

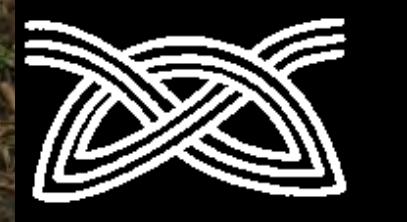
# The topography of archaeological sites with smelting characteristics on the territory of the River Drava Basin

Summer school:

Land use and exploitation of natural resources in the 1st millennium AD -  
New methods in archaeobotany, archaeometry and modelling

Poreč/Parenzo – Tar-Vabriga/Torre-Abrega – Crikvenica, Croatia,  
25th-30th June 2018.

Ivan Valent, Muzej grada Koprivnice



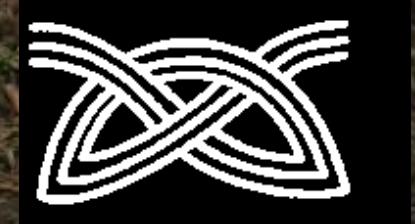
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# Research project IP-06-2016-5047 - Croatian Science Foundation

## *Production of Iron Along the Drava River During Antiquity and Middle Ages: Creation and Transfer of Knowledge, Technology and Commodities*

### Project goals:

- I. To recognize the production of iron retrieved from the iron ore and the processing of iron in the River Drava Basin (Podravina)
- II. To define how and in which measure that production influenced on the identity of the communities and the formation and dynamics of the development of different socio-cultural relations in the context of Antique and Medieval societies

In order to define the process and the importance of the production of iron, following tasks were set:

1. Defining the origin of the iron ore and the necessary resources (clay, water, wood)
2. Defining the technology of the processing of the iron ore through different periods as well as the intensities of these productions
3. Defining the influence of the production of the iron on a narrow and wider area within the context of the socio-culturological surrounding by means of following the production and distribution of products and semi-products (iron) which might allow the interpretation of economic, social and cultural contacts between several communities and societies during Late Antiquity and Medieval period

Virje – Volarski breg, 2007. (T. S. Ivančan, IARH)



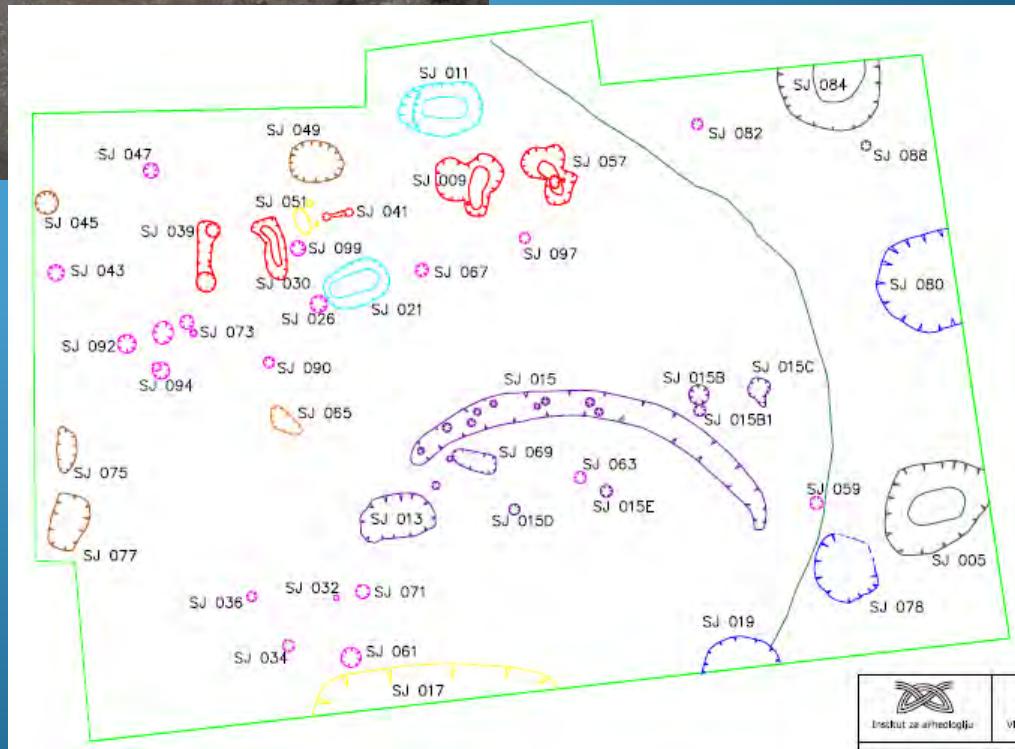


T. S. Ivančan, IARH



Picture: T. Tkalc̆ec, IARH

Trench 1 – 230 m<sup>2</sup>:  
5 smelting furnaces *in situ*  
4 dislocated remains of destroyed  
furnaces  
5 pits with burned bottoms  
1 fence and numerous postholes



Plan: K. Jelinčić, IARH

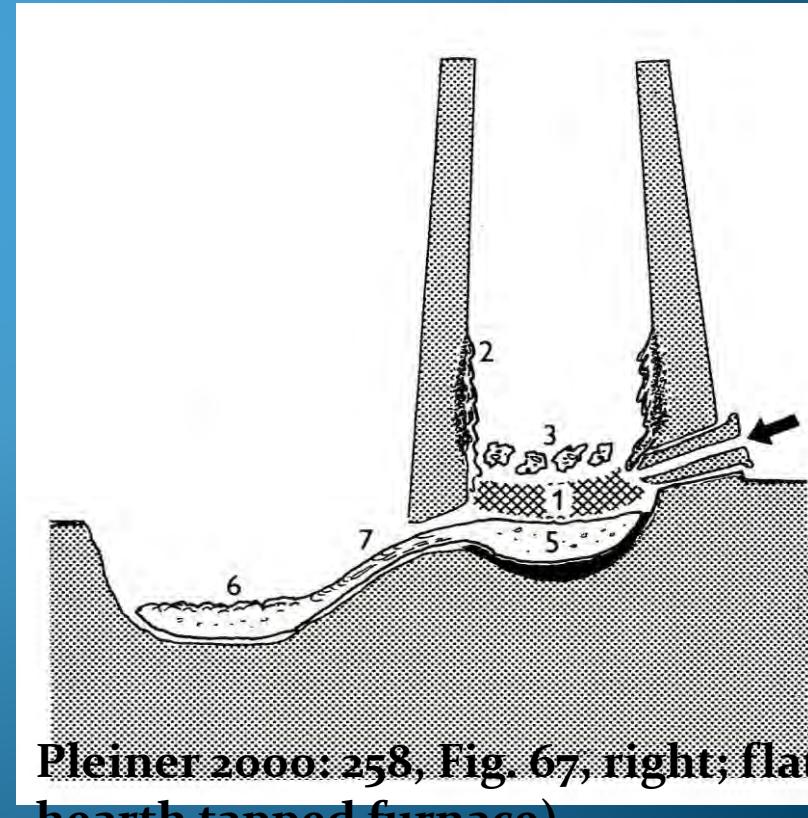


Virje – Volarski breg 2008. (T. S. Ivančan)



