Geophysical prospection of the ancient gold mining region “Karth” in Lower Austria

Scholger, Robert[1]; Cech, Brigitte[2]

1 Chair of Applied Geophysics, Montanuniversität Leoben, Peter-Tunner-Straße 25, A-8700 Leoben, Austria; 2 selbstständige Archäologin, Wien.

The “Karth” is a wooded plateau southeast of the town of Neunkirchen in southern Lower Austria. The traces of Roman gold mining, which are still clearly visible in the terrain today, are large reservoirs and water pipe canals, over which water was led over a distance of up to 25 km into the mining area. The aim of the FWF project (P 30790-G25, 2018-2022) is the interdisciplinary investigation of this only Roman gold mining area known in the Eastern Alps. The combined interpretation of geophysical and archaeological information enables detailed exploration, far beyond the area of the excavation areas. Analyses of magnetic anomalies and electrical resistivity tomography prove to be particularly suitable. Geophysical prospection was not only used to plan the archaeological investigations, but also to understand the sites where it is not possible to dig. The geological unit mined by the Romans is the Loipersbach Formation (Loipersbacher Rotlehmserie). It is a secondary deposit in which gold in the form of small flitters occurs irregularly distributed. The Loipersbach Formation consists of reddish-brown to greenish clay and quartzitic gravel. The deposit is located on a basal complex of mica slate, Semmering quartzite and carbonate rock. The structure of selected reservoirs was investigated geophysically. High-resolution electrical tomography profiles were measured with a multi-electrode system for 100 steel electrodes (Earth resistivity meter 4point light 10W from LGM – Erich Lippmann – Geophysical Instruments, Germany). The comparison of repeat measurements and the generally small measurement errors shows that the data quality is excellent despite high contact resistances in the dry forest soil (2 to 5 kOhm). The inversion of the measured data was carried out with the software RES2DINVx64 (GEOTOMO SOFTWARE SDN BHD, Malaysia). The inversion models show strong structuring in all profiles with model resistivities from 50 to 1,200 Ohm.m. The heterogeneous structure of the ramparts is clearly expressed and the separation of the basin floors to the geological subsoil is clearly visible. A formation with resistance values of up to 400 Ohm.m corresponds to the geological subsoil (Loipersbacher Rotlehmserie). Magnetic measurements aimed at detection of building relicts and were carried out manually (due to the rough topography and dense forest) with GEM Systems proton magnetometers with 2 sensors at heights of 0.5 m and 2.0 m above the ground. The data quality is consistently excellent. The standard reductions (diurnal variation and IGRF were calculated in Excel and the anomaly grids were created in SURFER. Most of the values of the reduced magnetic anomaly in the prospecting areas are almost normally distributed with a mean value of +9 nT, which can be considered as a local field fraction. Specific outliers were due to interfering bodies near surface (not detected in the field), which could be proven by a significant correlation between magnetic anomaly and vertical gradient. The distribution of anomaly values shows an obvious correlation with the topography in the measuring field. Several interesting magnetic structures could be detected in different parts of the study area. However, none of the structures is regarded as evidence for an archeological site.