

PROVENANCE STUDY OF OBSIDIAN STONE TOOLS WITH PGAA – NEW RESULTS WITHIN THE TÉT PROJECT

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OBSIDIAN

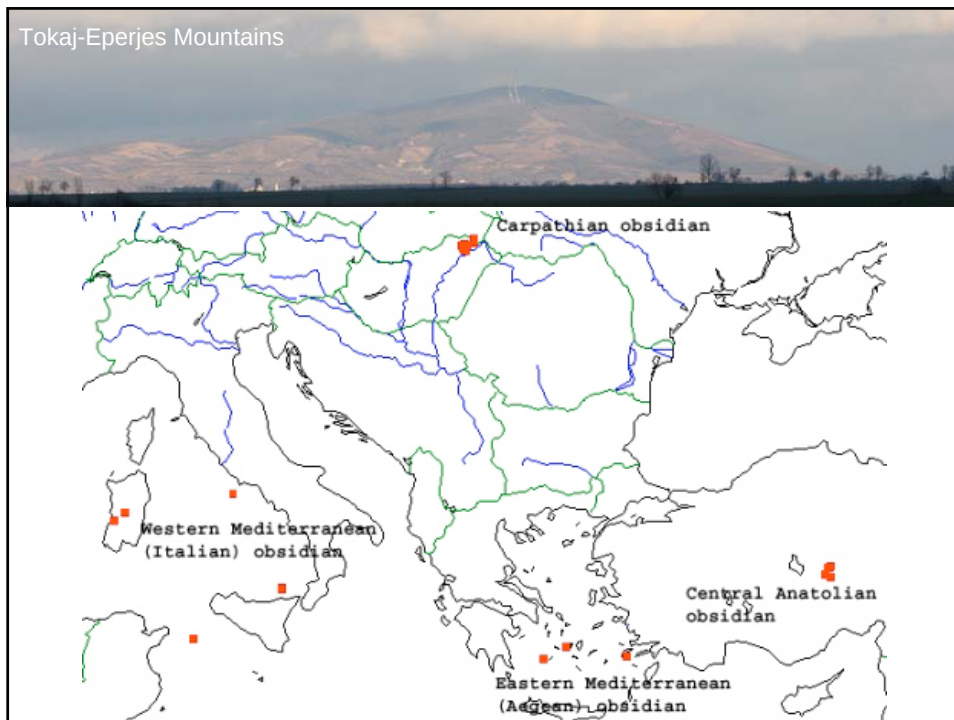
- Quenched igneous rock (rock glass of rhyolitic composition)
- Obsidians are typically young rocks of Tertiary or Quaternary age



Bodrogszerdahely: Primary geological occurrence



Vinicky: Secondary geological occurrence in rhyolite tufa



CARPATHIAN OBSIDIANS

C1: „Slovakian” 15-16 Ma, transparent, translucent



C2: „Hungarian” 10-12 Ma, non-transparent

C2T: Tolcsva



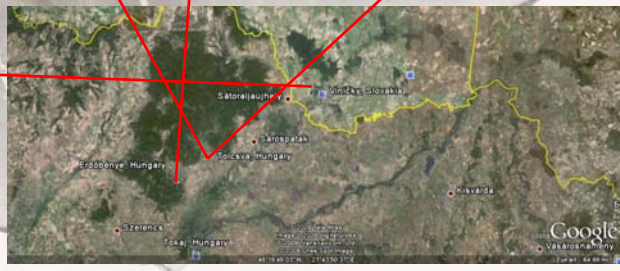
C2E: Mád-Erdőbénye



C2Tr: Tolcsva „mahagony”



Recently: C3 - Kárpátalja



ARCHAEOLOGY



Blade core hoard from Nyírlugos (HNM)

Favourite raw material for chipped stone artefacts from the Palaeolithic till the end of the Prehistoric period

Retouched blade from Csongrád-Felgyő (EBA)



TASKS (ARCHAEOMETRY)

