A swamp as an obstacle to approach – archaeological and geoelectrical investigations on the Early Bronze Age fortification of Ratzersdorf, Lower Austria

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Abstract
Interdisciplinary cooperation between geoelectrics and archaeology made it possible to identify a swamp as an integral part of a defense concept for the first time in Austria at the Early Bronze Age hilltop settlement of Ratzersdorf, Lower Austria. The marsh and a spring were included as natural topographic structures in the defense conception of the fortification.

Keywords
defense conception; Early Bronze Age; fortified hilltop settlement; geoelectric prospection; swamp

Introduction

In the late Early Bronze Age, numerous fortified hilltop settlements with a central site character became established in Central Europe. They often have complex defense structures and required intensive protection for some time. But the majority of these sites were destroyed at the beginning of the Middle Bronze Age. In most cases, the fortification structures were not rebuilt and the sites were abandoned. Obviously a social, economic, and political-ideological change made these fortifications obsolete (Jaeger 2016; Krenn-Leeb 2013).

Within the framework of a long-term research focus on the settlement region "Wölbling Basin" in Lower Austria under the direction of Alexandra Krenn-Leeb, landscape archaeological questions concerning the use of fortified hilltop settlements, space, activity zones, architecture, fortification structures, settlement site selection from the Neolithic Period to the Bronze Age are in the foreground of the interdisciplinary investigations (Krenn-Leeb 2019). The Wölbling Basin is located in the Dunkelsteinerwald and belongs geologically to the Bohemian Massif.

Therefore, since 2018 archaeological excavations have been taking place at the Early Bronze Age fortified hilltop settlement with a central site character of Ratzersdorf near Wölbling (1800–1600 BC; Krenn-Leeb 2021). The fortification is situated on a west-east oriented, oval spur-like hilltop on the western edge of the Wölbling Basin and is naturally bordered on three sides by deeply incised streams and steeply sloping hillsides. The site is ca. 440 m above the sea level and has an approx. 440 x 340 m extension (approx. 120 000 m^2).

Materials and methods

The oval plateau area of approx. 25 000 m^2 is surrounded by a circumferential, excellently preserved rampart/wall-ditch-rampart system. In the northern and eastern part of the plateau, a second rampart-ditch-rampart system reinforces the fortification. The northern flank is subsequently protected by at least two more rampart-ditch constructi-

