

Buried, forgotten and rediscovered – prospecting the Roman *villae rusticae* in the area of Flachgau in Salzburg, Austria

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Abstract

At six different *villae rusticae* sites in the Salzburger Flachgau high resolution motorized and non motorized magnetic and radar data was gained. The sites are well preserved due to sustainable agricultural use.

Keywords

archaeological prospection; georadar; landscape; magnetics; Roman

Introduction

The Flachgau is a district of the Austrian county Salzburg that surrounds the city of Salzburg. One of its micro-regions is the Salzburger Seenland which is located only 15 kilometers north of the city of Salzburg. Due to the nearby lakes, the soft slopes of the Alpine foreland and the good Roman road network close to the Limes this region was a preferred area for Roman farm estates – the *villae rusticae* – which were the production centers for supplying the military camps and urban settlements along the Limes (Huber et al. 2022).

As part of the 2021 granted EU LEADER project in the rural Austrian region of the Salzburger Seenland six locations were selected (Fig. 1) where the existence of Roman *villae rusticae* were determined through finds and small excavations (Voithofer 1988). Until the funding of this project, no further information about the size and the state of the preservation of these sites was known. That is why the University Salzburg, in correspondence with the ZAMG – Zentralanstalt für Meteorologie und Geodynamik, now GeoSphere Austria, decided to use archaeologic-geophysical prospection to solve that mystery (Huber et al. 2022).

Methods

The archaeological prospection surveys were conducted with two magnetometer systems and two different GPR systems. A motorized 8-channel Fluxgate-type magnetometer array mounted on a custom built, non-magnetic cart equipped with eight Förster FEREX CON650 gradiometer probes, a 10-channel EasternAtlas AD converter and a toughbook for data acquisition using in-house developed data logging and navigation software was used in combination with RTK-GNSS for exact data positioning. The system was towed by an ATV Quad bike. This survey setup permits for a sampling resolution of 25 cm in cross-line and 10 cm in in-line direction at speeds of max. 20 km/h. For appropriate data positioning at this speed a RTK-GNSS with a 5 Hz NMEA string output rate was used and a PPS fed a time-stamp marker into the magnetic data. The data were recorded in XML format and visualized as coverage map in greyscale.

Additionally to the magnetic prospection GPR surveys were conducted at selected areas, using a 6-channel 500 MHz Sensors&Software SPIDAR and a custom build hand-held 3-channel SmartCart from Sensors&Software equipped with three pulseEKKO PRO 500 MHz antenna pairs. The

