Change in settlement positions regarding some major Holocene climate events
Case study of two sites in Drava region

Katarina Botić
Institute of Archaeology, Zagreb, Croatia

Strategic use of landscape
(IP-11-2013-3700)

HRZZ Croatian Science Foundation

WORKSHOP EX-AQUA 2019
PALAEOHYDROLOGICAL EXTREME EVENTS: EVIDENCE AND ARCHIVES
26-29th September 2019, Zagreb, CROATIA

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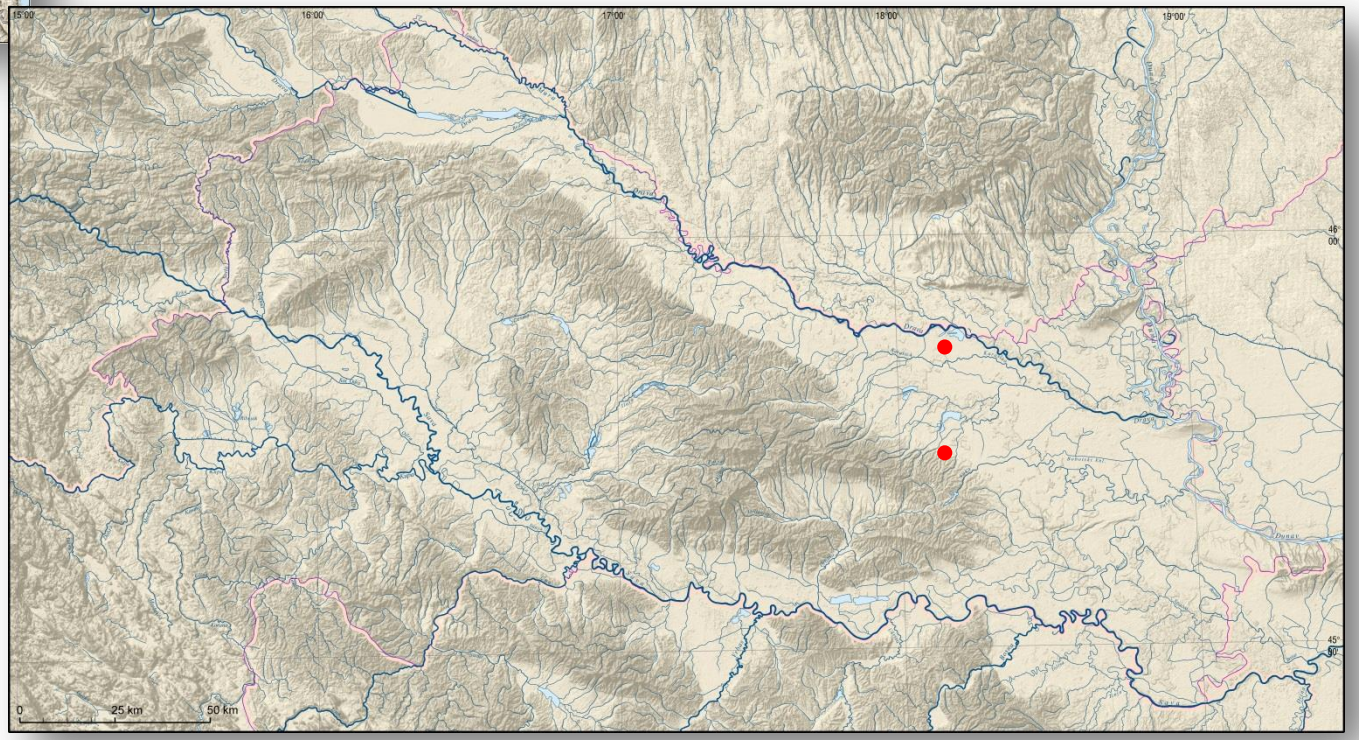
Palaeohydrological extreme events: evidences and archives



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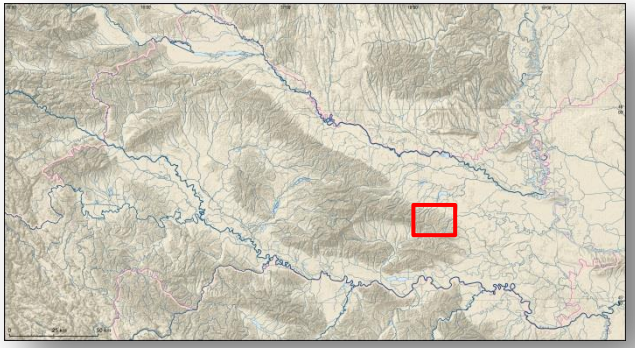
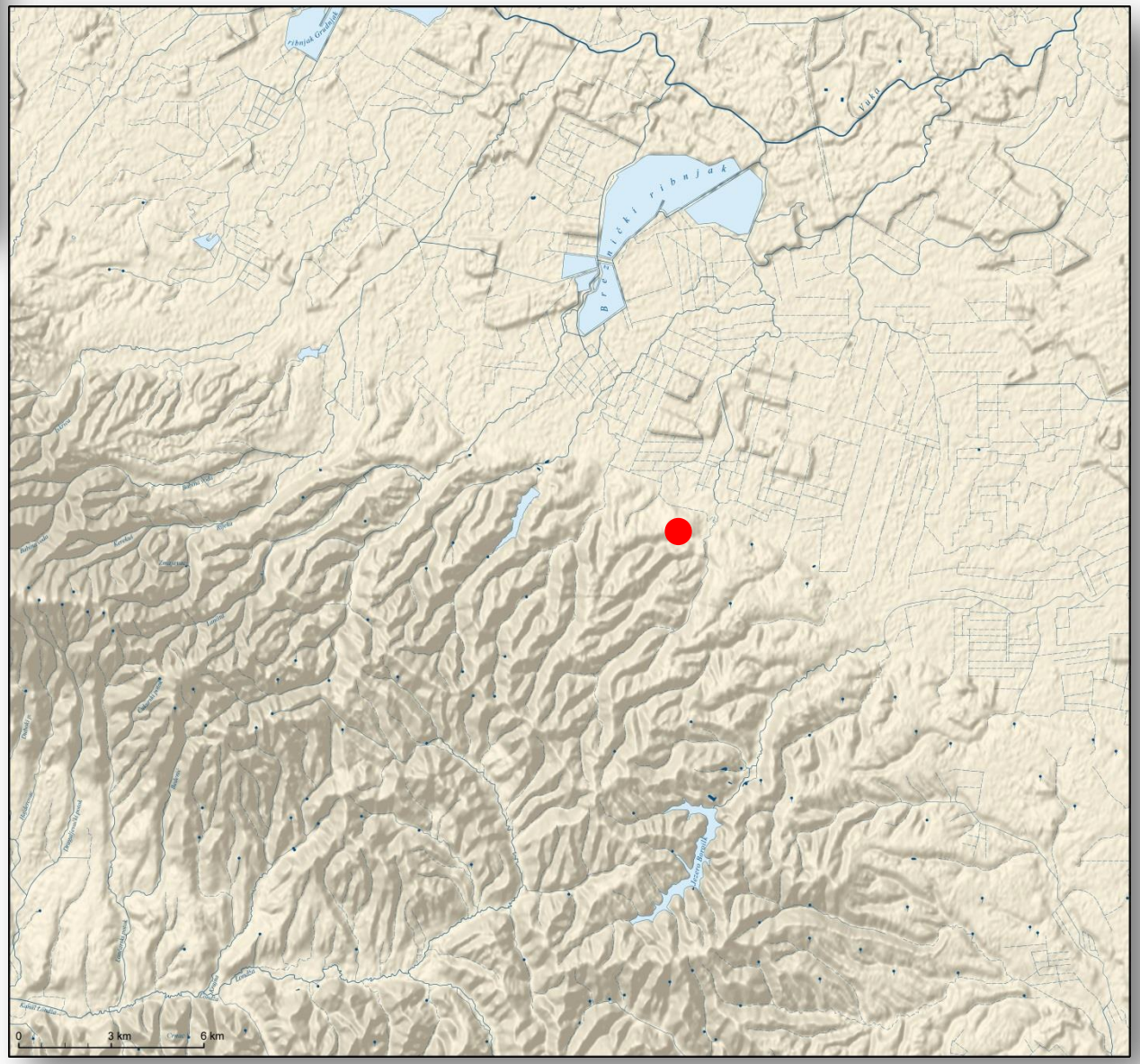


Strategic use of landscape (IP-11-2013-3700)

study of use of landscape in various time segments and data concerning natural resources (water, woods, arable land etc.) in a wider region of Našice in the middle Drava valley (Botić 2016a; Marković et al. 2016)