Provenance study of archaeological objects - based on non-destructive chemical analysis (**PGAA**)

Earlier: Classification of archaeological pieces and raw materials from the Carpathian region

- 2008-2009: Provenance study of artefacts from Croatia and Bosnia and Herzegovina (TÉT project)

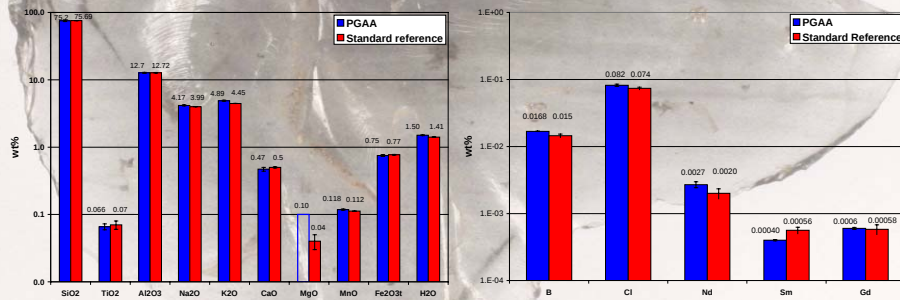
What is the origin of raw materials of Croatian and Bosnian artefacts?

The Carpathian or the Mediterranean region?

(There is no local geological source in Croatia!)

PROMPT GAMMA ACTIVATION ANALYSIS

- Major components: SiO_2 , TiO_2 , Fe_2O_3 , MnO , Al_2O_3 , CaO , (MgO) , K_2O , Na_2O , H_2O
- Traces: B, Cl, Nd, Sm, Gd

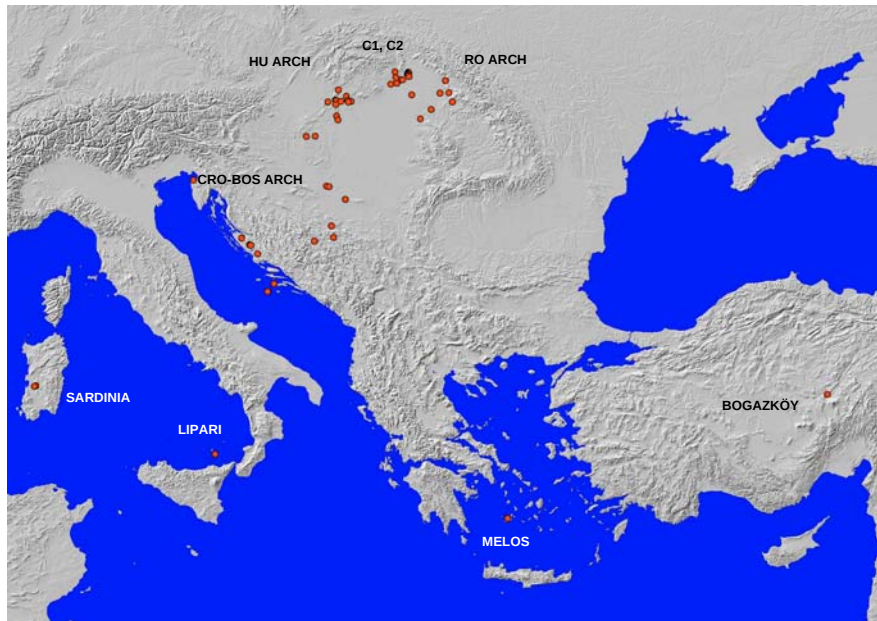


JR-2 geological standard (ryolite – Wada Toge obsidian / Geological Survey of Japan)

WE HAVE STUDIED WITH PGAA

- 26 Croatian and Bosnian archaeological finds
- 28 Hungarian archaeological finds
(Hundreds were investigated earlier with EDS-XRF, but non-Carpathian origin was not indicated)
- 5 Romanian archaeological finds
- 20 Carpathian (C1, C2 and C3) geological samples
- 6 Mediterranean (Lipari, Sardinia and Melos) geological samples
- + 126 reference data from the literature was used for Mediterranean region

