

Geomagnetic prospection and archaeomagnetic dating of Roman and Medieval iron smelting sites in Hüttenberg (Austria)

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Introduction

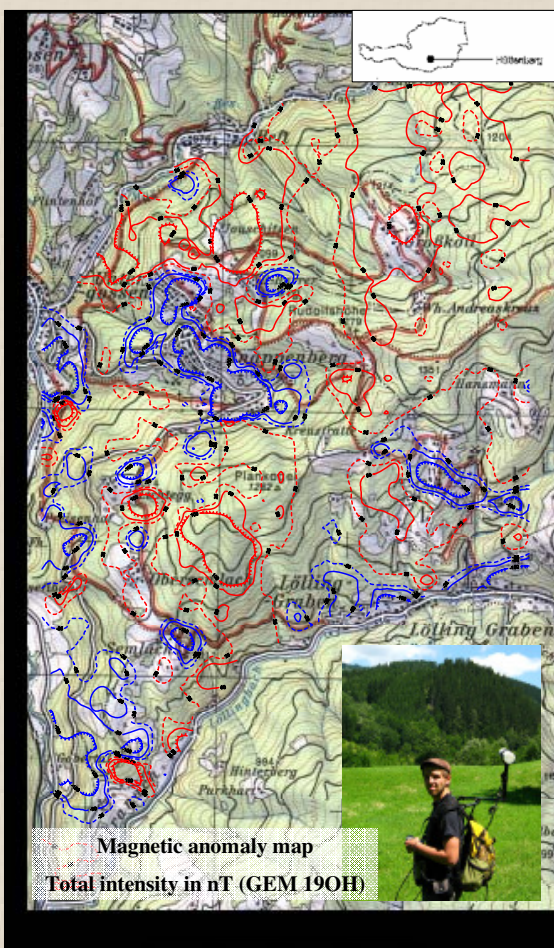
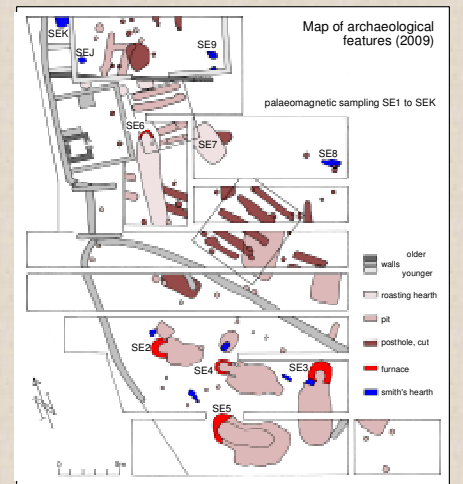
Ongoing investigations in the frame of FWF funded research projects comprise geomagnetic prospection of smelting sites at Hüttenberg, archaeological research and archaeomagnetic dating of excavated furnaces. Results from the geophysical surveys carried out in different phases and scales (searching/localisation to structuring/details) in the current FWF-project P20688 "2000 years of iron production in Hüttenberg - archaeometry" are presented together with results originating from a recently concluded preceding project P16071 „Ferrum Noricum in Hüttenberg – archaeoprospection“ (2003-2006/Ao.Univ.Prof.Dr. Georg Walach).

Geophysical ground mapping

High resolution magnetic measurements were applied in order to delineate the borders of the area of interest for archaeological investigations and successive detailed prospection on the survey areas. Accompanying geological and petrophysical investigations support the geophysical modelling and interpretation. Systematic archaeological and geophysical field surveys of find sites which are known from bibliographical data, but not yet scientifically investigated are performed.

