Introduction
The Virje-Volarski breg site is located in the Podravina region of the Drava River valley (NW Croatia). Extensive field surveys were conducted and a total of 70 positions with smelting slags and 88 position with smiting slags were discovered, indicating different, interrelated metallurgical activities have been present in this region. Several sites with surface finds of smelting debris have been excavated, and these have shown that iron ore processing has been present in this region in 5th century (Virje-Sušine), 7th century (Hlebine-Velike Hlebine) and 8-9th century (Virje-Volarski breg and Sušine). At the Virje-Volarski breg remains of four bloomy furnaces had an in situ residue of iron slag formed during the smelting process. According to the archaeological records, these furnaces were interpreted as free – standing shaft furnaces with tapped slag.

Objectives
- Correlation between the iron ore and slags
- Source of the used ore – exploitation area – work shop location
- Variations in the slag composition - consistency or change? - smelting recipe

Results
Resources at hand - local bog iron ore
- Local bog iron ore mainly composed of Fe oxhydroxide goethite and quartz, was found on all excavated sites
- The results of the comparison (REE correlation) indicate certain differences in elements that can be interpreted as influence of different micro environments in which the ore was formed – similar area of exploitation, different micro-location
- These differences are seen between contemporary sites – exploitation areas as prerequisite for workshop location selection, organised territory of exploitation?

Ore to slag
- REE comparison of ore and slags – same general trend – samples of exploited ore
- Main oxide ratio – low FeO, and high MnO percentages – discarded ore?
- Archaeological features – roasting hearth? - preparation of the ore

The last smelt with the single recipe?
- Similar main oxides - contribution of fuel ash, furnace lining, ore, furnace temperature, fuel to ore ratio and air blowing rhythm to the slags was relatively consistent in all furnaces - single smelting recipe in all furnaces at the same location
- Different levels of oxides in different types of slag – correlation to the stages of slag forming within the furnace (oxidising event (tap slag), unreduced ore? (furnace slag)) and post reduction

Methods
- Mineralogical composition of ores and slags – XRD
- Geochemical analyses – major oxides and rare earth elements (REE) of ores and slags - ICP-MS
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