



## **Analysis of shallow continuous electromagnetic measurements on archaeological sites in southern Austria and comparison with other geophysical methods**

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Aim of this investigation was outlining the potential of continuous electromagnetic measurements by the comparison of the electromagnetic results with other different geophysical methods at known archaeological sites in Carinthia (Southern Austria). In general a very high resolution is necessary to outline the foundations of roman buildings covered by a sedimentary layer of at least half a meter thickness. The electromagnetic prospecting method had been applied within an archaeologically important region, the archaeological remnants of the first roman provincial capital at the Magdalensberg and at the site of the later location of the capital, at Virunum. With the establishment and consolidation of the Roman Empire the Romans needed more settlement space for the fast growing town and also the demands for defence were less - therefore the Romans transferred the provincial capital down to the "Zollfeld" valley northeast of Klagenfurt. Additional to the electromagnetic investigations, geoelectric, magnetic and susceptibility mapping, spontaneous potential surveys, multielectrode tomography (Niesner, Scholger, Leonhardt 2009) and ground penetrating radar (Morawetz 2006) have been employed jointly during the last years. Also visual and infrared aerial pictures had been available from those areas. The work had been done within a collaborative project between the Geophysical Institute of the University of Leoben and the Landesmuseum Kärnten. The fieldwork and part of the interpretation had been done by students of the University of Leoben within summer field camps. Within these surveys various portions of the archaeological sites had been mapped, providing valuable information of this ancient settlement. One of the most important achievements of the past years of close integration work by the archaeological and the geophysical team was the detailed outlining of an early Christian church, dated by the archaeologists to the early time of the Christians (Dolenz, Niesner, Scholger 2008), but other interesting objects had also been outlined. Based on these results, the archaeologists of the Carinthian museum started digging campaigns in the most interesting areas, verifying the geophysical results. Up to now part of the apsis had been digged out. Photos of these fundaments will be shown. The digging results show good agreement with the geophysical results. Geoelectric mapping gives excellent results, but is rather time consuming – therefore specific parts had been mapped using the faster EM method in a continuous registration mode – either by walking along lines and the setting of marker points or by coupling the instrument with an precise GPS system and using a random walk strategy. The achievable resolution to the archaeological objects in comparison to the other geophysical methods had been analysed. Field strategies in geophysical investigations from reconnaissance mapping to volume mapping, instruments and field procedures, data processing and interpretation merits and limitations of each technique are discussed within their archaeologically context.

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