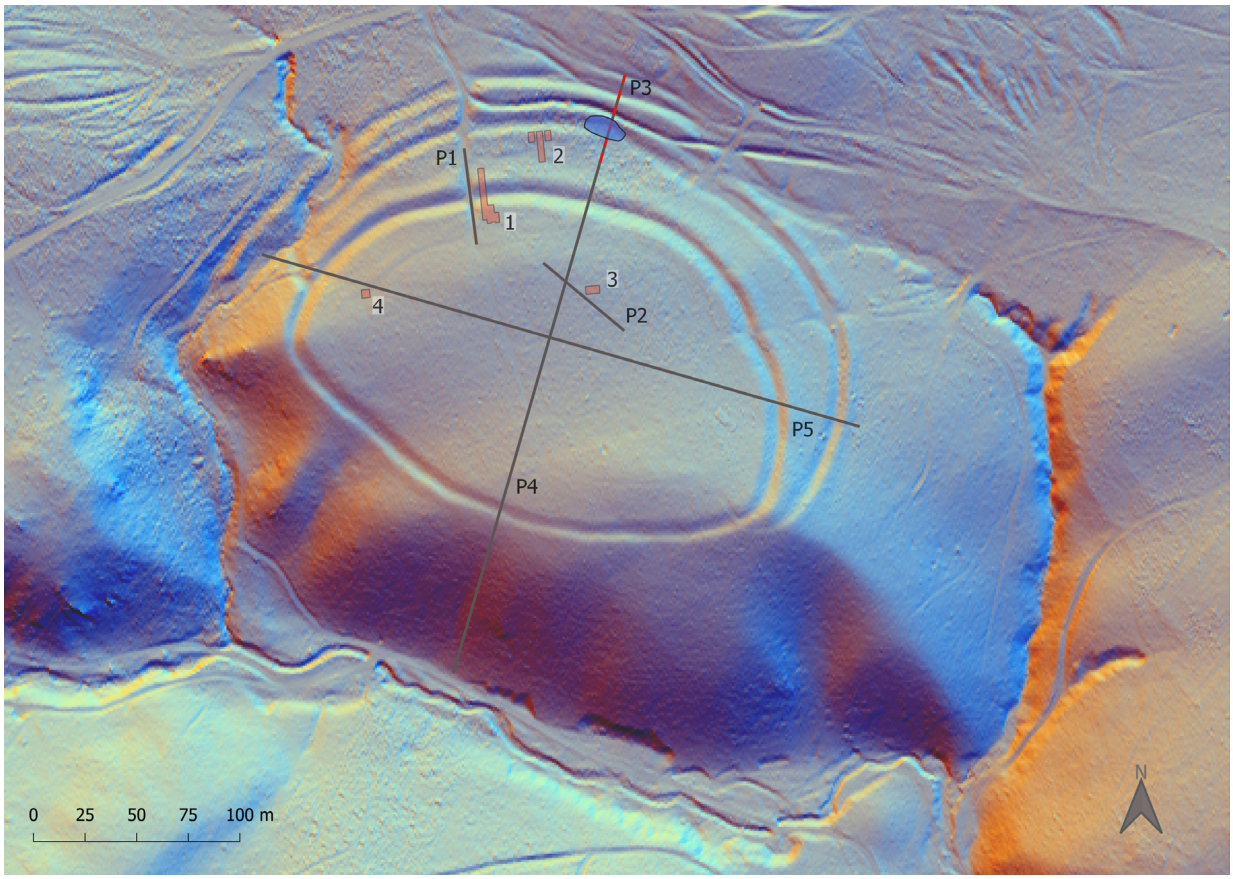

Fig. 1: The Early Bronze Age fortification with ramparts and ditches of Ratzersdorf, Lower Austria. Red: excavation areas 1–4. Gray: Profiles P1–P5 of the geoelectrical measurements. Blue: the integrated water spring (Ratzersdorf project, IUHA Vienna; LiDAR NÖGIS, BEV; https://basemap.at/).

ons. These fortifications represented obstacles to approach that were difficult to overcome. They mainly protected the easily accessible northern area of this Early Bronze Age central site (Fig. 1).

Terrain structures visible in the airborne laserscan to the northeast of the site led Robert Supper to suspect wetlands at the same location. The geoelectrical measurements initiated as a result were carried out over wide areas of the fortification between 2020 and 2022 (Supper et al. 2021).

The most common geoelectric field measurements usually make use of a linear, symmetrical electrode configuration in the 4-point arrangement, with the outer electrodes injecting the current and the inner electrodes measuring the potential difference.

For quality control purposes, the measurement results are presented in the form of a so-called „pseudosection", where the measured apparent resistances are plotted against the respective electrode spacing („pseudodepth"). A model of the resistivity-depth distribution is calculated from the pseudo resistivities using an inversion procedure to obtain the resistivity structure of the subsurface. Data inversion was performed using the commercial software Res2Dinv. The results are profile sections, where the topography along the profiles has been taken into account (Milsom 2003).

Results

The geoelectric measurement results provided good data quality. The topography of the profiles was integrated into the inversion (default setting), which means that the final result is already provided with topographic height information. Five profiles were measured (Fig. 2).

Profile P1 ran parallel to trench 1 on the modern forest road. The aim of this first test measurement was to verify the visibility of the archaeologically documented rampart and ditch structures in the geoelectrical measurements,