MAP OF OCCURANCES

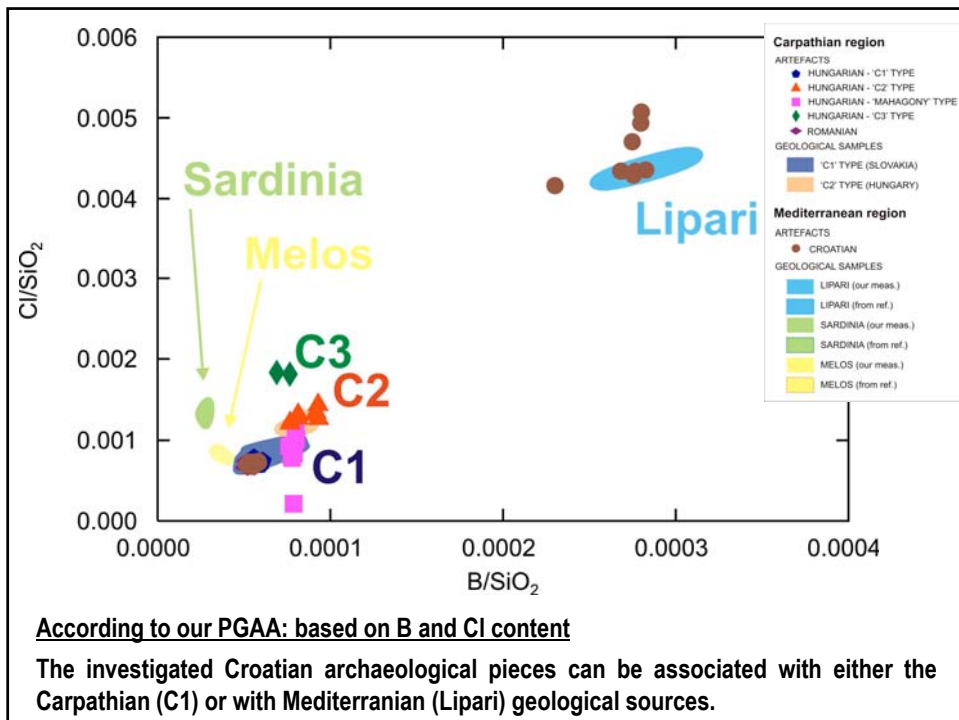


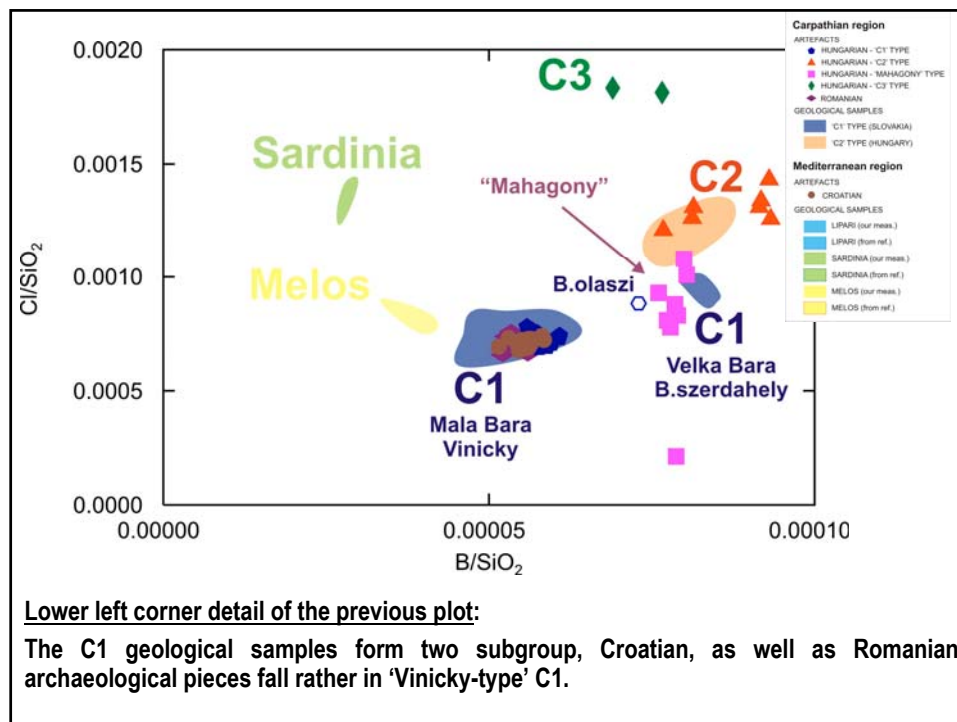
RESULTS



APPROXIMATE DETECTION LIMITS FOR THE BUDAPEST PGAA SYSTEM

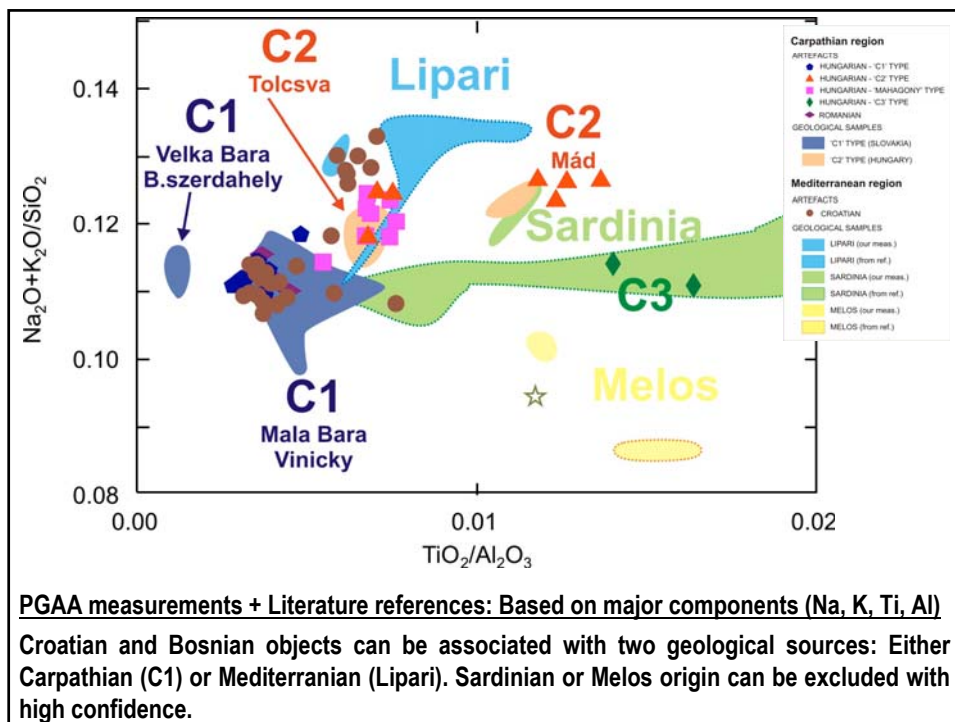
Element		Detection Limit [ppm]	
stable isotope	atomic weight	σ - capture	σ - scattering
		0.01-1	1-10
		10-100	100-1000
		>1000	>1000
		no data	
H	1		
He	4		
Li	7		
Be	9		
B	11		
C	12		
N	14		
O	16		
F	19		
Ne	20		
Na	23		
Mg	24		
Al	27		
Si	28		
P	31		
S	32		
Cl	35.5		
Ar	39.9		
K	39		
Ca	40		
Sc	45		
Ti	48		
V	51		
Cr	52		
Mn	55		
Fe	56		
Co	59		
Ni	58.7		
Cu	63.5		
Zn	65.4		
Ga	69.7		
Ge	72.6		
As	75		
Se	78.96		
Br	79.9		
Kr	83.8		
Rb	85.47		
Sr	87.62		
Y	88.91		
Zr	91.224		
Nb	92.906		
Mo	95.94		
(Tc)			
Ru	101.07		
Rh	102.91		
Pd	106.91		
Ag	107.87		
Cd	112.41		
In	114.82		
Sn	118.71		
Sb	121.76		
Te	127.6		
I	126.905		
Xe	131.29		
Cs	132.91		
Ba	137.33		
La	138.905		
Hf	178.49		
Ta	180.948		
W	183.85		
Re	186.207		
Os	190.23		
Ir	192.22		
Pt	195.084		
Au	196.967		
Hg	200.59		
Tl	204.38		
Pb	207.2		
Bi	208.980		
(Po)			
(At)			
(Rn)			
(Fr)			
(Ra)			
(Ac)			
104			
105			
106			
Ce	140.12		
Pr	140.91		
Nd	144.24		
Pm			
Sm	150.36		
Eu	151.96		
Gd	157.25		
Tb	158.93		
Dy	162.50		
Ho	164.93		
Er	167.26		
Tm	168.93		
Yb	173.05		
Lu	174.967		
Th	232.04		
(Pa)			
U	238.03		
(Np)			
(Pu)			
(Am)			
(Cm)			
(Bk)			
(Cf)			
(Es)			
(Fm)			
(Md)			
(No)			
(Lr)			