### Tapped furnace – 3 parts:

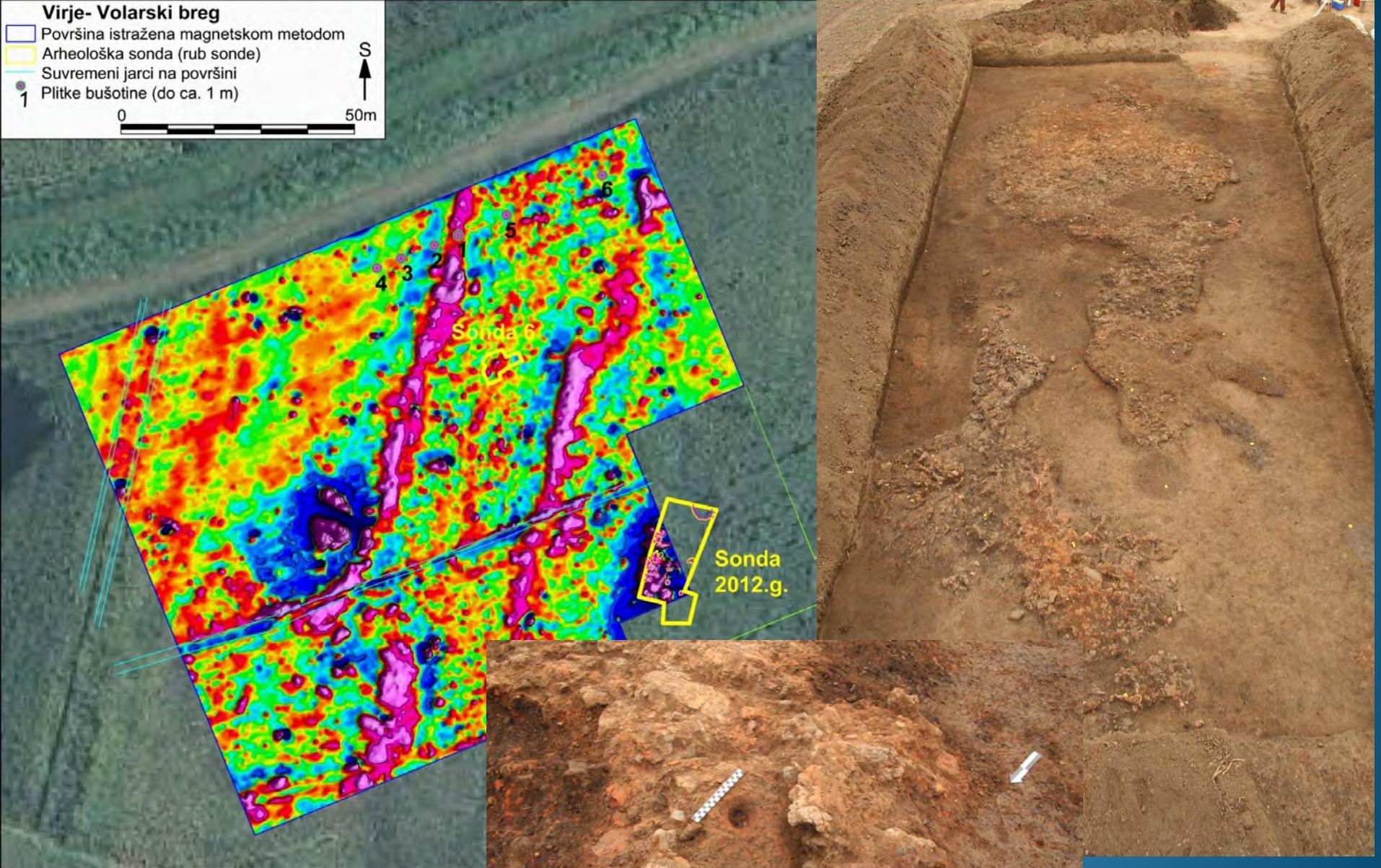
- 1.fireplace – interior of the furnace with burned bottom within which the ore was mixed with charcoal /1-5/
- 2.Burned bottom of a small cmanell through which the slag was released from the furnace /7/
- 3.Small pit within which the slag accumulated/6/



Pleiner 2000: 258, Fig. 67, right; flat-hearth tapped furnace)



Virje – Volarski breg 2008. (T. S. Ivančan)



Trench 5 – 202 m<sup>2</sup>  
Over 1 tone of slag

Virje – Sušine  
2012.



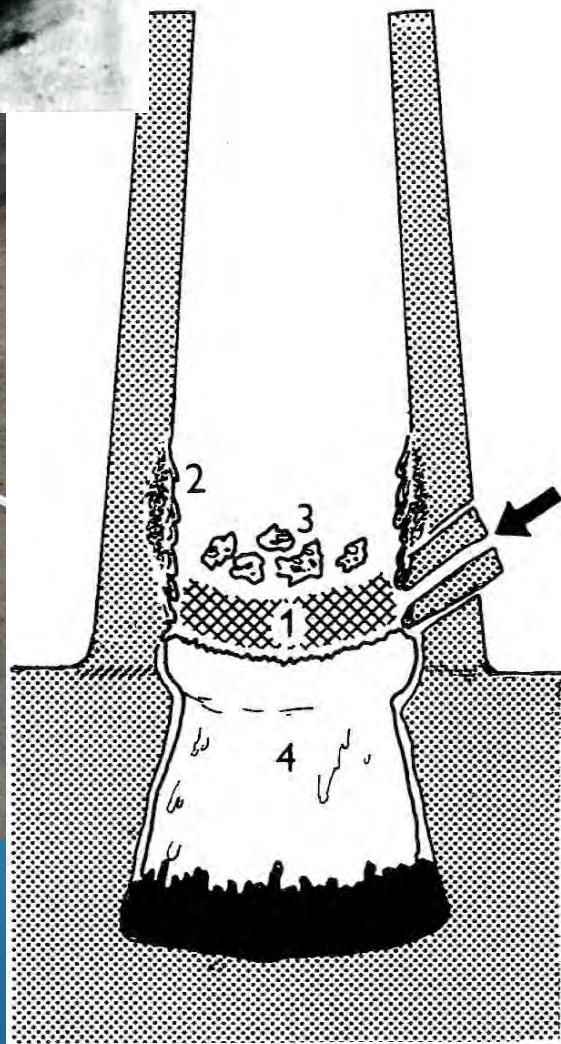
(Pleiner 2000:  
Pl. IX, Romano-  
Barbarian sleg pit  
furnaces in Jutland,  
Drengsted,  
Denmark)



(Pleiner 2000:  
Fig. 67, Left,  
sleg pit furnace)



Virje – Sušine 2013.



Stará huť, Adamov, Brno 2018.