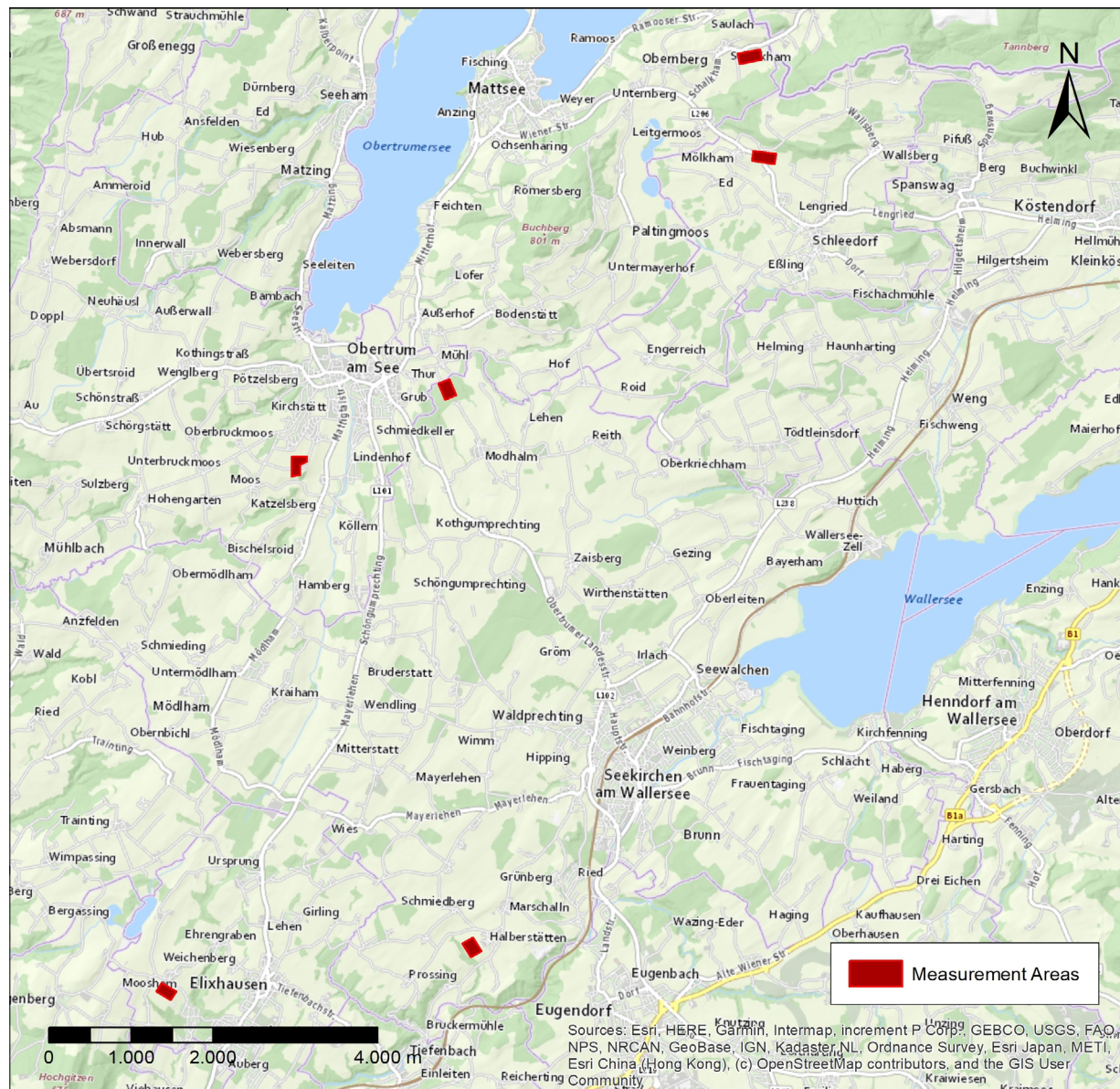


Fig. 1: Overview of the area and the archaeological sites that were prospected during the LEADER project (base map: © Geoland.at/2021).

SPIDAR system is towed by an ATV Quad bike. It consists of six radar antenna pairs arranged in two rows. Every receiver records the reflections of their behind transmitter antenna, resulting in a resolution of 25 by 8 centimeters at a speed of 5 km/h using a four-fold trace stacking factor. The SPIDAR system and the SmartCard are operated using the same RTK GNSS for positioning as the magnetometers (Trinks et al. 2018).

All data collected at the sites in Flachgau were processed and visualized with the software ApMag and ApRadar, an in-house development of ZAMG and its partners.

Results

The data were collected within two short campaigns around the 15th of November 2021 and around the 21st of March 2022. During the first campaign only the motorized magnetic surveys were conducted. The sites of Halberstätten, Molkham (Fig. 2), Schalkham and Steinmauer showed plenty of thermoremanent structures, which can be affiliated to oven structures, hypocaust channels and brick debris as well as clusters of iron dipole anomalies. Using these results, the second campaign with the mo-



Fig. 2: Example for the magnetic surveys, the site of Mülkham magnetometry (top); interpretation of the magnetic data (bottom) (base map: © Geoland.at; 2021).



Fig. 3: Example for the radar surveys, the site of Mölkham radargram (top) depth 0.3 m to 1.0 m (background provided by INSPIRE BEV); interpretation of the radar data (bottom) combined with the magnetic data (background provided by INSPIRE BEV).

torized multi-channel radar system SPIDAR was planned to get a more complete picture of the archaeological sites.


At the site of Moosham neither thermoremanent structures nor clustered iron anomalies of archaeologically relevant origin were detected, so a subsequent radar survey was called off.

During the second campaign in March, the sites of Halberstätten, Mölkham, Schalkham and Steinmauer were surveyed using a motorized 6-channel Sensors&Software SPIDAR system. Due to the already done magnetic survey, it was possible to focus on those parts of the investigated areas that showed the most promising anomalies regarding possible roman villas. The additional information gathered by the radar surveys shows partially well preserved walls and foundation structures deriving from roman villas and their outhouses at all four selected sites (Fig. 3).

With all these georeferenced data it was now possible to overlay both surveys and to combine the interpretations.

The site of Waldprechting was the only site that had to be done by hand and furthermore was not possible to be investigated with magnetics. Nevertheless, it was possible to detect a well-preserved Roman building within a wooded area.

Conclusion

In four of the six sites magnetic- and radar-prospections were carried out, in the two others only one method was used. It was possible to collect high-resolution data at all six sites. Five of the sites still contain more or less well-preserved remains of Roman *villae rusticae* and their outbuildings and facilities. Only at the site of Moosham the dataset shows no remains of a roman villa. It is highly possible that parts of the main buildings were overbuilt with modern structures. Due to these results, it is now possible to give the sites a better protection by listing them and to gain additional money to extend surveys on similar sites in this region. 

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