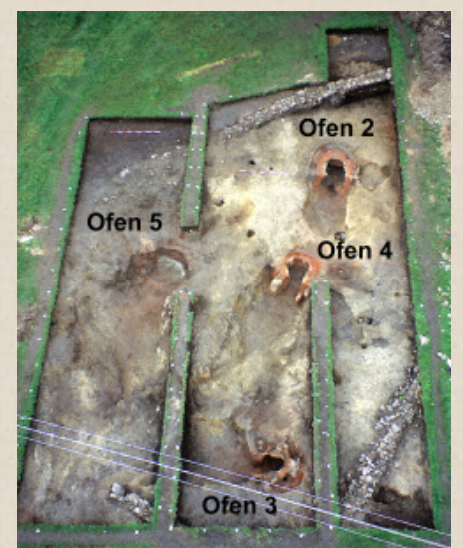
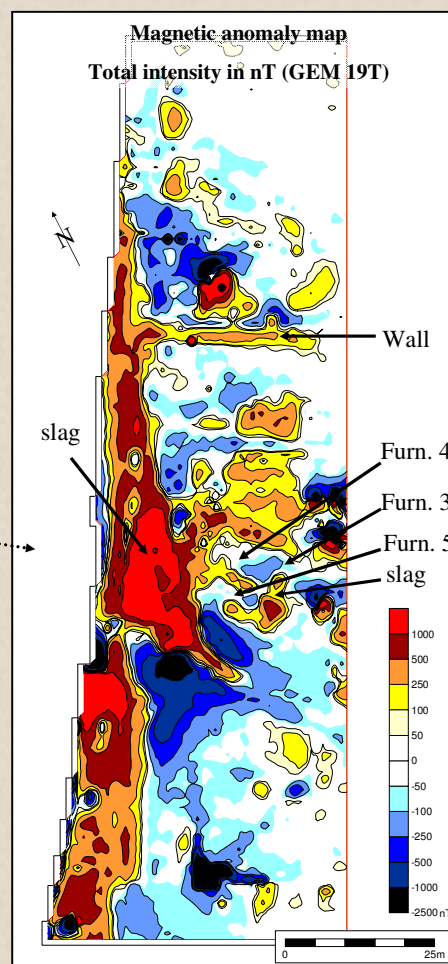
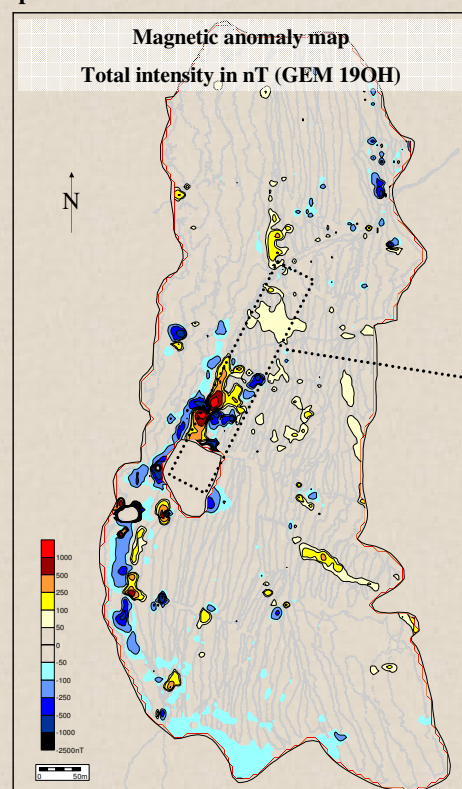
Archaeological setting

The mining district 'Ferrum Noricum' in Hüttenberg, Austria can be proven to look back on a 2500 year old tradition of iron production which only ended in the second half of the 20th century. Since 2003 an integrated investigation, including geophysical prospection and systematic excavations, discovered six iron smelting furnaces of Roman age (Cech, 2008), nine smith's hearths, a roasting hearth, walls and three buildings.



Searching phase

A geomagnetic survey covering an area of about 20 hectare yielded insights about the extension of the Roman industrial area (furnaces) and the dissemination of slag deposits at the site Semlach/Eisner.