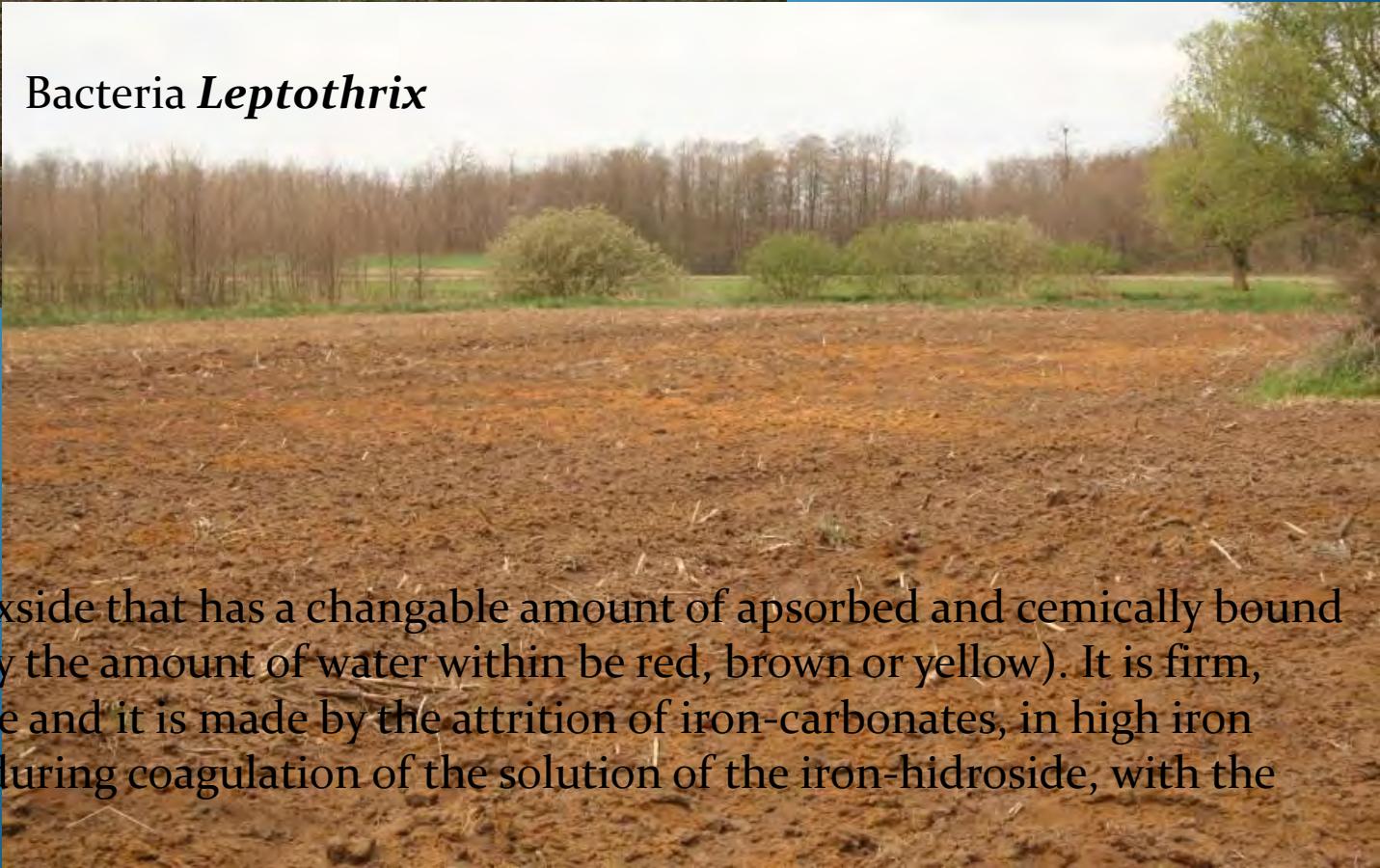
ZATYKO, Csilla. Settlement pattern.  
Landscape use in medieval Berzence  
(Hungary) / Obrasci naselja. Korištenje  
krajolika u srednjovjekovnom Berzencu  
(Mađarska), *Podravski zbornik* 39,  
Koprivnica, 2013., 164-172.

# BOG IRON ORE

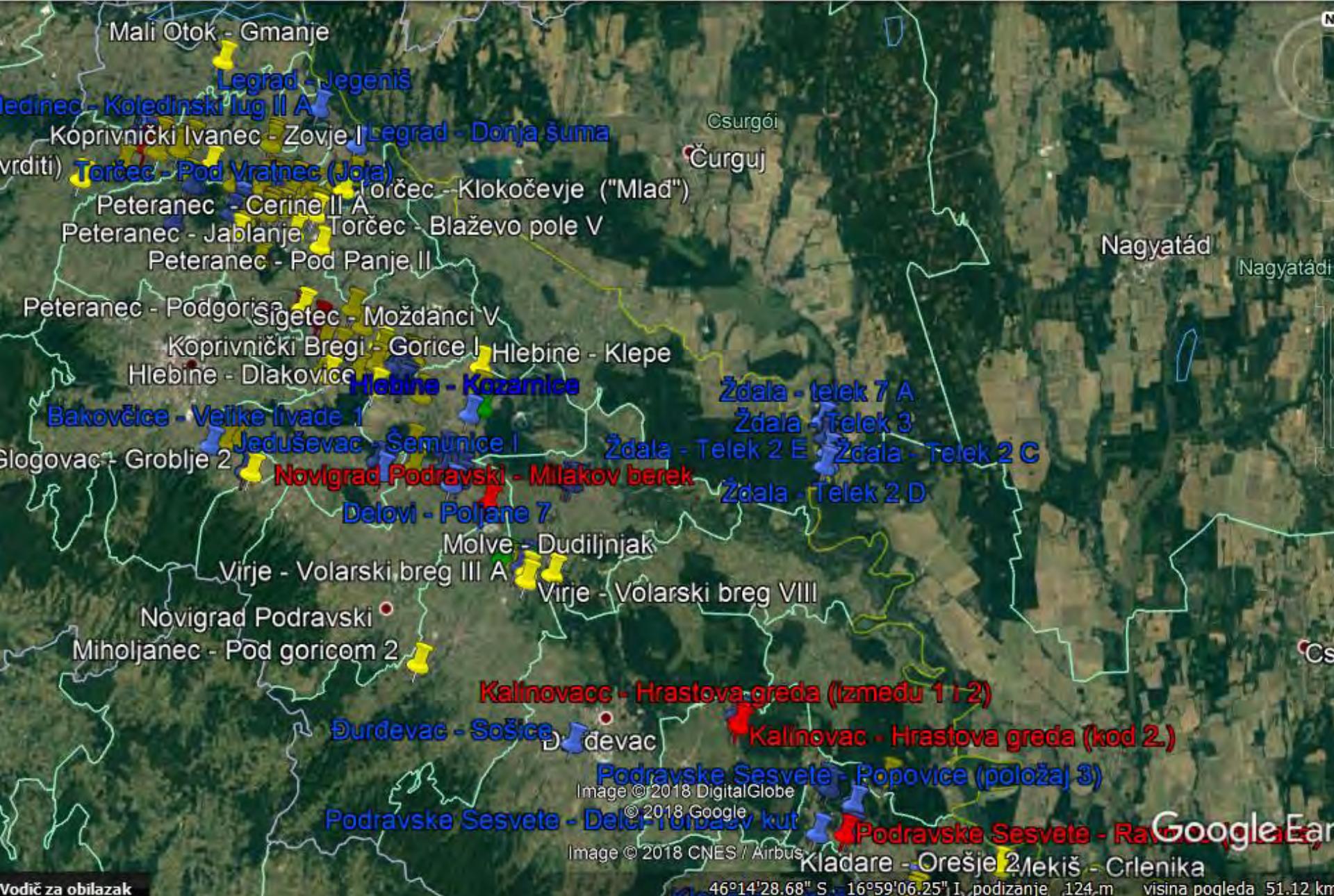


Virje – Volarski breg  
(T. S. Ivančan)