Stipanovci – Planina 1 site



0 100m

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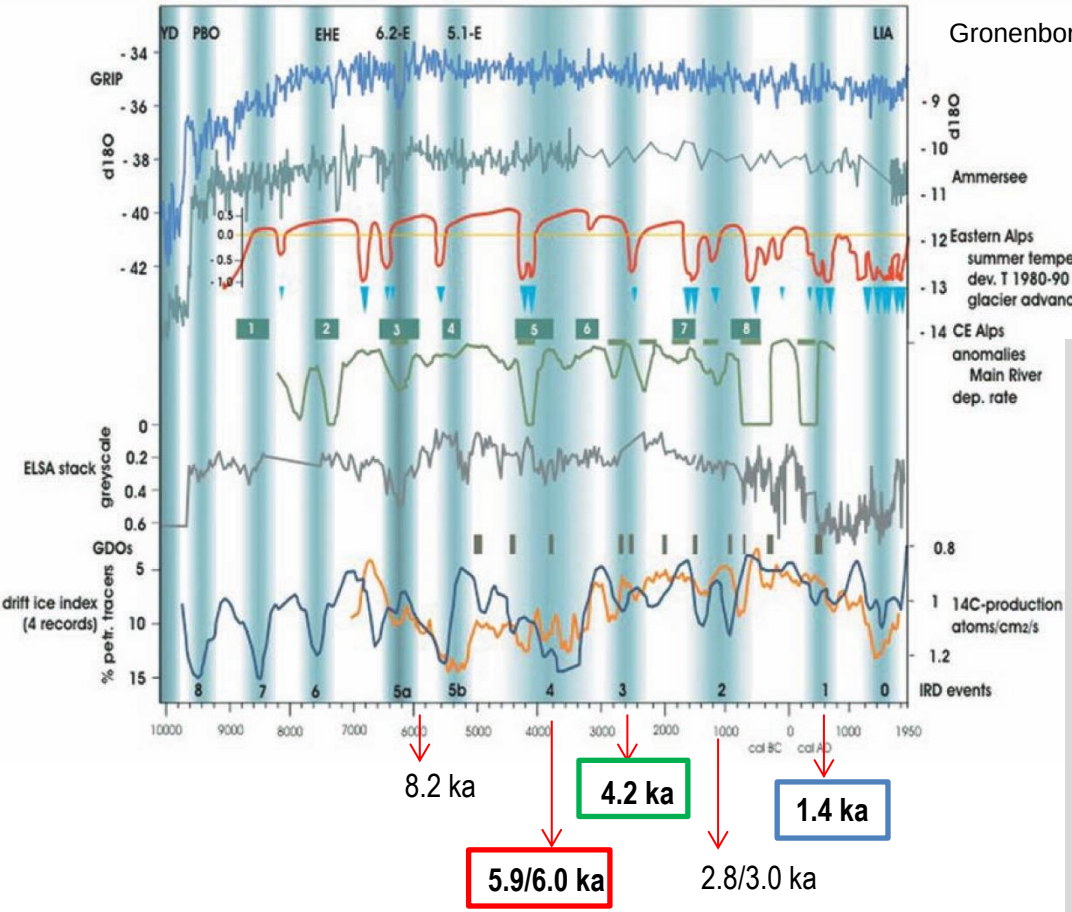
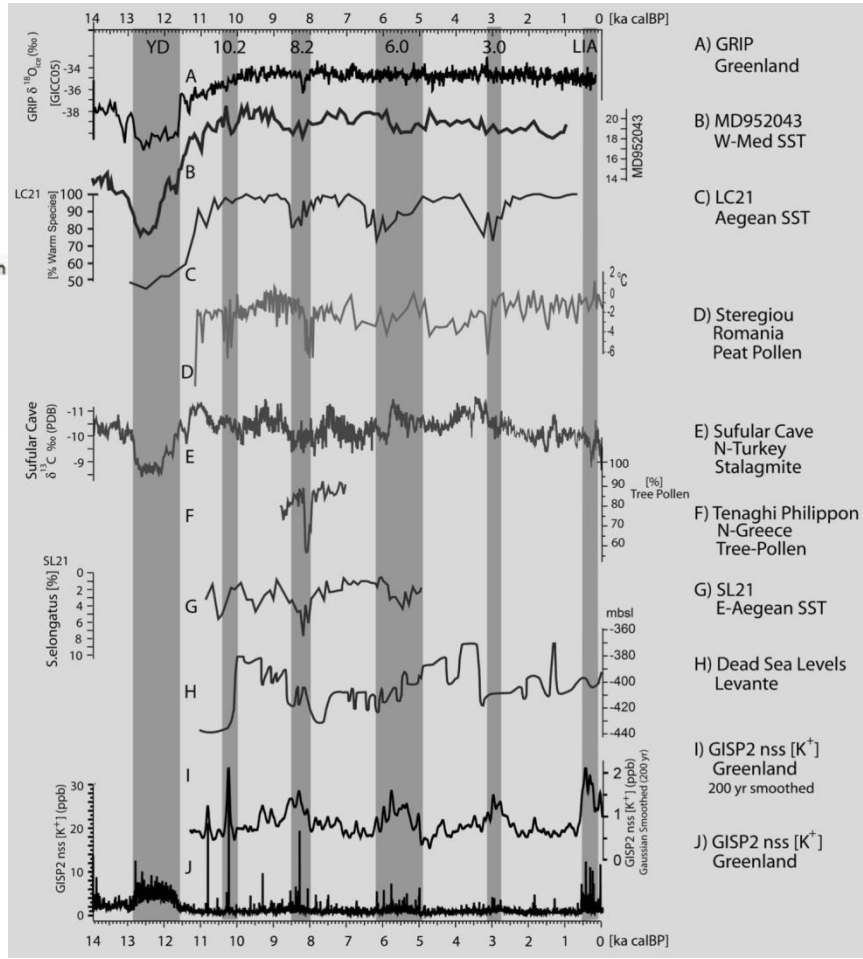
NAPOMENA: NIJE JAVNA ISPRAVA

field survey
Spring 2016

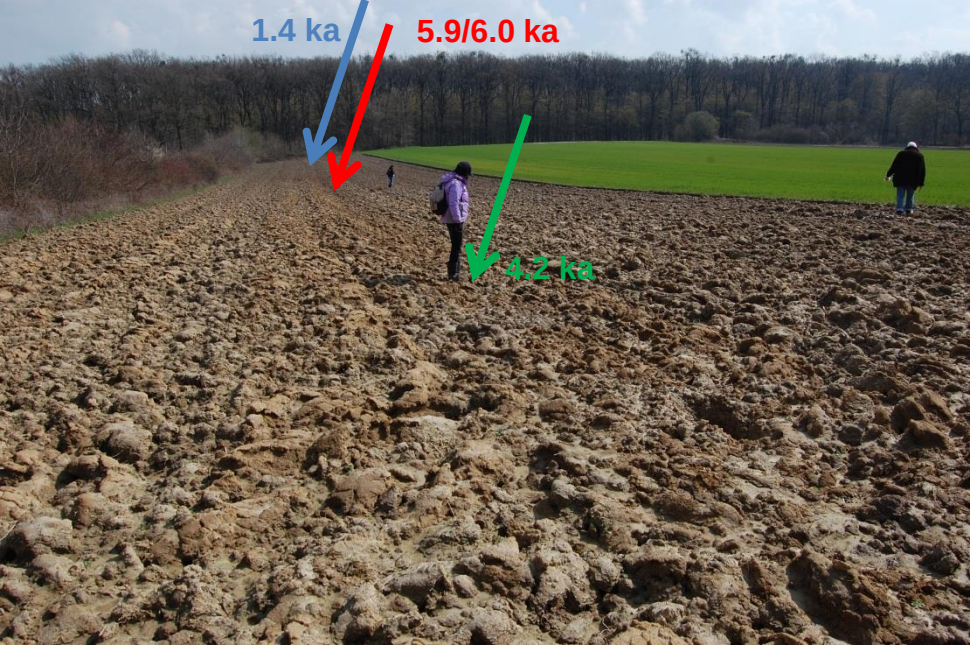
Marković, Botić 2017;
Botić 2017

Gronenborn 2009: 98, Fig. 1





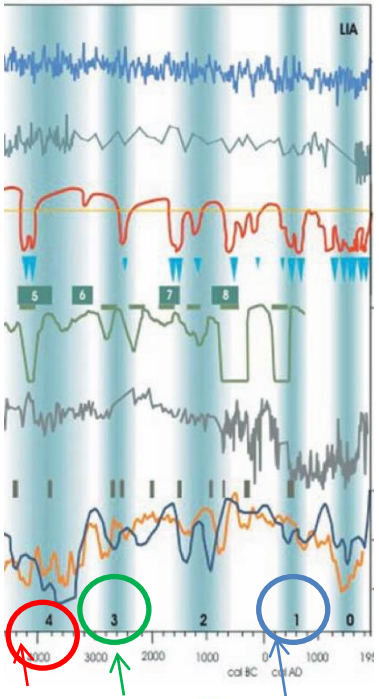
Weninger et al. 2014: 11, Fig. 5



late Iron Age (1st c. AD)

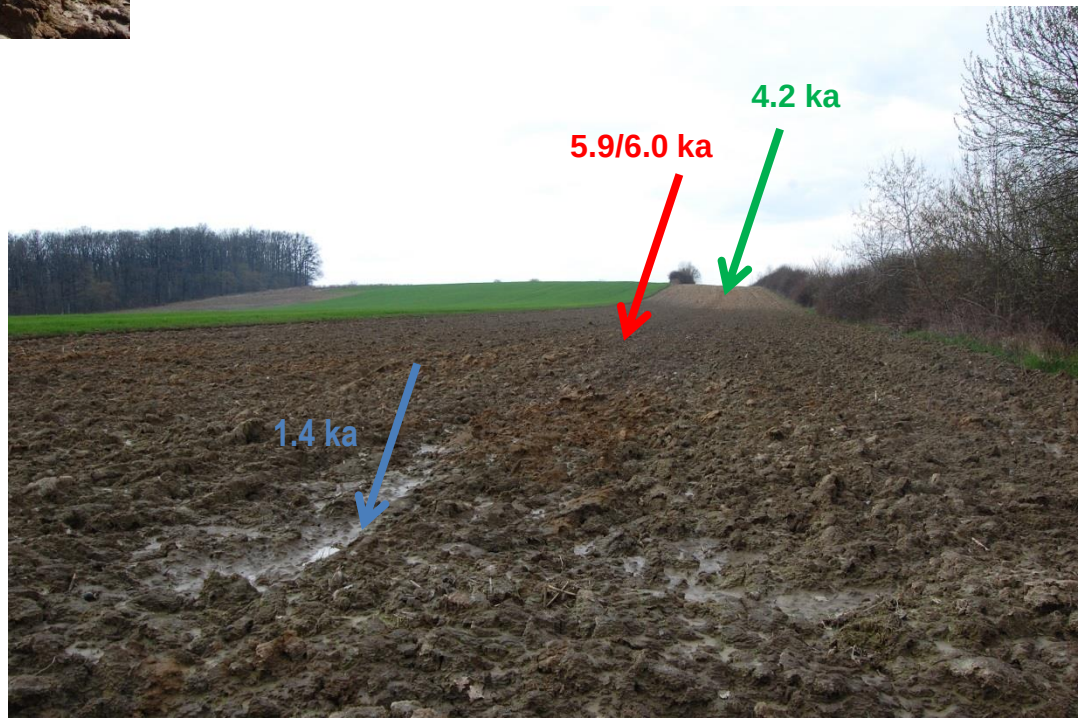
final Neolithic / early Eneolithic (4500-4000 BC)