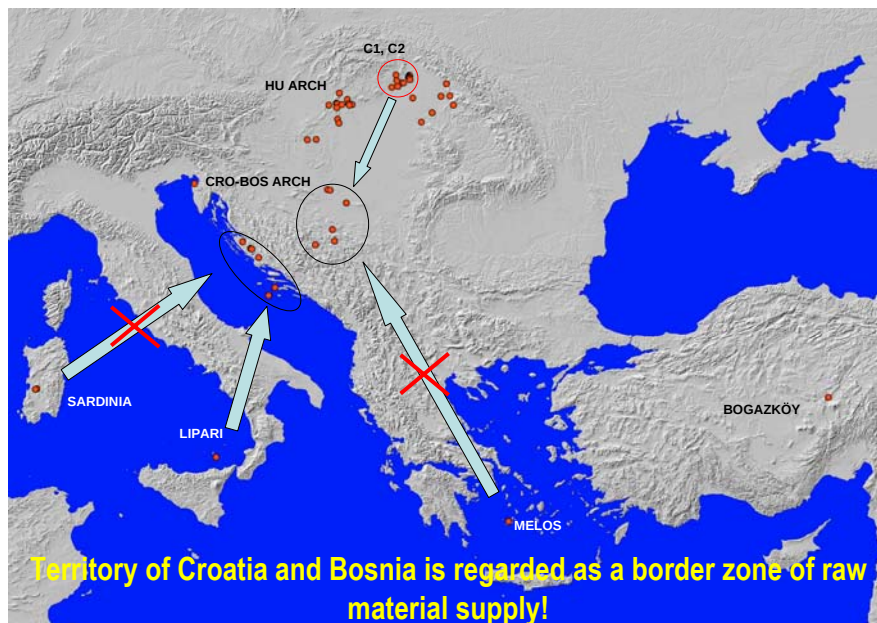
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CONCLUSIONS

- Croatian archaeological finds – without local geological sources – can be associated with Carpathian (C1) or Mediterranean (Lipari) sources.
- Within the Carpathian obsidians, C1, C2 and C3 can be distinguished.
- Sardinia and Melos can be excluded from the possible sources of raw materials.
- Problem: Literature can not be used for comparison of B and Cl data.
- Again, we have to emphasize the importance of **non-destructive** study – because of the small number of archaeological finds.



PUBLICATIONS AND ACKNOWLEDGEMENTS

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THANK YOU FOR YOUR ATTENTION!