Bacteria *Leptothrix*



Limonit is an iron oxide that has a changeable amount of absorbed and chemically bound water (which can, by the amount of water within be red, brown or yellow). It is firm, fragile or earthly-like and it is made by the attrition of iron-carbonates, in high iron percentage waters, during coagulation of the solution of the iron-hydroxide, with the aide of bacteria.



Total: 157 sites with metallurgical characteristics (slag, furnace parts, nozzles);  
smelting: 56 (december 2017.)

## Delovi - Poljane 1

**Mjesto:** Delovi

**Općina:** Novigrad Podravski

**Županija:** Koprivničko-križevačka



TK 1:25 000  
Novigrad Podravski 272-4-4

**Položaj:** G.Š.  $46^{\circ} 07' 20''$

G.D.  $16^{\circ} 58' 26''$

Oko 1,4 km zapadno od farme za tov junadi koja se nalazi na sjevernom izlazu iz Delova i oko 350 metara jugoistočno od zapuštene plinske stanice Molve 13, na mjestu nekadašnjeg hangara.

**Geografske karakteristike:** ravničarski prostor; na mjestu talioničke radionice je blaga padina prema sjeverozapadu, prema manjoj potolini kroz koju je nekada tekao potok (n.v. 120 m).

**Tip lokaliteta:** naselje, talionička radionica

**Vrsta nalaza:** keramika, talionička zgura, metal

**Datacija:** rani srednji vijek (9.-11.st.), kasni srednji vijek

**Uvjeti nalaza:** rekognosciranje, 1973. g., S. Kolar, MGKc; probno iskopavanje, 1974. g., voditelj S. Kolar, MGKc, istr. pov 70 m<sup>2</sup>; zaštitno iskopavanje, 1983. g., voditelj Z. Marković, MGKc, istr. pov 110 m<sup>2</sup>; rekognosciranje I. i Z. Zvijerac; zaštitno iskopavanje, 2016. g., voditelj R. Čimin, MGKc, istr. pov. 500 m<sup>2</sup>.

**Smještaj nalaza:** MGKc; Zbirka obitelji Zvijerac, Torčec

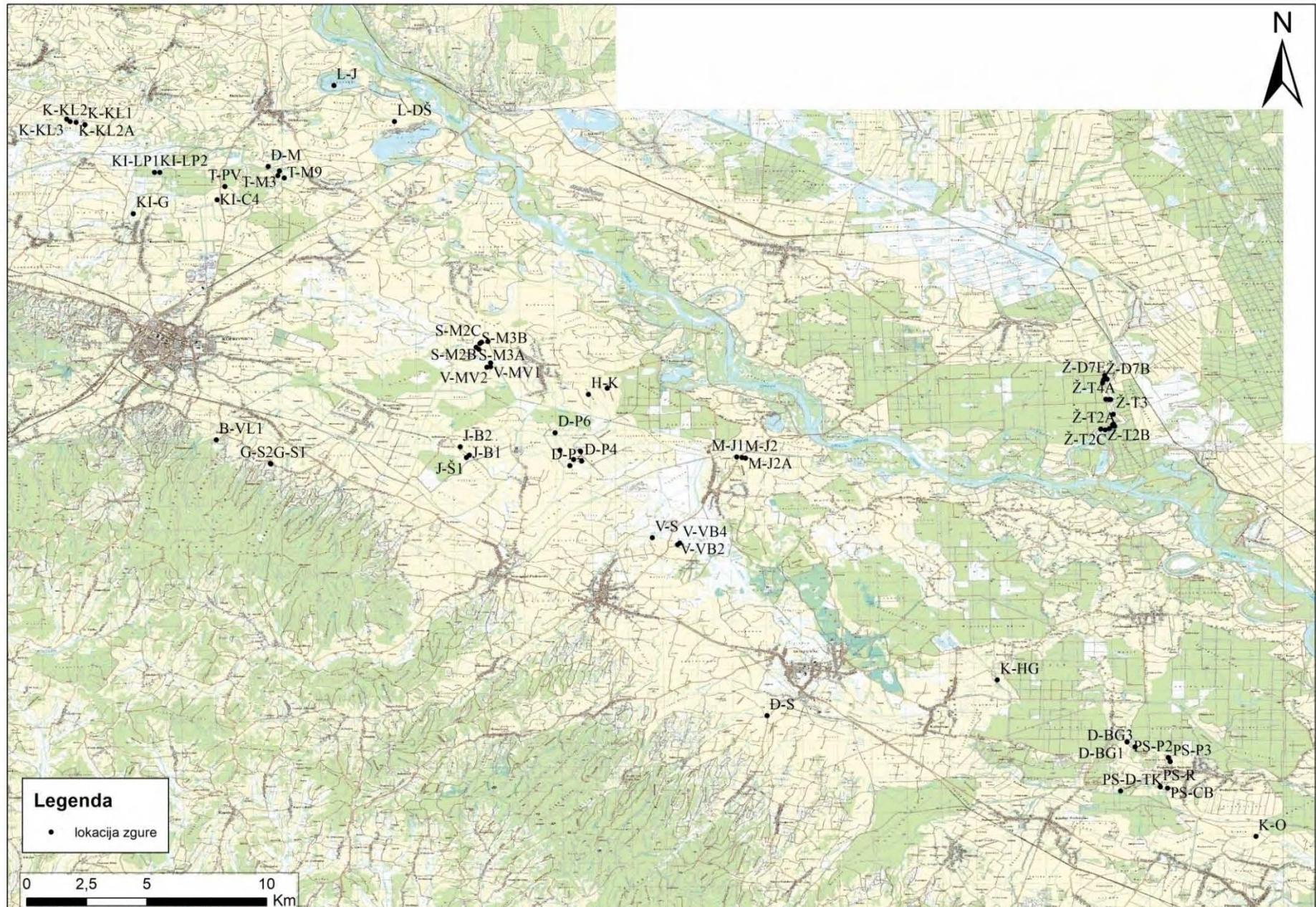
**Literatura:** Kolar-Sušanj 1973:172-173, T. XCI-XCIII; 1974: 58-60; Kolar 1976: 106,112; Marković 1980b: 324-330; 1984: 296-298,301; 1986c: 84; 1990b: 108; 1994: 113; 1997e:151; Sekelj Ivančan 1995: 137; 2001a, Pl. XVIII, 116; 2010: 21; Zvijerac 2000: 51, 56; 2008: 72; 2010: 12, 17, 18, 20, 22, 26; Valent 2016: 132; Valent et al. 2017: 15-16

**Dodatna napomena:** Na temelju prikupljenih površinskih nalaza i provedenih zaštitnih arheoloških istraživanja, na lokalitetu Delovi-Poljane 1 zabilježena su naselja iz kasnog brončanog doba, starijeg i mlađeg željeznog doba, te ranog i kasnog srednjeg vijeka. Tijekom triju provedenih istraživanja istraženi su objekti iz brončanog i starijeg željeznog doba te mlađeg srednjeg vijeka.