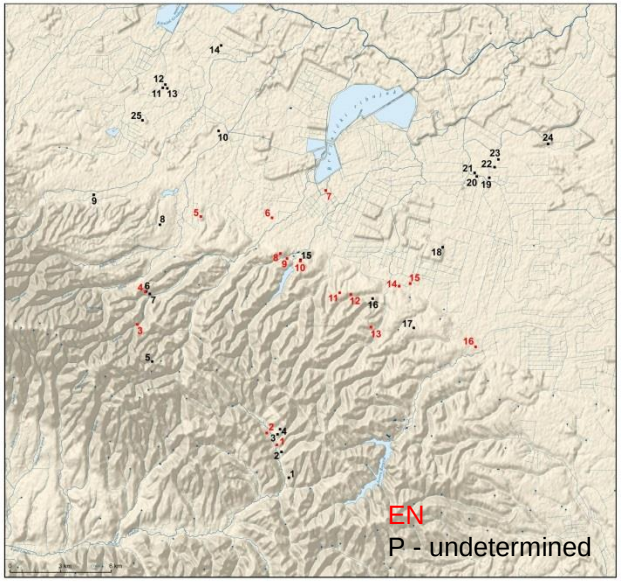
early Bronze Age (2400-2200 BC)



Roman optimum

(McCormick et al. 2012; Botić 2017)

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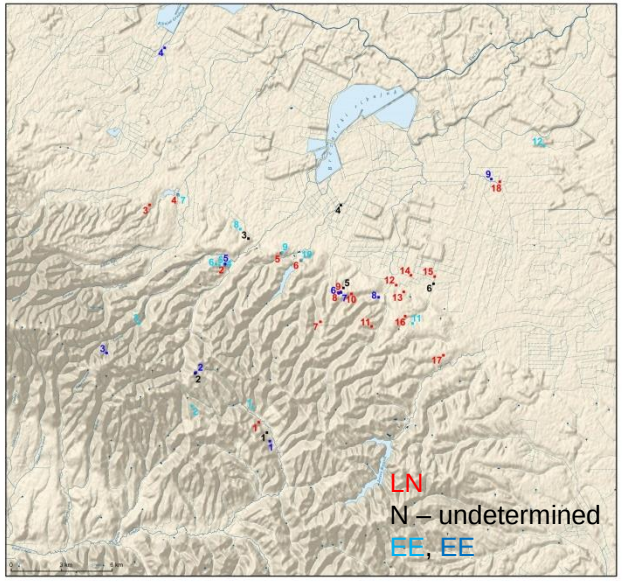
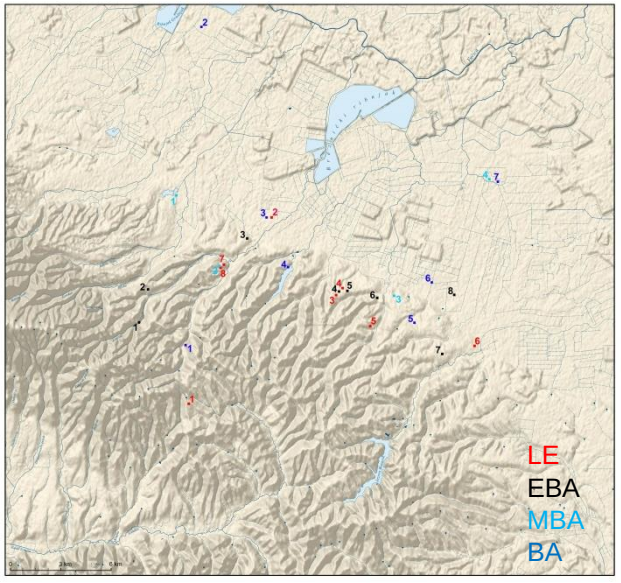
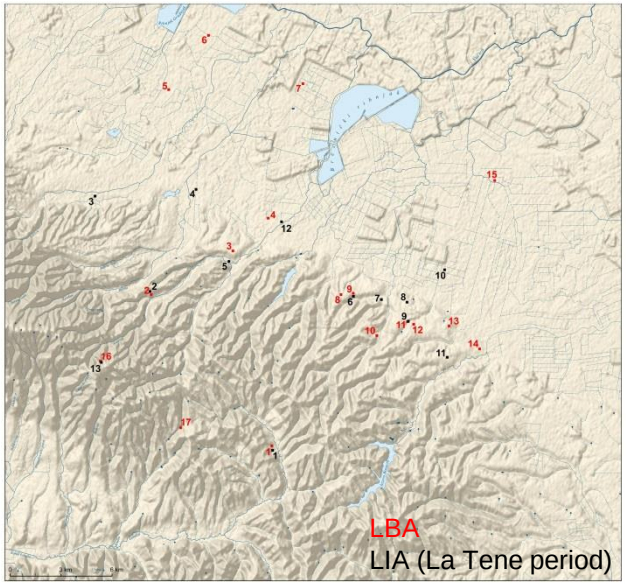
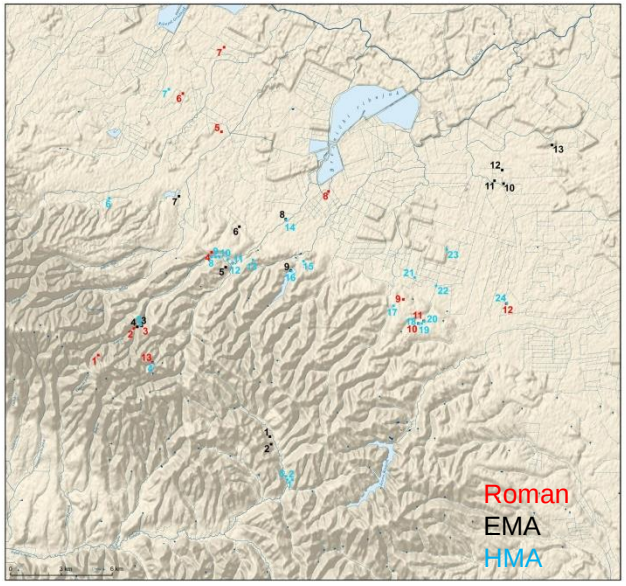
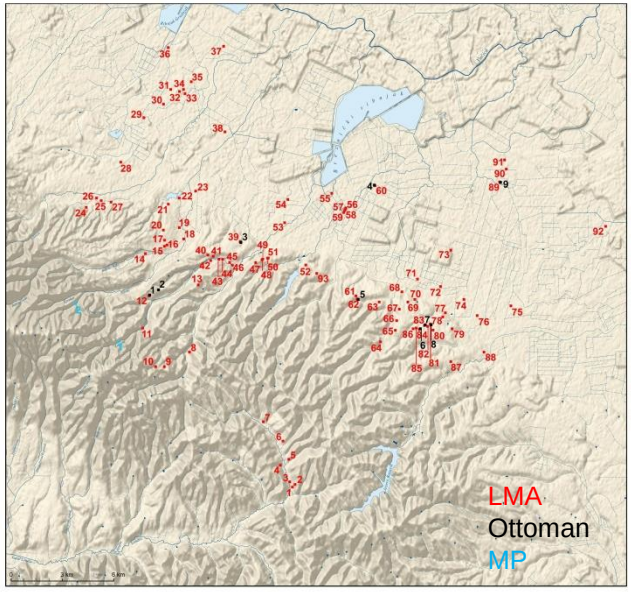
P - undetermined

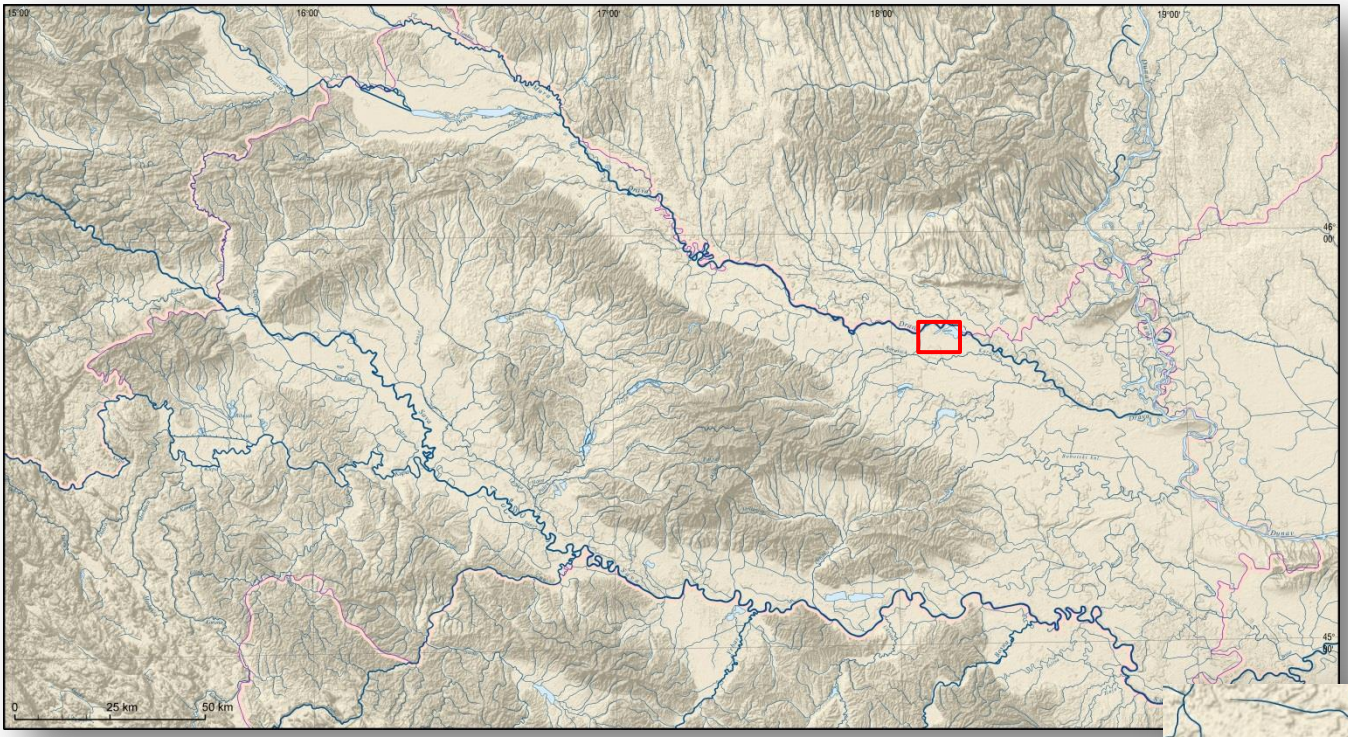

LN
N – undetermined
EE, EE

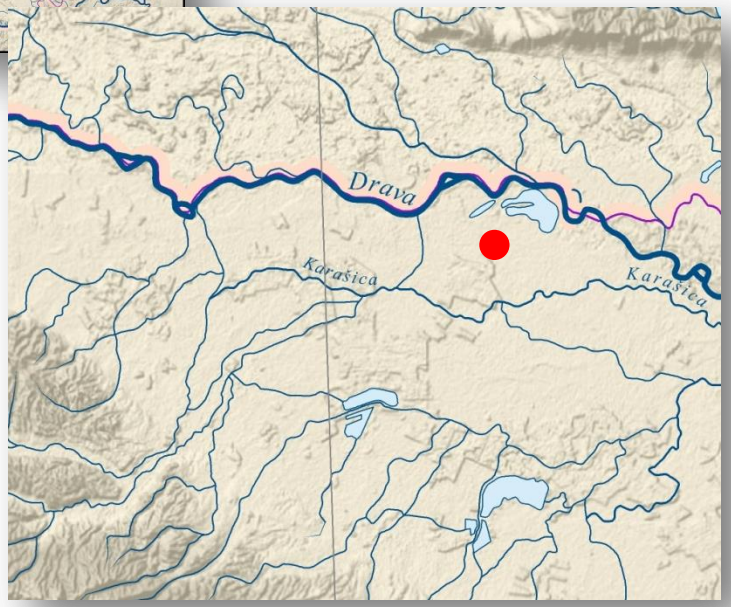

LE
EBA
MBA
BA


LBA
LIA (La Tene period)


