeratofir s podređenim pojavama andezita i bazalta: Slovenija uglavnom na području savskih bora
II. magmatska grupa - bazalt-spilit-andezit: Gorski Kotar, Lika, Dalmacija
III. magmatska grupa - bazalt-spilit: Hrvatsko Zagorje i JI Slovenija: mala grupa uglavnom izgrađena od bazalta izmijenjenih u spilite s nešto andezita u asocijaciji s piroklastičnim stijenama.
IV. magmatska grupa - bazalt-spilit-andezit-keratofir-kvarckeratofir u asocijaciji s gabrima, dioritima i granosijenitima: JZ centralni Dinaridi. Vulkaniti su popraćeni većim plutonskim tijelima ponekad u asocijaciji s dijabazima. Srednjotrijaska vulkanogeno-sedimentna formacija predstavljena je tufovima, tufitima, tufitičnim pješčenjacima, željezovito-manganskim škriljcima, šejlovima, rožnjacima i vulkanskim stijenama.
V. magmatska grupa - andezit-keratofir-kvarckeratofir s pojavama diorita i granosijenita: JI Bosna i S Crna Gora
VI. magmatska grupa - bazalt-spilit: JI i središnja Bosna

Metamorfne stijene ovoga područja (ofiolitna zona središnjih Dinarida = CDOB) zastupljene su nisko-metamorfnim facijesom zelenih škriljaca ili visokometamorfnim filitima, kloritoidnim i kloritnim škriljcima, metapsamitima, eklogitima itd. (Majer et al. 1993). Značajka te ofiolitne zone je, u svijetu najveća, pojava spinelskih lercolita (Garašić & Majer 1993). Istovremeno, metamorfne stijene s alkalijskim amfibolima zapažene su samo u kolizijskoj zoni između Dinarida i geotektonskih jedinica Panonskog bazena pri čemu je tek nekoliko njihovih izdanaka u izravnoj vezi s ofiolitnim pojasom (Majer & Lugović 1991).

ZAKLJUČAK

Većina neolitičkih alatki pronađenih na hrvatskim lokalitetima izrađena je od dijabaza, gabra, amfibolita, kvarca, kvarcita, i rožnjaka, a tek sporadično iz nefrita, opsidijana, jaspisa, jadeita i opala (Benac 1979). Uz iznimku opsidijana i jadeita porijekom iz Italije, sirovinski je materijal autohton. Uzimajući u obzir geografske i geološke značajke, moguća izvorišta sirovinskog materijala u Hrvatskoj su uglavnom formacije koje se pojavljuju kao izdignute erodirane jezgre megastruktura izgrađenih od kristalinskih stijena (gnajs, amfiboliti, mikašisti) okruženih pokrovom tercijarnih i kvartarnih naslaga Panonskog bazena, odnosno stijene koje tvore magmatsku grupu Hrvatskog zagorja. Istovremeno izvorište dijela sirovinskog materijala su naplavine riječnih tokova (Soča, Sava, Drava, Una, Bosna, Neretva itd.) koji su nosili velike količine valutica i kamenih blokova nastalih trošenjem vulkanskih i metamorfnih stijena Slovenije, odnosno Bosne i Hercegovine.

Budući da je glavna značajka neolitičkih naselja Hrvatske njihov položaj na prirodnim uzvisinama uz tokove rijeka, stanovništvo je za izradu alatki u najvećoj mjeri koristilo sirovinski materijal koji je bio lako dostupan u naplavinama taloženim u blizini naselja. Istovremeno, alatke izrađene iz rijetkih materijala, kao što je opsidijan ili jadeit, najvjerojatnije su luksuzni predmeti ili pokloni istaknutim pojedincima, porijeklom iz Italije, a pristigli na područje Hrvatske trgovačkim ili migracijskim putovima.