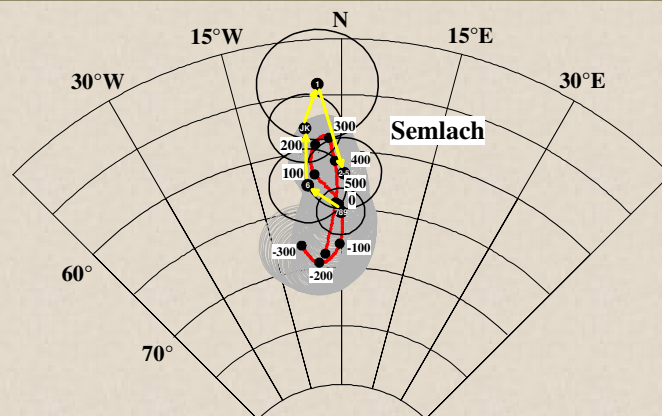


Structuring/details

Several geomagnetic structures including known and previously excavated slag deposits and furnaces, as well as walls of a large building were detected at the scale of a 0,5 x 0,5m grid survey performed in April 2008. The magnetic anomaly map shows the effects of 3 lightning strikes in the investigation area.

Paleomagnetic sampling and results

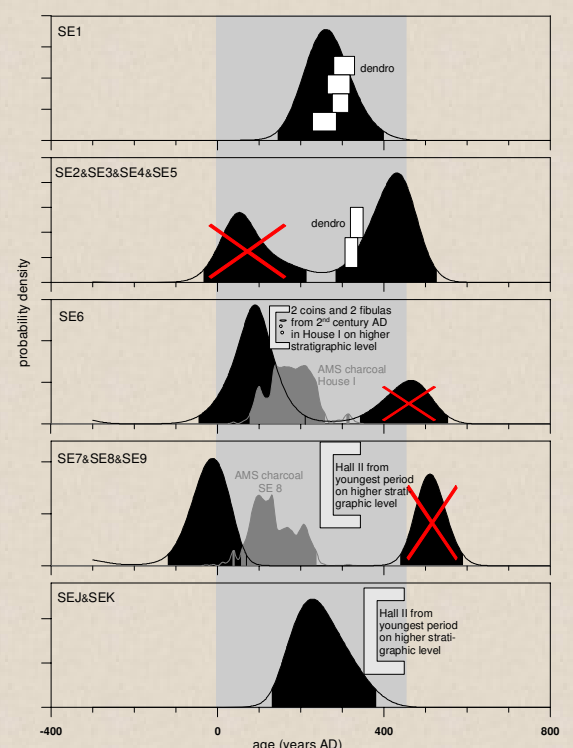
In the frame of FWF project P19730-N19, oriented paleomagnetic samples were taken from six furnaces, four smith's hearths and the roasting hearth. Most specimens carried very stable remanence directions and only a few yielded secondary magnetisation components. For three of the furnaces the directions show a considerable dispersion which was not reduced after demagnetisation but, by correction with the tensor of thermal remanence anisotropy. The mean directions of the eleven structures show several directional groups and reflect occupation of the place lasting for several centuries.



Archaeomagnetic dating

Archaeomagnetic dating is based on the well established paleomagnetic field and laboratory methods, which allow determining the direction of the ancient Earth's magnetic field.

By combining directions of neighbored structures five distinct temporal units can be seen which show the same directional movement as recorded in the archaeomagnetic reference curve for Austria (Schnepf and Lanos, 2006). Using this curve, archaeomagnetic dating confirms that smelting and iron working activity lasted for several hundred years from beginning to the end of the Roman empire at this place. Together with archaeological, dendrochronological and AMS dating, the new archaeomagnetic directions will also serve as input data for an updated Austrian reference curve.



Probability densities obtained from the archaeomagnetic dating are derived from the Austrian archaeomagnetic reference curve. The Grey bar shows the archaeological age estimate, white bars are results obtained from dendrochronology of six pieces of charcoal, white dots are age determinations of archaeological finds.



References

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