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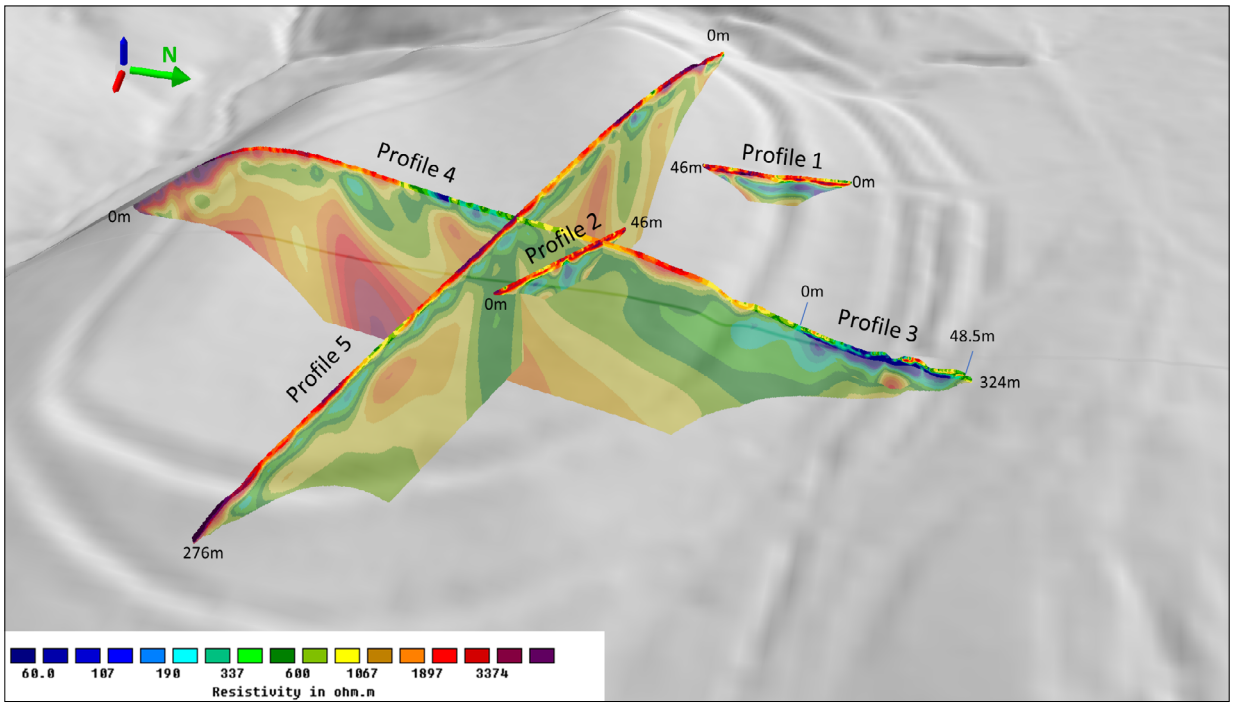

Fig. 2: The profiles P1 (length 46 m), P2 (length 46 m) and P3 (length 48.5 m) have an electrode spacing of 0.5 m, the profiles P4 (length 324 m) and P5 (length 276 m) an electrode spacing of 3 m (Ratzersdorf project, IUHA Vienna; GeoSphere Austria).

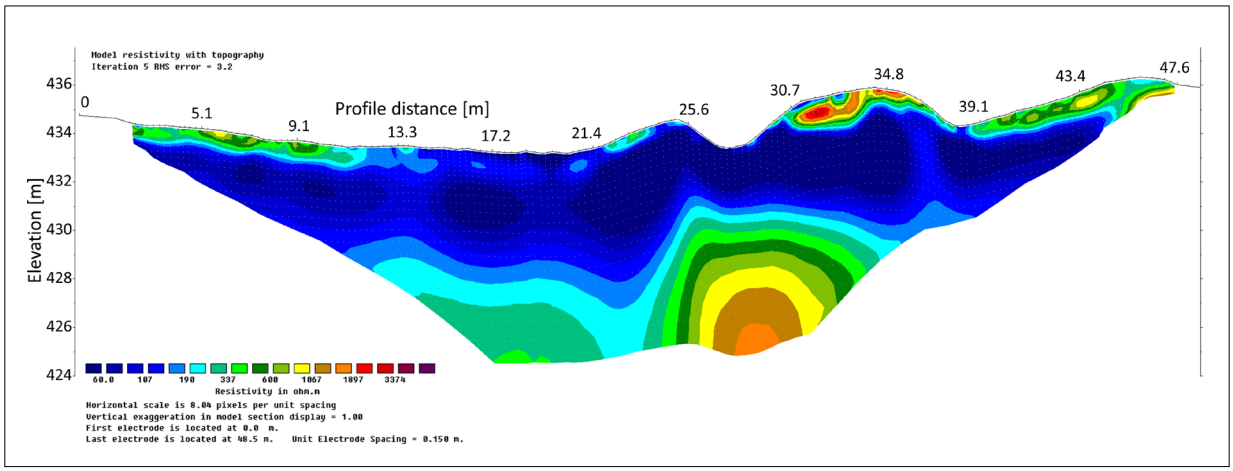

Fig. 3: Profile P3 shows a horizon with a low resistivity, which indicates a wetted area (Ratzersdorf project, IUHA Vienna; GeoSphere Austria).

which could be confirmed positively. The profiles P2 and P5 crossed the elongated geological anomaly that crosses the entire plateau area in a N-S direction. The measurements confirm a geological structure that can be assigned to a periglacial process at the current stage of research. The profiles P4 and P5 ran across the entire NNE-SSW and WNW-ESE extent of the site. The measurements document a largely crystalline bedrock over the entire plateau area. Profile P4 also clearly shows a wet area in NNE. Profile P3 confirmed the presumed wetland (Fig. 3). Archaeological fortification structures are also clearly visible in the geoelectric profiles.