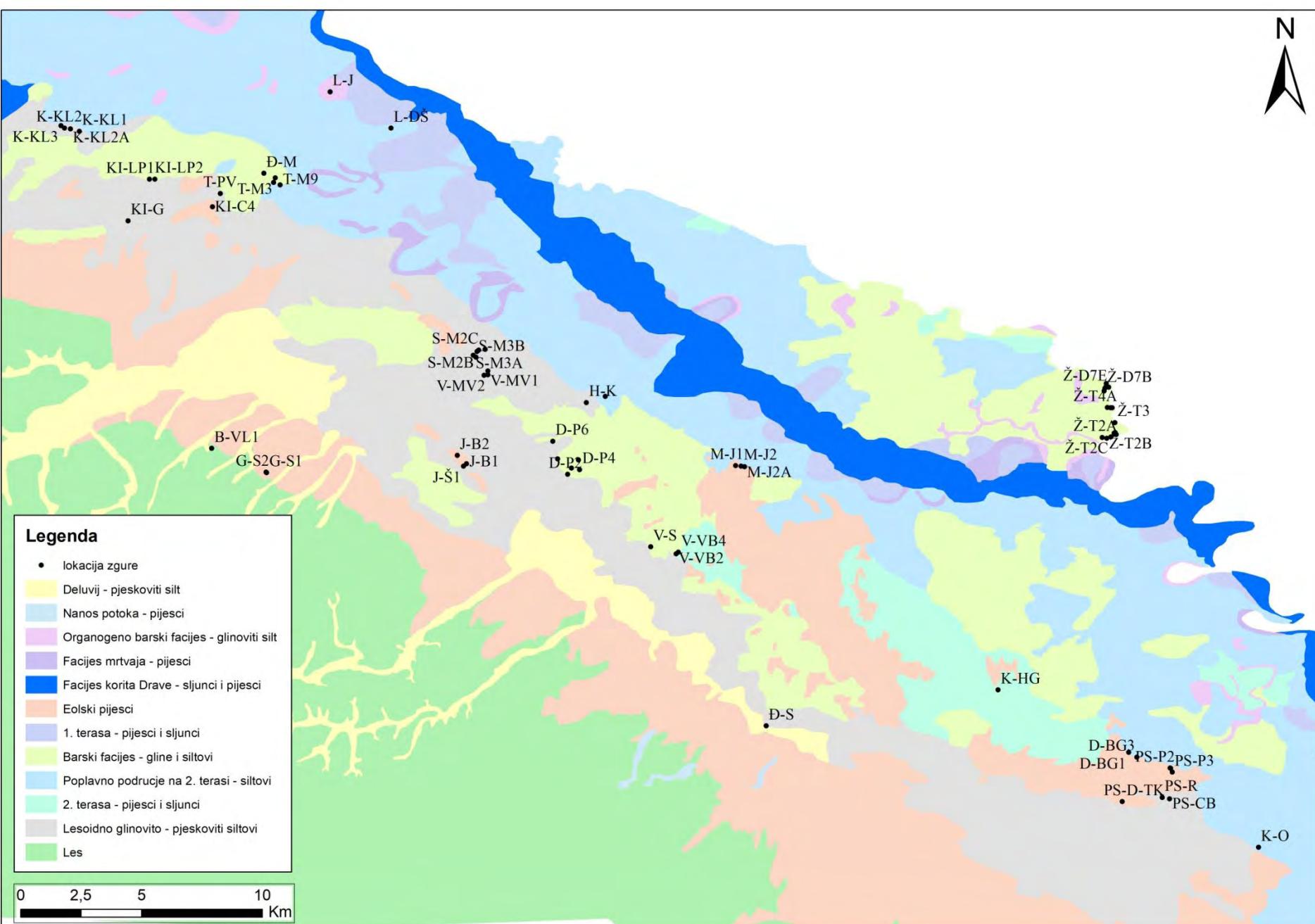


# Delovi – Poljane (I. Valent)

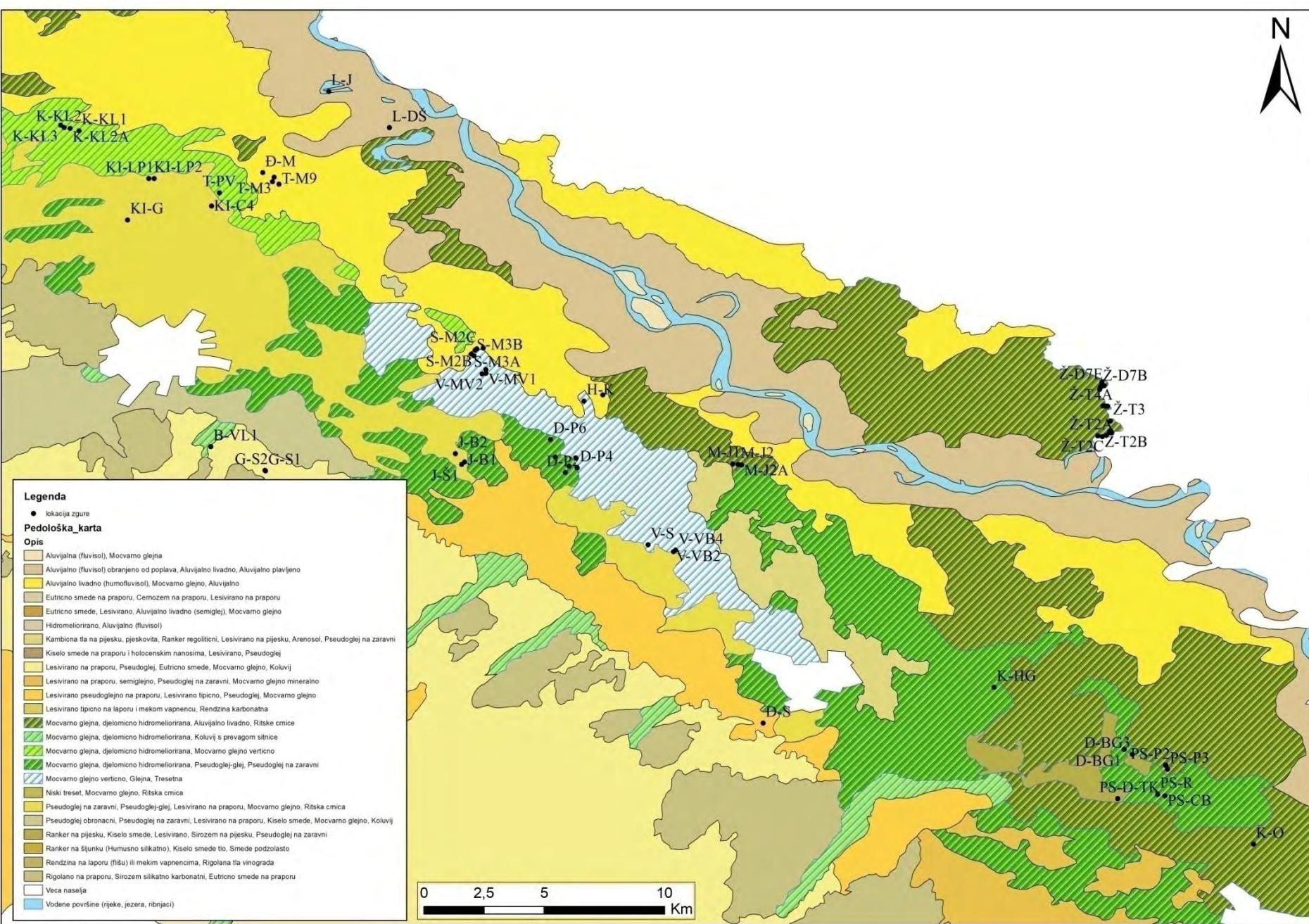




Topographic map of the River Drava Basin with archaeological sites with recorded smelting characteristics  
 (by Tomislav Brenko University of Zagreb, Faculty of Mining, Geology and Petroleum engenering, Department for Minerology, Petrology and Mineral sources)