Roman
EMA
HMA


LMA
Ottoman
MP





Donji Miholjac – AN 3 Mlaka/trafostanica site

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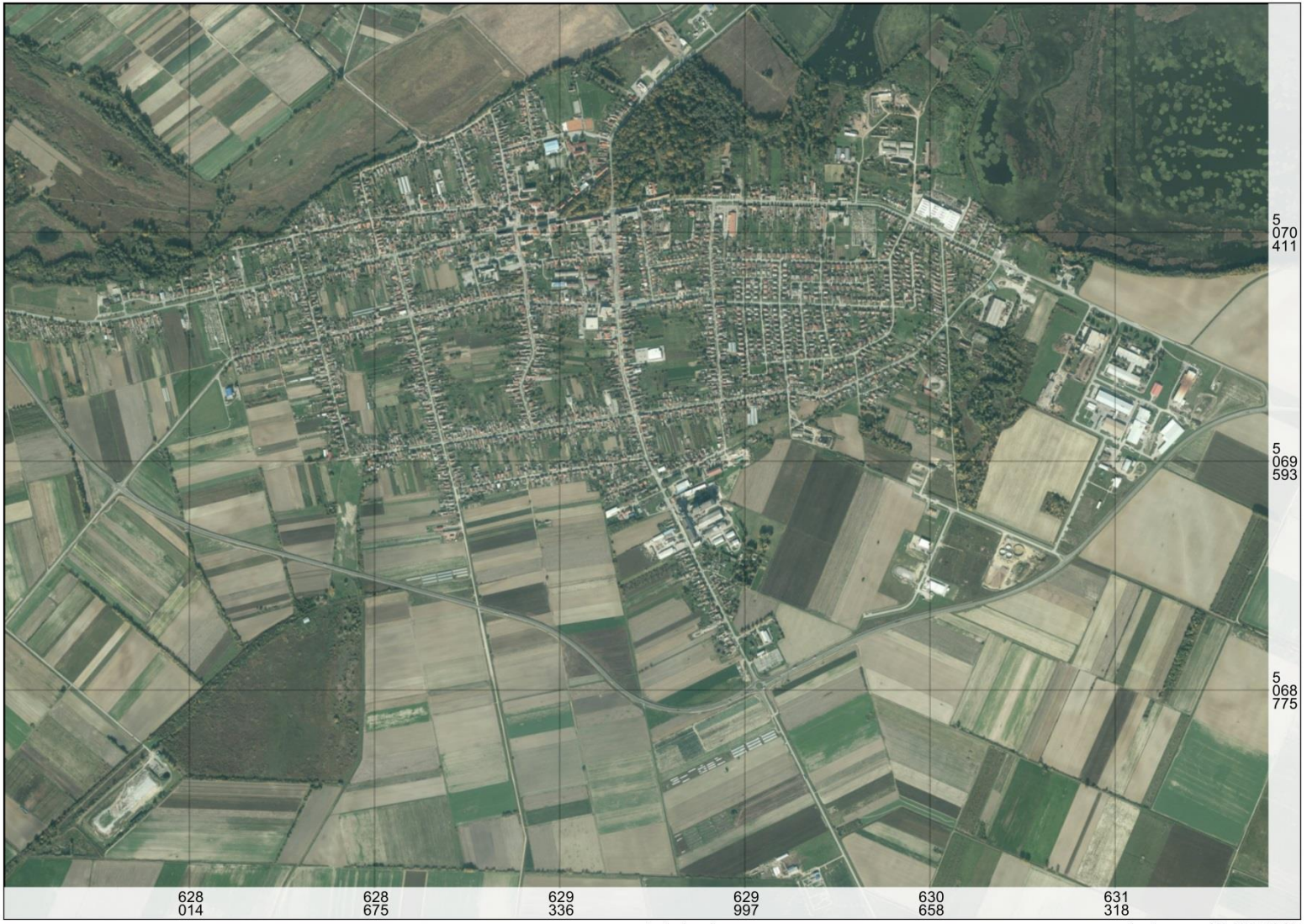

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Ispisano 19.09.2019.

NAPOMENA: NIJE JAVNA ISPRAVA

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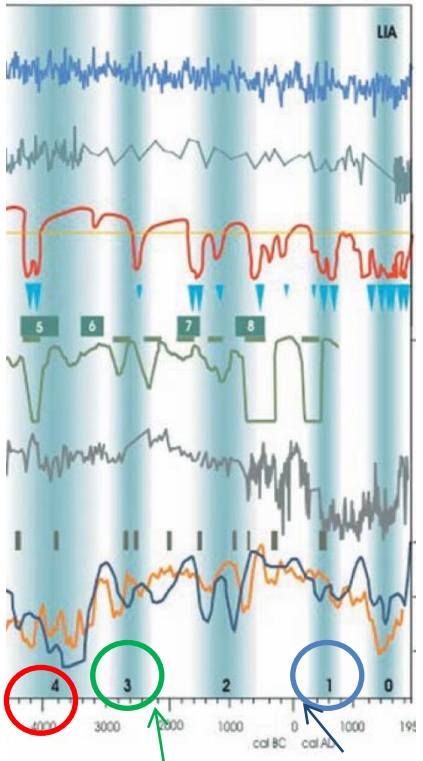
rescue excavation
Spring 2015

Botić 2016b

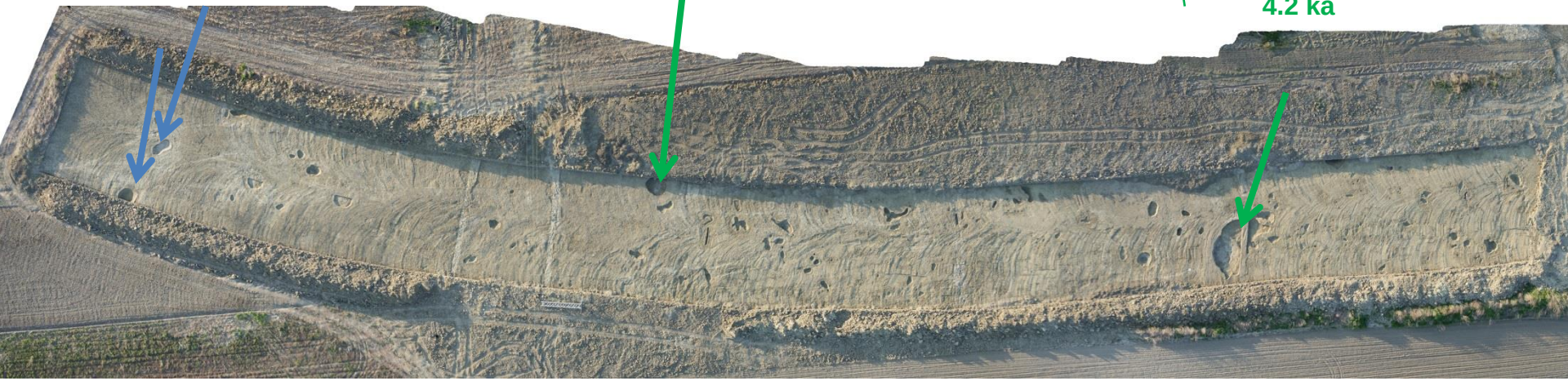


AMS 14C Lab Code	Conventional 14C age (yrs BP) (± 1σ)	Calibrated calendar age (cal BC) (1σ)
DeA- 83357	3938 ± 25	2480 - 2350