The geoelectrical measurements have demonstrated a significant wet area with low resistivity values (low ohmic) in the NNE area of the fortification.

Discussion

The archaeological investigations already revealed some evidence of the presence of a wetland. The unusually large distance and the wide, fortificatory unfavorable area between the inner and the outer rampart-ditch-rampart systems in the north and east of the settlement has been irritating since the beginning of the research activities. A water spring discovered in the big outer ditch was obviously intended to be kept accessible to secure the water supply within the fortified area. Several other water springs in the near vicinity of the site are there.

In the southern part of trench 2, located near the water spring, an area with loosely placed stones was recorded. Their arrangement points to a levelling of a strongly soaked area. Wooden planks placed on top of the stones may have established a dry level of foot traffic along the southern flank of the rampart.

Finally, geoelectrical investigations did indeed provide evidence of a wetland area to the northeast of the site. Both the archaeological and geoelectrical surveys confirm a marsh area that strongly influenced the fortification conception.

Conclusion

The interdisciplinary investigations were efficiently designed in the Ratzersdorf project. Several factors indicate a strategically well-considered choice of location for the fortification at Ratzersdorf. Natural conditions, which include the steep slopes, the diverse resources of the surrounding area and also the excellent water supply from several springs, were among the decisive selection criteria. The fortification structures were largely adapted to the terrain and even extended towards a water spring. The outermost rampart-ditch constructions in the north were built exclusively in that section with the weakest fortification quality. They continue for some distance into the marshy area, but then run out to the east. The swamp may have extended over the entire area northeast of the fortification. Even today there are thick humus layers. All features clearly show that the wetland had been deliberately included in the defense conception for the Early Bronze Age central site. The marshy area obviously represented a sufficient obstacle to approach. The current, extremely heavy and impenetrable growth of blackberries in the swampy zones – blackberries are shallow rooted and require sufficient water – may well have been used as further additional natural protection at that time.

Based on several features documented by archaeology, a wet area was already suspected in the northeast area of the fortification. However, the significant proof of a marshy area was finally achieved very sucessfully by the geoelectrical measurements. Thus, for the first time, evidence of the integration of a marsh into a fortification concept of the Early Bronze Age in Austria was found.

References

Jaeger M. Bronze Age Fortified Settlements in Central Europe. Studien zur Archäologie in Ostmitteleuropa. Poznań. 2016.

Krenn-Leeb A. Sozialer Wandel um 1600 v. Chr. in Österreich. In: Meller H, Bertemes F, Bork H-R, Risch R, editors. 1600 – Kultureller Umbruch im Schatten des Thera-Ausbruchs? 4. Mitteldeutscher Archäologentag vom 14. bis 16. Oktober 2011 in Halle (Saale). Tagungen des Landesmuseums für Vorgeschichte Halle. 2013;9:411–433. German.

Krenn-Leeb A. Raumorganisation – Raumnutzung – Raumsphäre: Einblicke in die Lebenswelt um 2900 v. Chr. in Ostösterreich. In: Meller H, Friederich S, Küßner M, Stäuble H, Risch R, editors. Siedlungsarchäologie des Endneolithikums und der frühen Bronzezeit. 11. Mitteldeutscher Archäologentag vom 18. bis 20. Oktober 2018 in Halle (Saale). Tagungen des Landesmuseums für Vorgeschichte Halle. 2019;20/1–2:733–760. German.

Krenn-Leeb A. Ratzersdorf bei Wölbling in Niederösterreich: Eine „Burg" der Frühbronzezeit. In: Pieler F, Nowotny E, editors. Beiträge zum Tag der Niederösterreichischen Landesarchäologie 2021. Asparn/Zaya: Bösmüller Print Management; 2021:28–39. German.

Milsom J. Field Geophysics. New York: John Wiley & Sons; 2003.

Supper R, Ottowitz D, Jochum B, Preiner A. Ergebnisse der geoelektrischen Vermessung zur Untergrunderkundung der archäologischen Ausgrabungsstätte bei Wölbling/Ratzersdorf (NÖ). Division of Geophysical and Applied Geological Services, GeoSphere Austria. Wien. 2021. German.

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