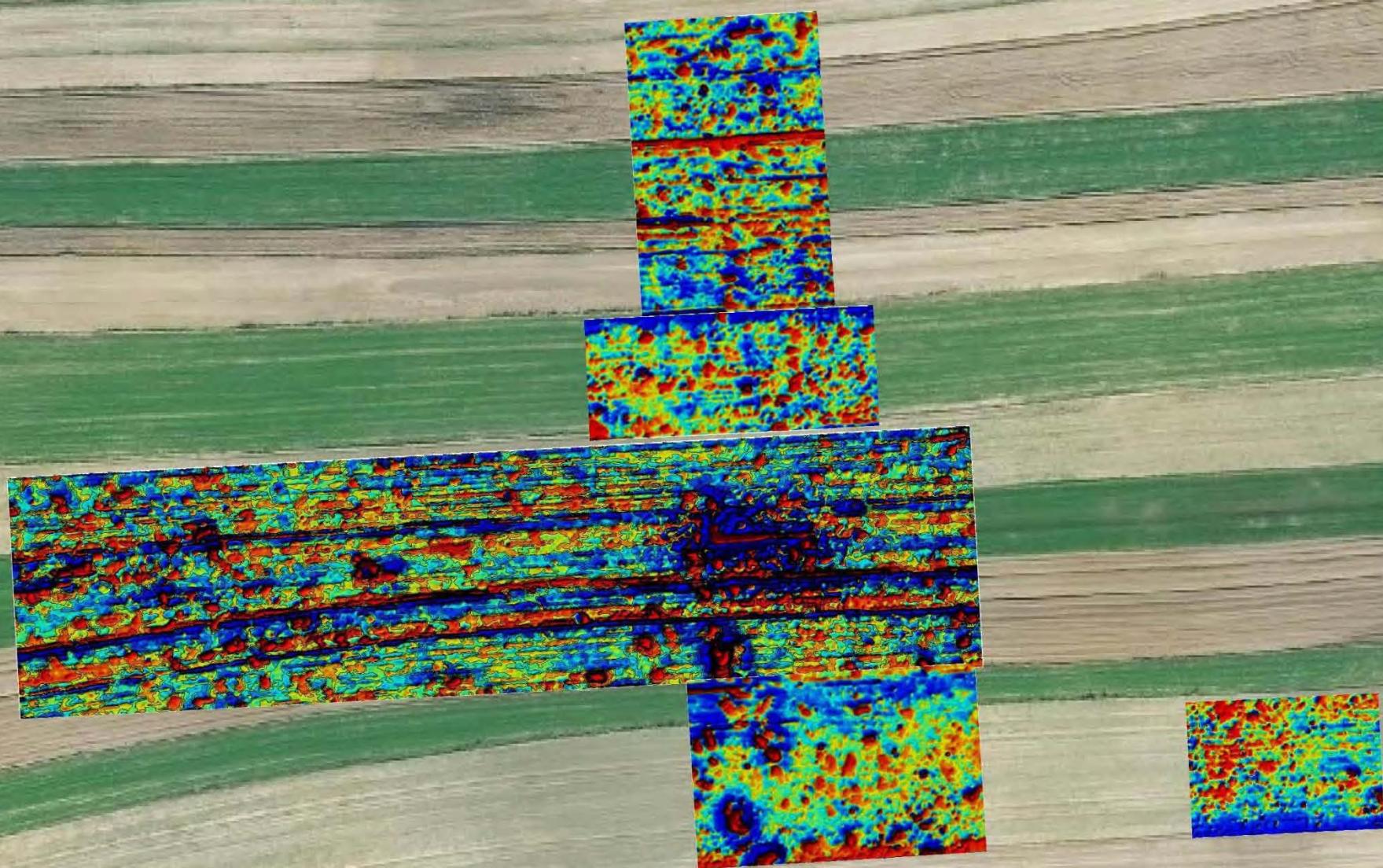


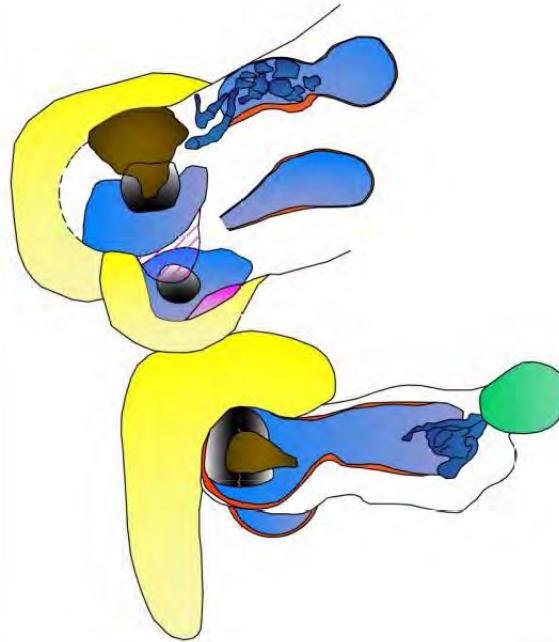
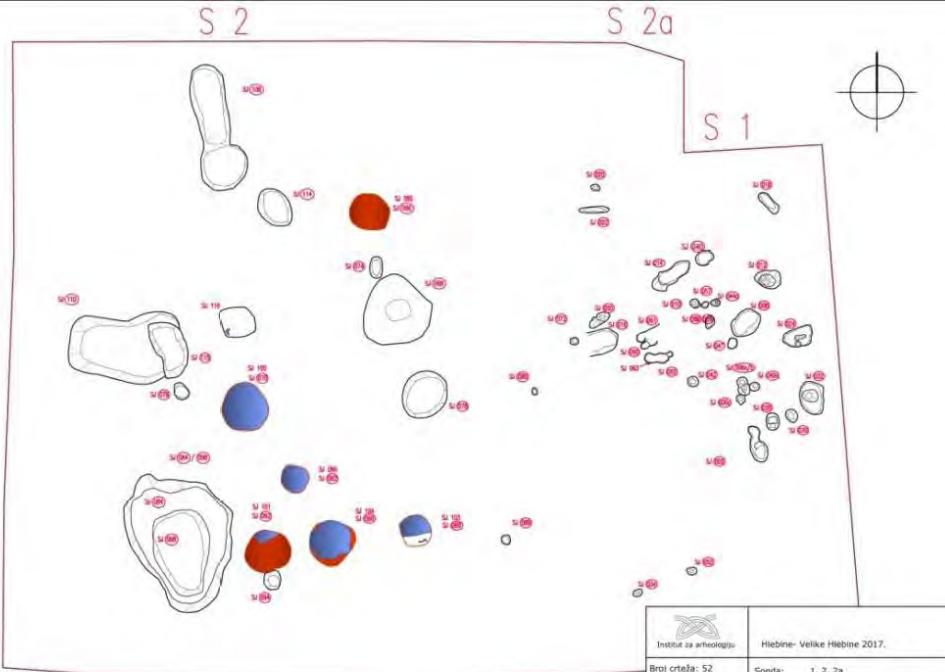
Geologic map of the River Drava Basin with archaeological sites with recorded smelting characteristics  
(by Tomislav Brenko)



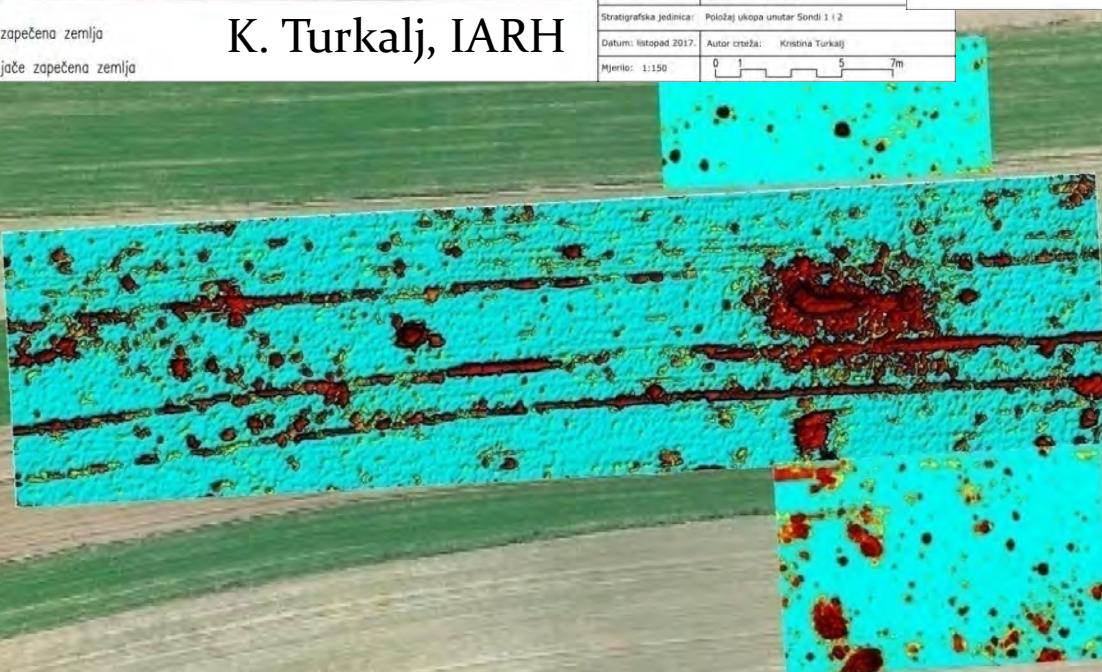
Pedologiy map of the River Drava Basin with archaeological sites with recorded smelting characteristics  