1.4 ka

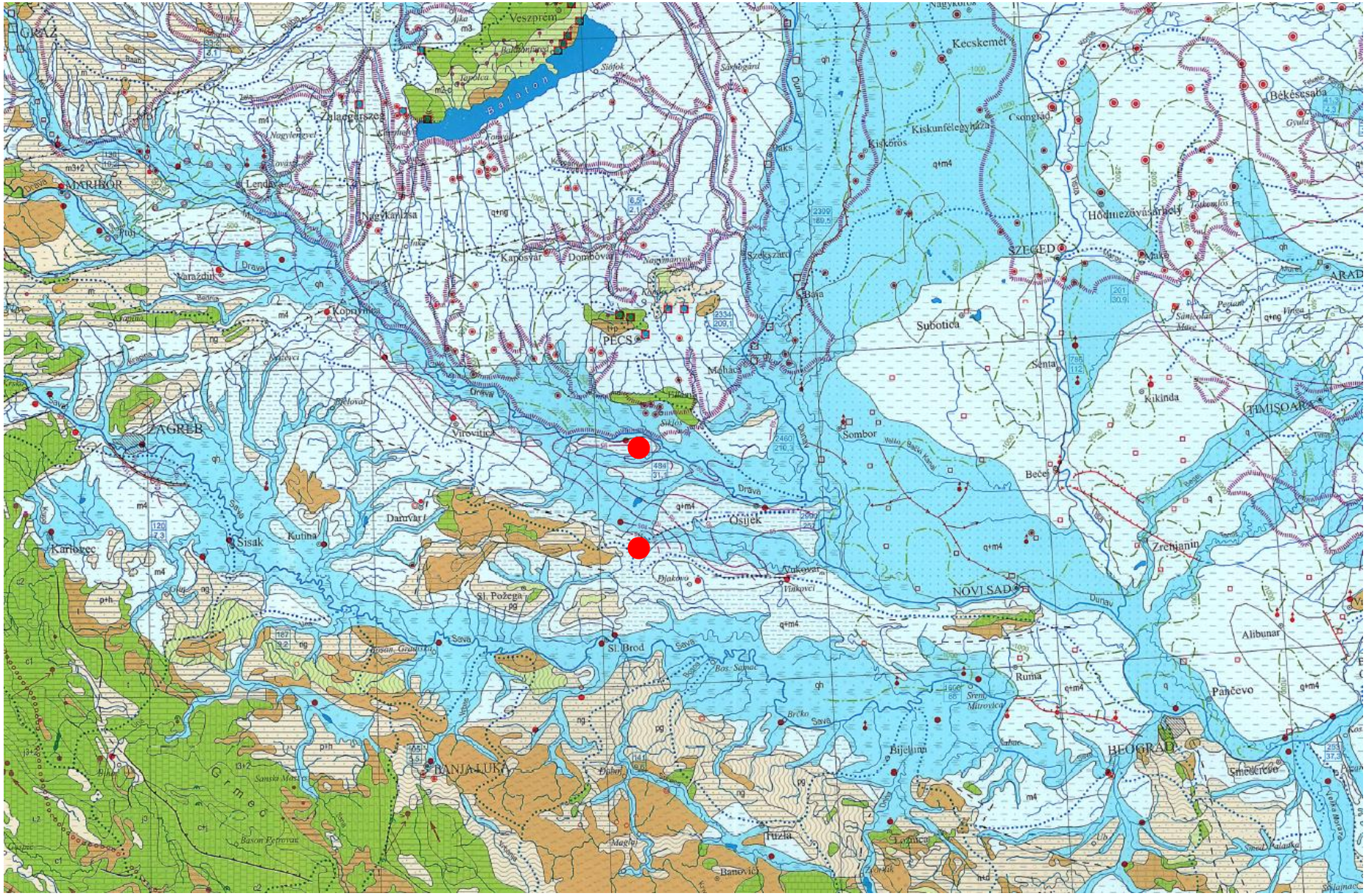
4.2 ka

4.2 ka



Europe in the XIX. century

Base maps



International Hydrogeological Map of Europe

International Association of Hydrogeologists Commission for the Geological Map of the World

Published by Bundesanstalt für Geowissenschaften und Rohstoffe and UNESCO

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- 3 positions on Stipanovci – Planina 1 site:

1. lowest position (currently very wet Spring conditions) - late Iron Age (1st c. AD), occupied during the so-called Roman optimum **predating 1.4 ka BP (Bond 1) event**
2. somewhat elevated position – late Neolithic / early Eneolithic (4500-4000 BC), slightly predating **5.9/6.0 ka (Bond 4) event**
3. elevated position – early Bronze Age (2400-2200 BC), occupied during the **4.2 ka (Bond 3) event**

- position of pits in a lowland area in the case of the Early Bronze Age finds from Donji Miholjac site suggests earlier temporal occupation of the site in comparison to the Stipanovci – Planina 1 site (confirmed by one radiocarbon date) and could be placed **at the very end of the 4.2 ka BP (Bond 3) event**; late Iron Age features can be dated to the same period as the finds from Stipanovci – Planina 1 site (**predating 1.4 ka BP (Bond 1) event**)

- on both sites in wider Drava region link between paleohydrological condition changes and site position changes can be presumed, spanning over various time segments

Project: TransFER (2017-2021)

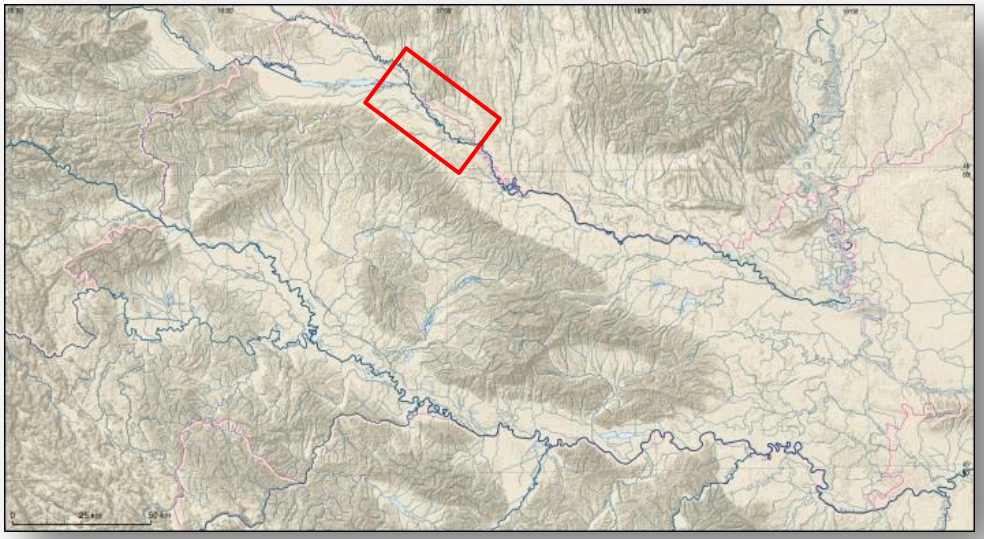
Proizvodnja željeza uz rijeku Dravu u antici i srednjem vijeku: stvaranje i transfer znanja, tehnologija i roba

Iron production along the Drava River in the Roman period and the Middle Ages: Creation and transfer of knowledge, technologies and goods

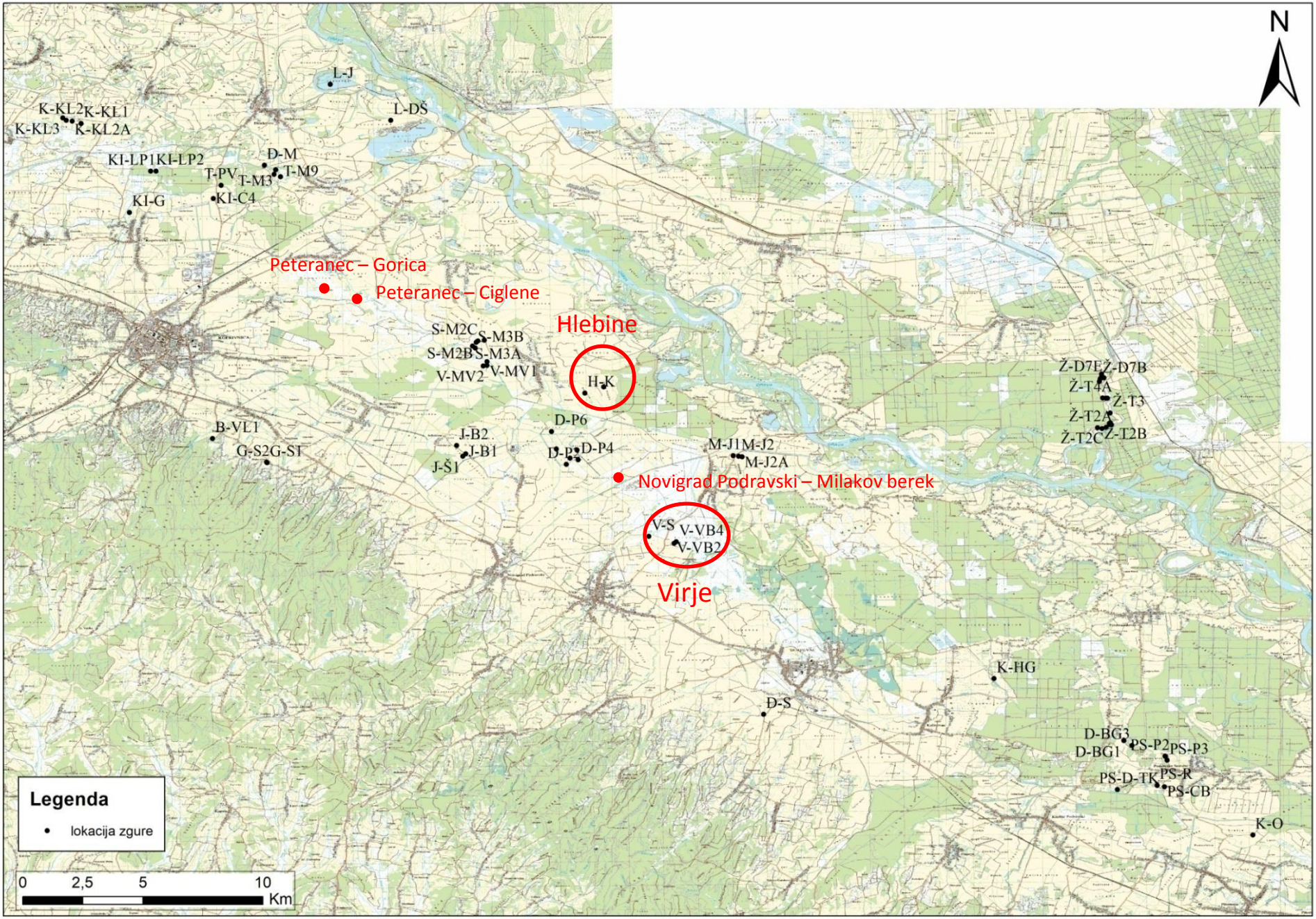
Leader: Phd Tajana Sekelj Ivančan, Institute of Archaeology, Zagreb, Croatia
Funded by: Croatian Scientific Fundation

In order to define the meaning of iron production in the context of ancient and medieval societies, the following tasks were set:

- To specify the source of the iron ore and the other necessary resources (clay, water, wood);
- To define the technology of processing the iron ore throughout the historical periods and the intensity of production;
- To define the impact of iron production in the context of socio-cultural relations and interaction of people and goods



http://transfer.iarh.hr/index.php/hr/



Topographic map of the Drava River basin with positions of archaeological sites with recorded smelting features (slag)
(made by: T. Brenko, Univ. of Zagreb, Faculty of Mining, Geology and Petoleum Engineering, Department for Minerology, Petrology and Mineral sources; Valent et al. 2017: 7)

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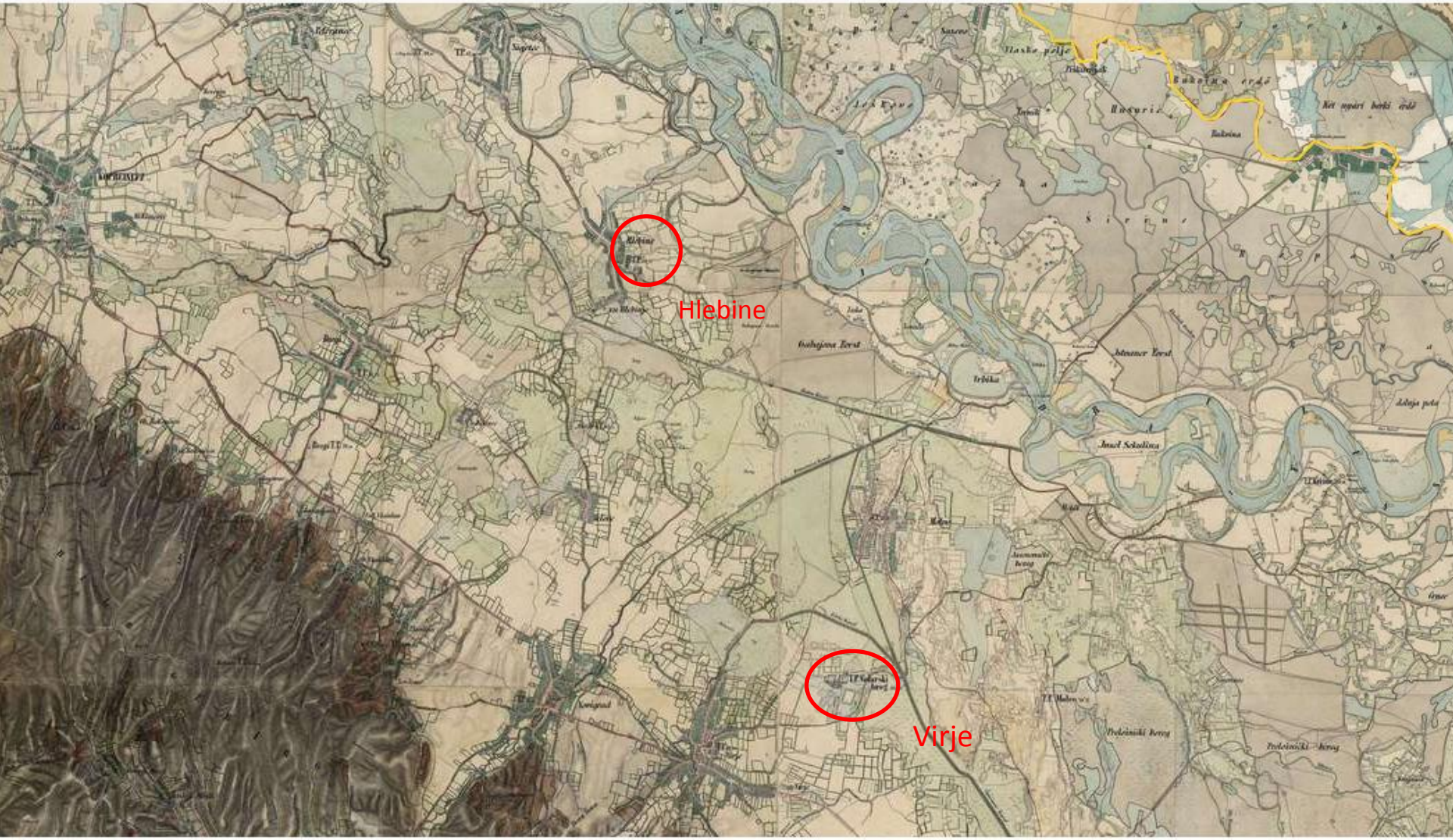
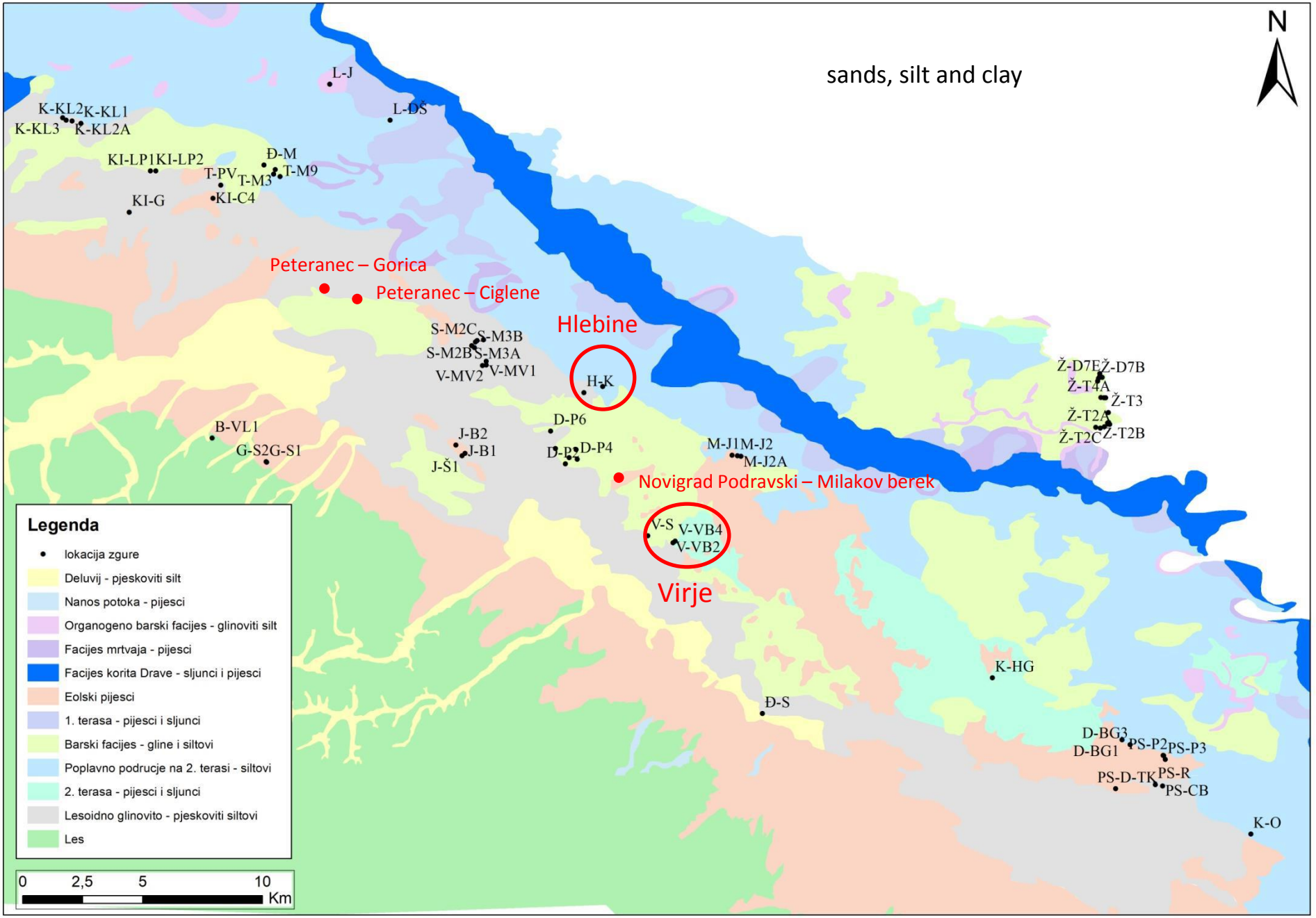
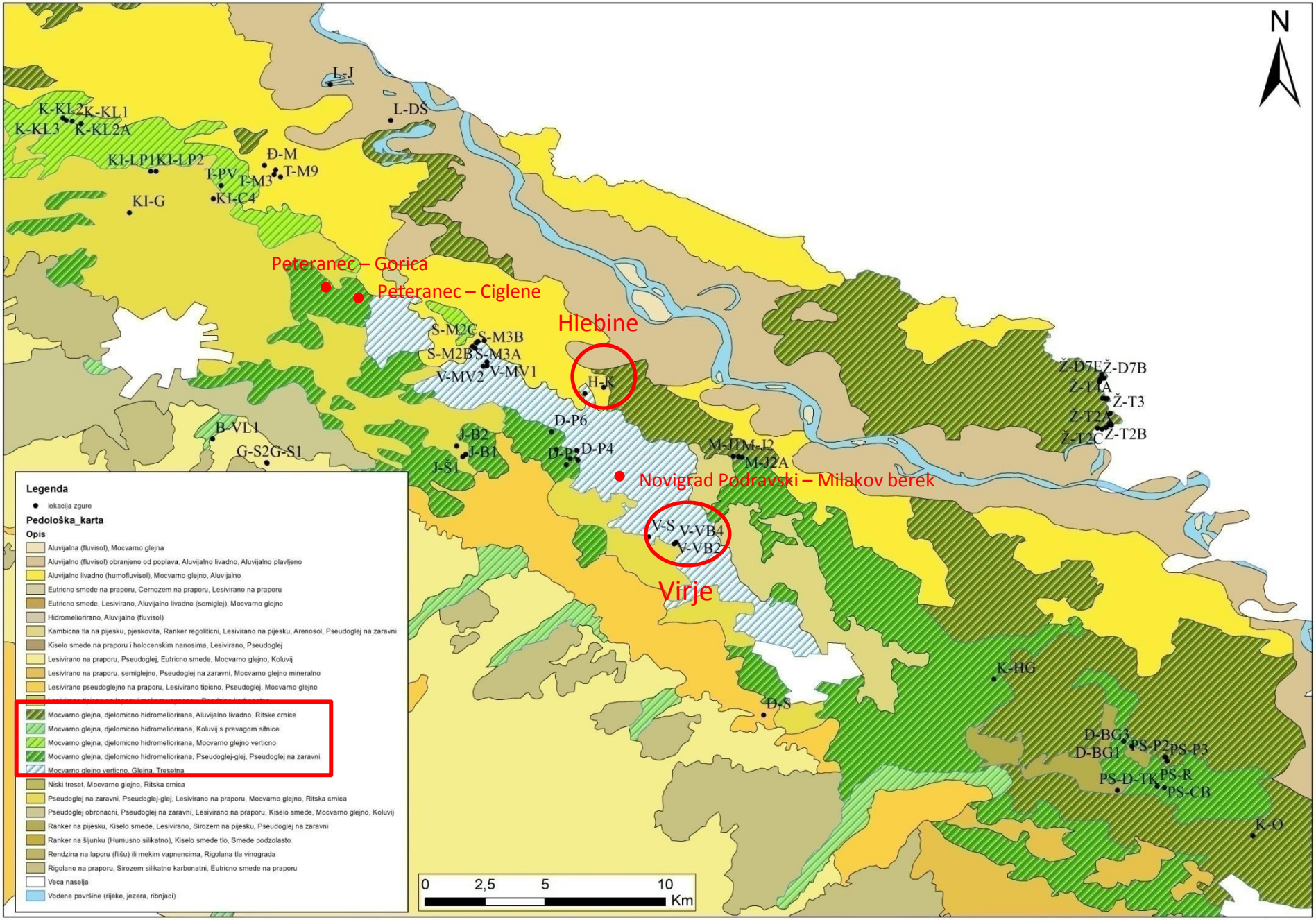