(by Tomislav Brenko)

Hlebine – Velike Hlenine (B. Mušić, Univerza v Ljubljani, Filozofska fakulteta, Oddelek za arheologijo)

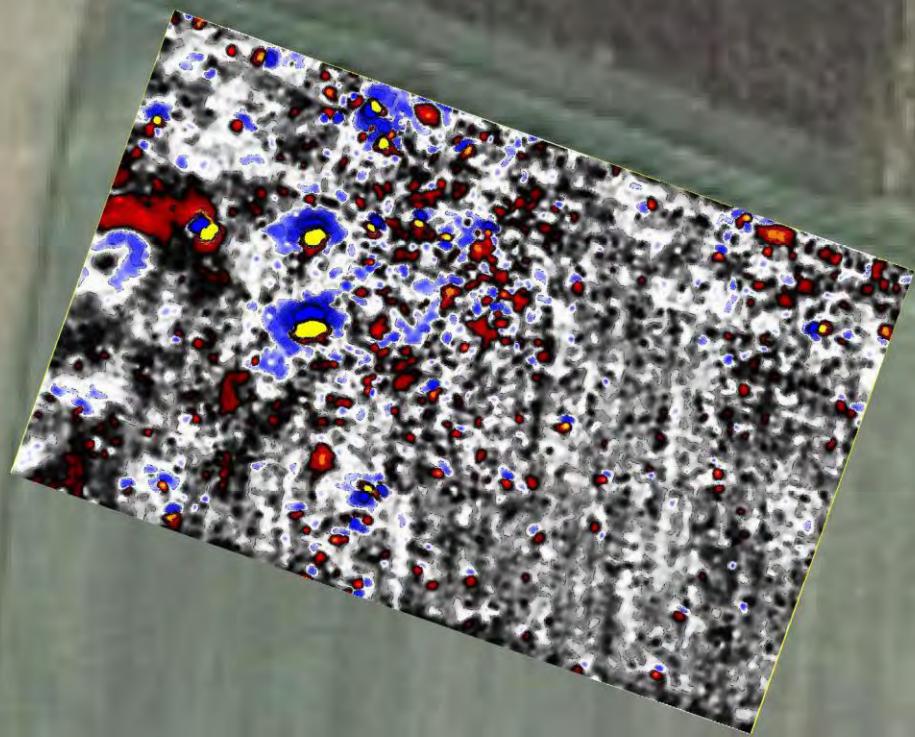




	Hlebine- Velike Hlebine 2017.
Broj crteža: 45	Kvadrant: 1
Stratigrafska jedinica:	peč 1,2,3,4
Datum: 29.3.2017.	Autor crteža: Kristina Turkalj
Mjerilo: 1:10	0 10 50cm