Europe in the XIX. century

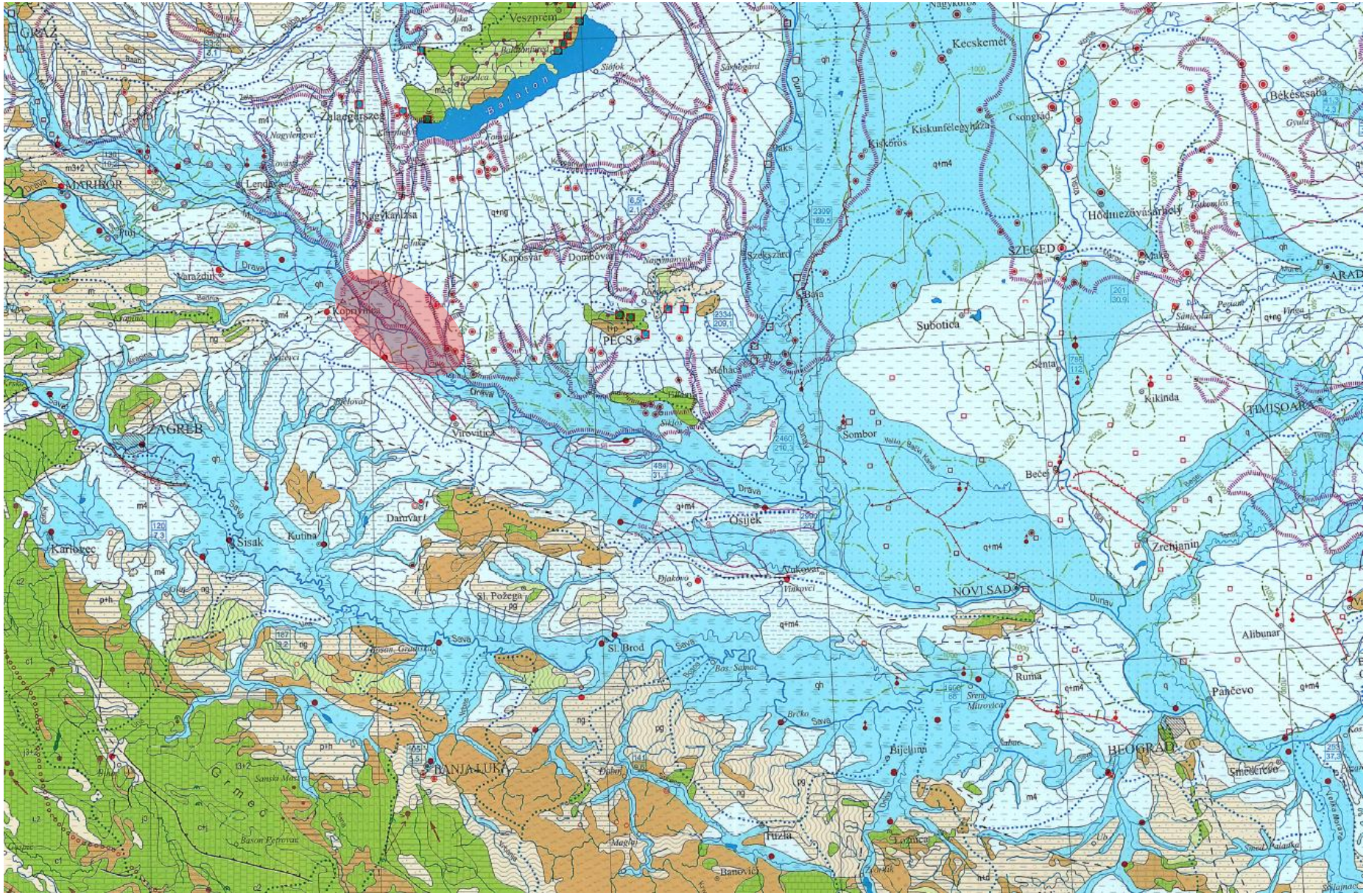
Base maps



Geologic map of the Drava River basin with positions of archaeological sites with recorded smelting features (slag)
(made by: T. Brenko; Valent et al. 2017: 8; map: Hećimović 1994)



Pedological map of the Drava River basin with positions ofarchaeological sites with recorded smelting features (slag)
(made by: T. Brenko; Valent et al. 2017: 9; map: Republic of Croatia, Soil suitability map for cultivation, 1:300000, 1996)



International Hydrogeological Map of Europe

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Virje – Volarski breg 2007 (photo: T. Sekelj Ivančan)

Bacteria *Leptothrix* (better iron deposition)
goethit
oolithic iron ore layer (Valent et al. 2017: 11) is naturally renewed by regular flooding

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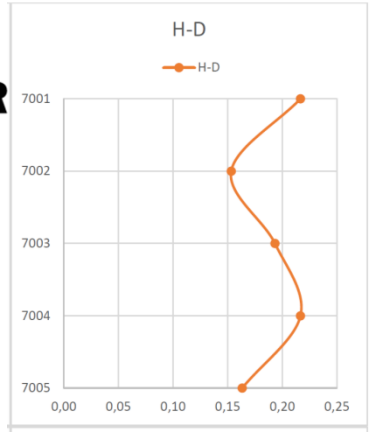
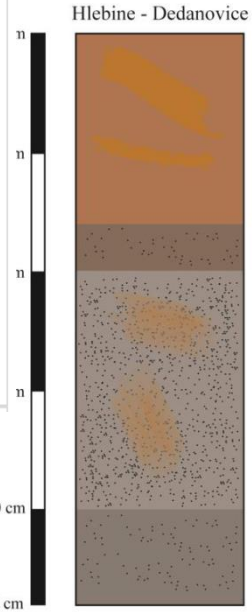
Brenko 2018

Faculty of Mining, Geology and Petroleum Engeneering, University of Zagreb

goethit



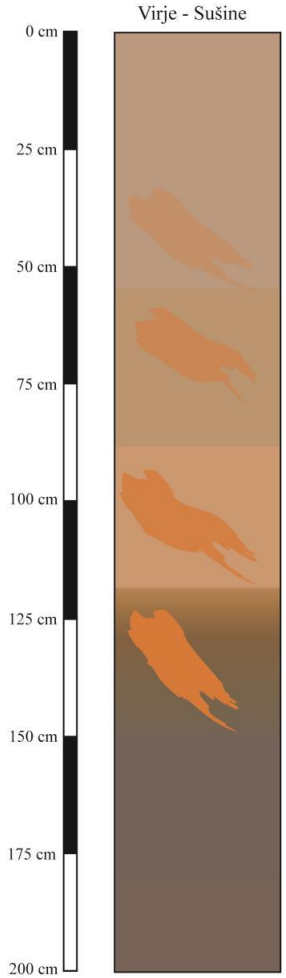


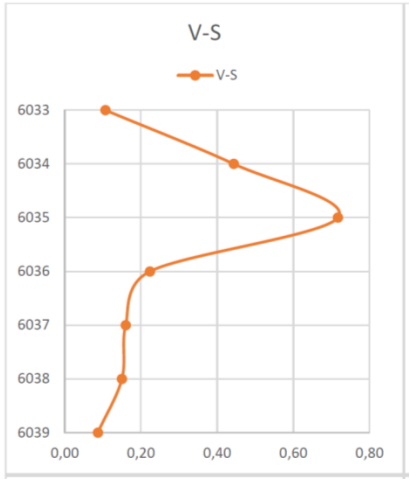
silt with clear traces

silt with occasional traces

sand with traces of low intensity

silt, sandy silt





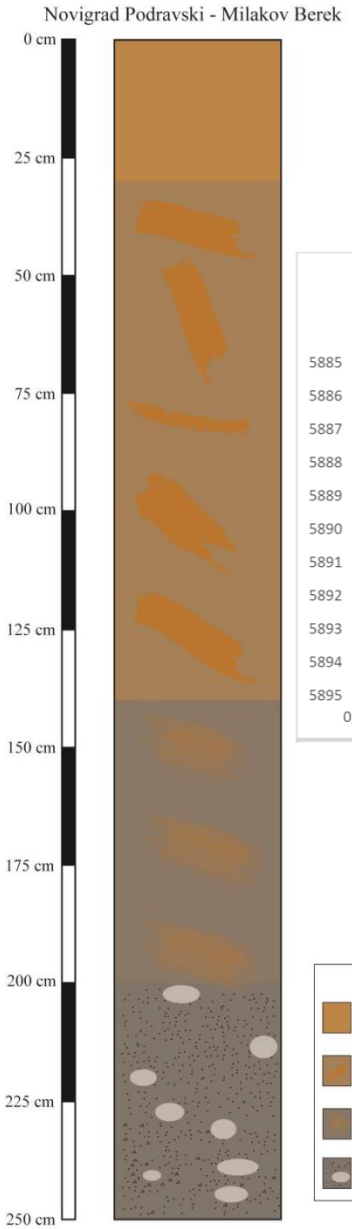
clayey silt

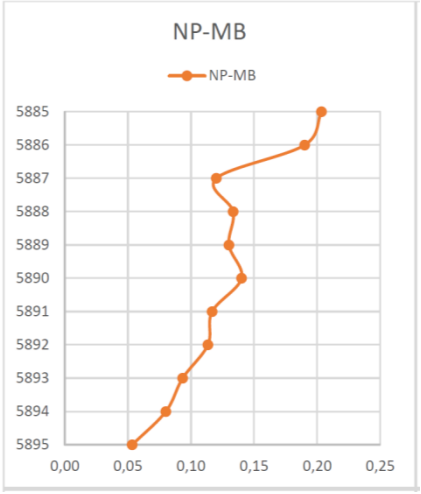
silt with occasional traces

silt with orange traces of middle intensity

silt to clay transition with clear traces

clay





silt

silt with orange traces

silt with traces of low intensity

sand with the occasional gravel

Virje –Volarski breg 2007, surface finds (photo: T. Sekelj Ivančan)