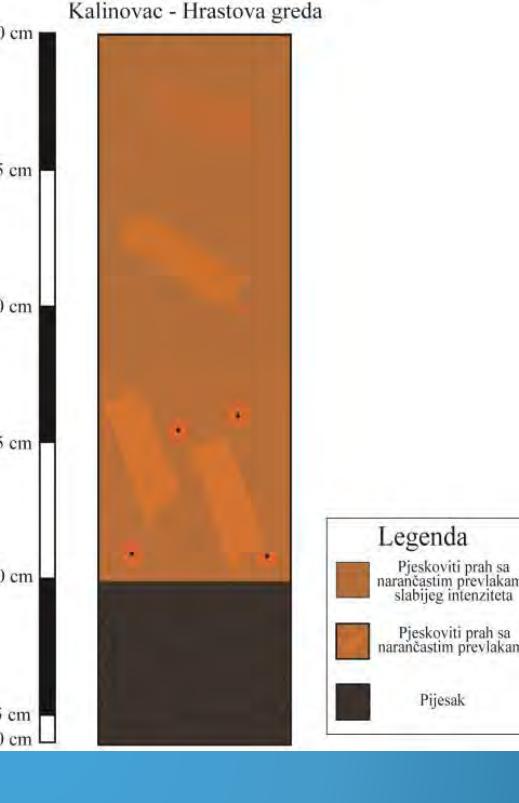
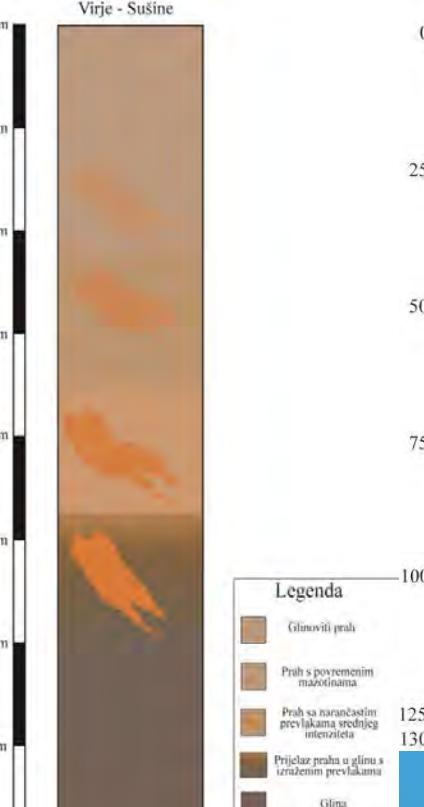
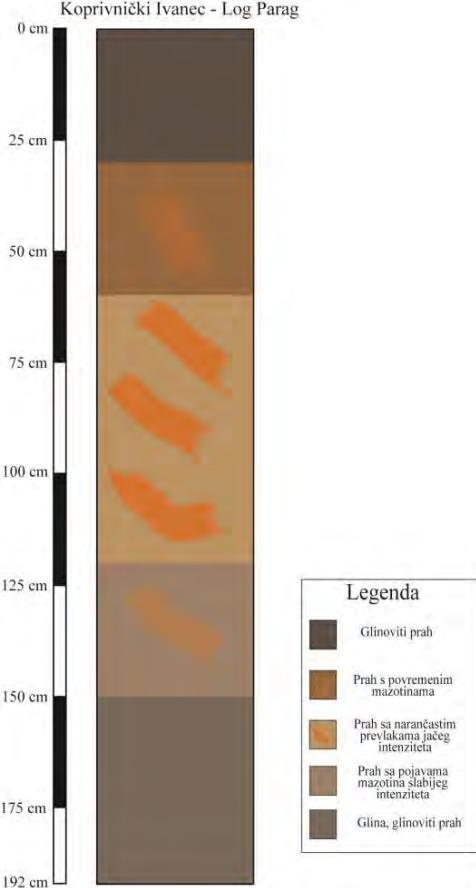


Hlebine - Dedanovice (B. Mušić, Univerza v Ljubljani, Filozofska fakulteta, Oddelek za arheologijo)



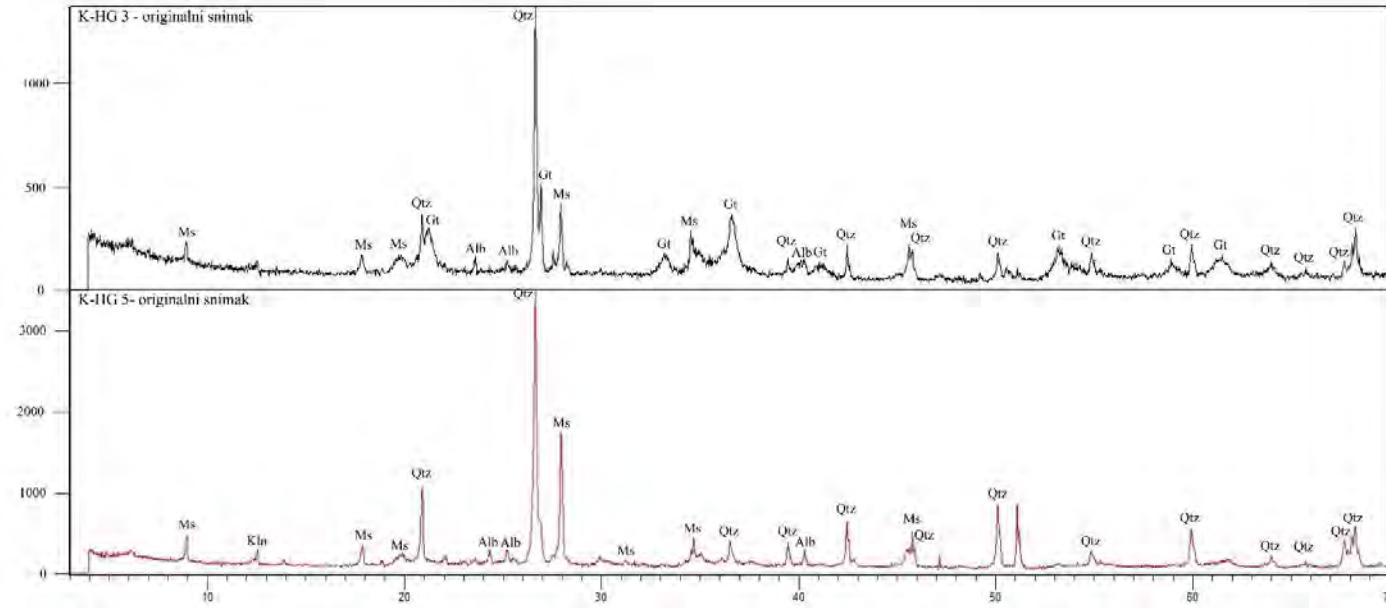
0 40m

Koprivnički Ivanec - Log Parag



# Tomislav Brenko

## 71 soil sample 8 soil and ore samples



Drava Drava  
Mrzla voda  
Donesla me k tebi roda  
Na početku prvog čina  
Žufka slatka Podravina



The rest is yet to come...  
Thank you for your attention!