Sekelj Ivančan 2017; Tkalčec, Sekelj Ivančan 2017; Sekelj Ivančan, Hrovatin 2017; Valent 2018

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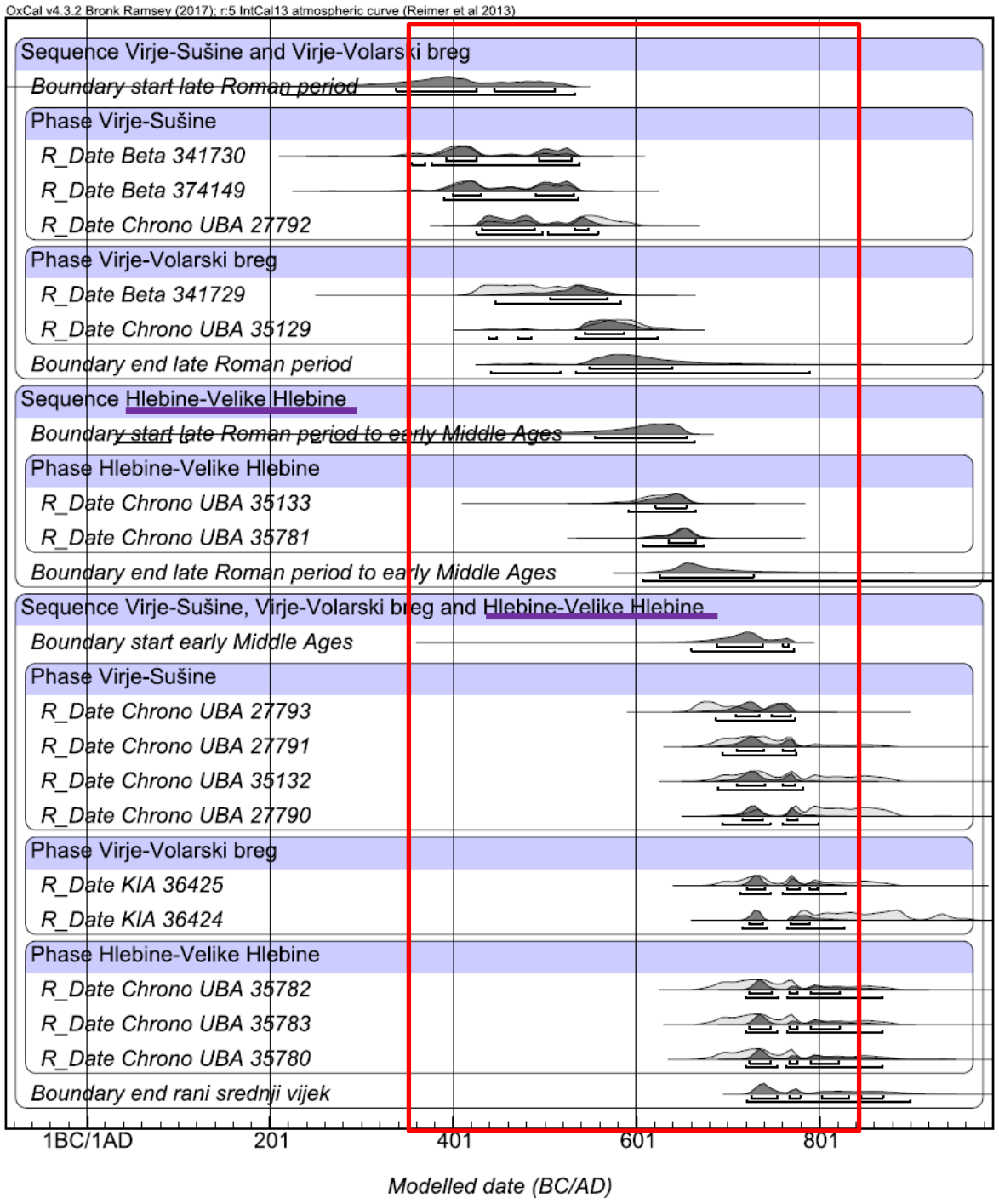
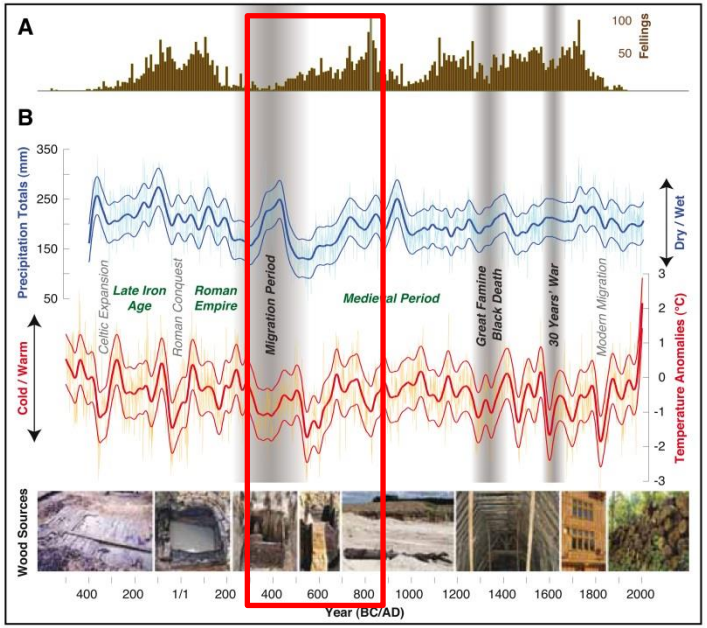


1.4 ka



A. Deforestation during the last 2500 years; B. Reconstruction of rainfall (April-June) and temperature (June-August) in the last 2500 years. Gray vertical bands mark key events in European history (Buntgen et al. 2011: 580, Fig. 2; 581, Fig. 4; Lubick 2011: Fig. 1)

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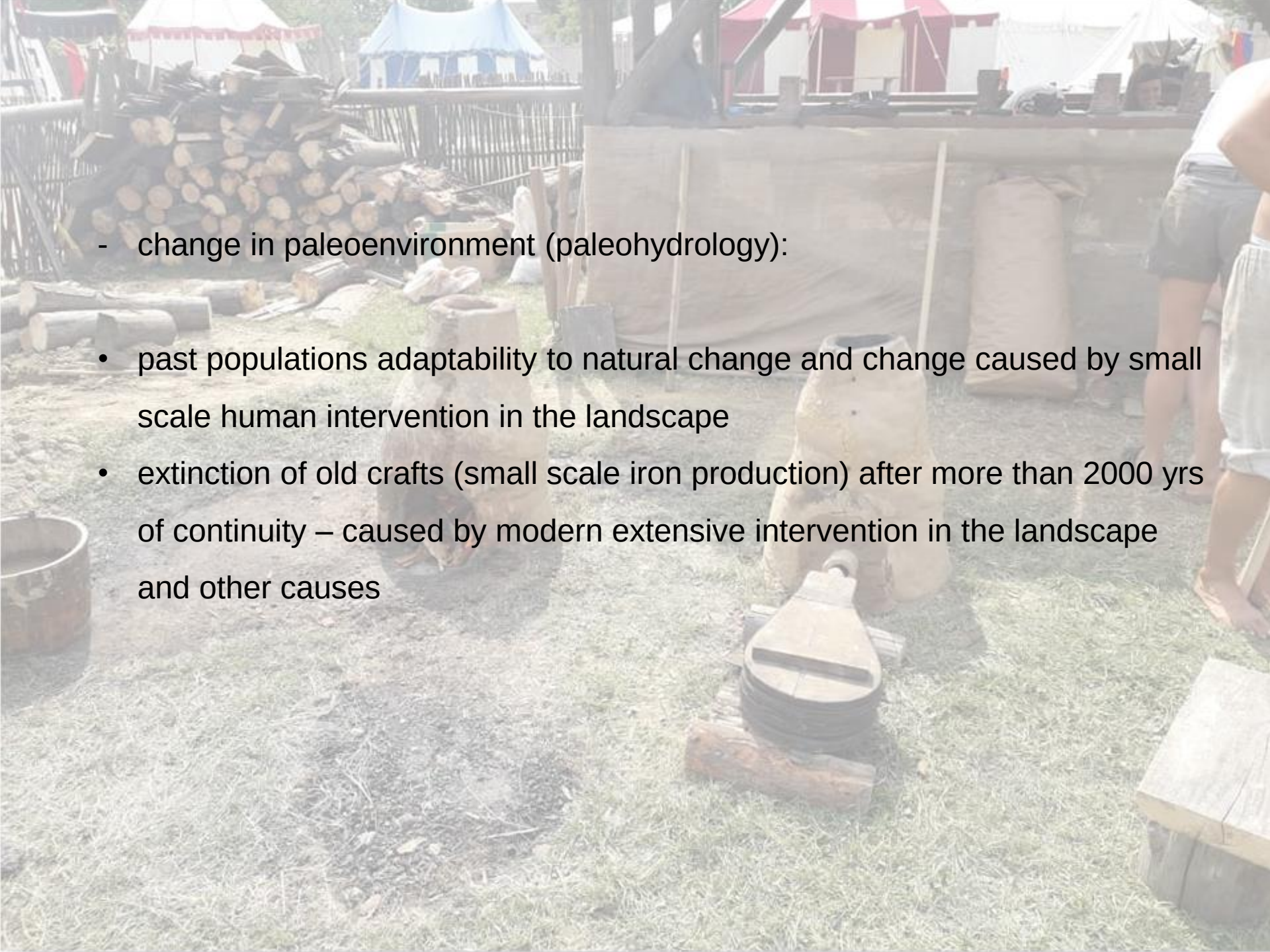
Renaissance Festival, Koprivnica 2019

experimental smelting of bog iron ore

photo: K. Botić

photo: Town Museum Koprivnica
source: https://www.facebook.com/964813090202797/photos/a.1305692906114812/2954960474521372/?type=3&theater



- change in paleoenvironment (paleohydrology):

- past populations adaptability to natural change and change caused by small scale human intervention in the landscape
- extinction of old crafts (small scale iron production) after more than 2000 yrs of continuity – caused by modern extensive intervention in the landscape and other causes