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Archaeology Searched, Armour Legacy Found

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Site and Aim

The 'Friesener Warte' (or 'Warte') is a hill in Upper Franconia (Northern Bavaria, Germany), characterised by an elongated plateau approximately 1 km long and up to 200 m wide, with an altitude of 520 m above sea level. While the plateau is nearly flat, the western and southern slopes are steep (Figure 1). Such exposed locations within the Franconian Jurassic and Keuper regions frequently contain archaeological fortifications from various historical periods. Some of these, including the Warte, suffered significant damage due to the construction of sports airfields in the 1950s (Abels 1990; Schwarz 1955).

In summer 2024, an international research team comprising members from BLfD and CAT conducted a magnetic gradiometer survey at the Warte. The survey was initiated as part of an effort to replace a weathered information board from the 1990s, which has become barely legible over time. Annette Schäfer (of the municipality of Hirschaid) will undertake the task as a volunteer project. This process involves critically reviewing the existing content and updating it using data from an airborne laser-scanning (ALS) digital topography model (DTM1, 1 m resolution; Figure 1b) alongside findings from the gradiometer survey.

Even before the acquisition of ALS and magnetometer data, a field survey revealed the remains of a well-preserved gate and a rampart, possibly accompanied by a ditch. An excavation in 1980 confirmed the presence of a shallow ditch, along with the remains of a double-fronted post-slot wall. The proximity of the site to a Late La Tène settlement in Altendorf, approximately 4 km southwest of the Warte, suggests that the fortification served as protection for the local population. Additionally, a hoard of Celtic coins was discovered nearby. The rather hasty construction of the fortification indicates an urgent need for defence, possibly due to a sudden threat from Germanic

tribes. These findings reflect the turbulent period of Celtic-Germanic population shifts. Beyond the La Tène period features, the site also contains the remains of a small Carolingian-Ottonian castle complex on the southwestern edge of the plateau (Abels 1990). Its strategic location would have provided a wide view over the Regnitz Valley, extending as far as the Steigerwald, making it a key observation point in the early medieval period.

Today, all ramparts in tree-free areas on the Warte have been levelled (Figures 1a and 1b). The oldest Allied aerial photographs show that both the La Tène period and early medieval ramparts were still present in the mid-1940s (Figure 1c). Moreover, our geophysical data indicate that the destruction of these archaeological monuments was not solely due to the levelling of the ramparts for the construction of the sports airfields.

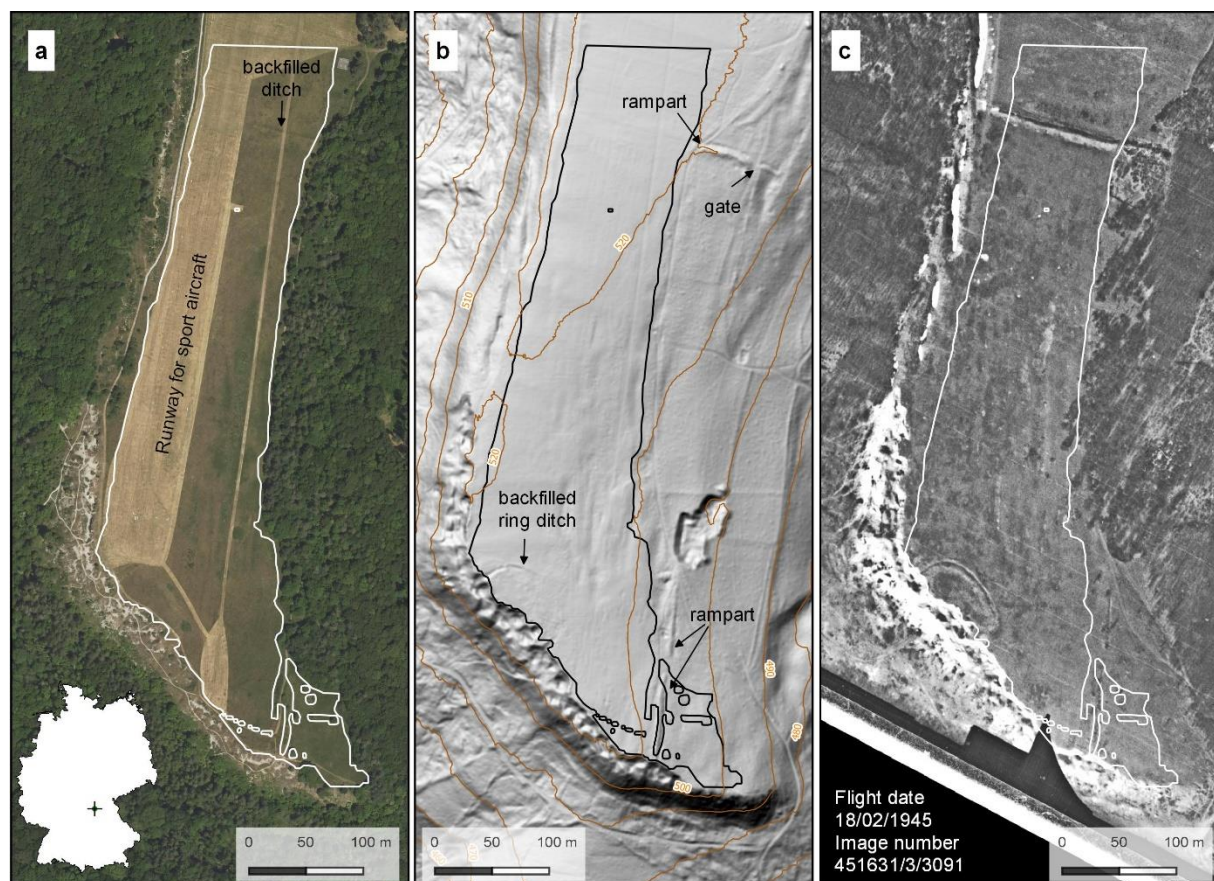


Figure 1: The Friesener Warte. 1a: Recent digital orthophoto; 1b: DTM1 highlighting remnants of archaeological features (La Tène rampart/gate and Carolingian-Ottonian ring ditch); 1c: historical photograph from Allied reconnaissance flights. The white and black outlines indicate the area covered by the gradiometer survey. Digital orthophoto from 2023, DTM1 (1 m resolution) and historical aerial photograph: © Bayerische Vermessungsverwaltung, www.geodaten.bayern.de. North to top.

Figure credits: Andreas Stele.

Gradiometer Survey Results

All accessible areas relevant to the Celtic fortification and medieval castle, covering a total of 7 ha, were surveyed using a five-channel magnetic gradiometer Sensys MXPDA in GNSS mode.

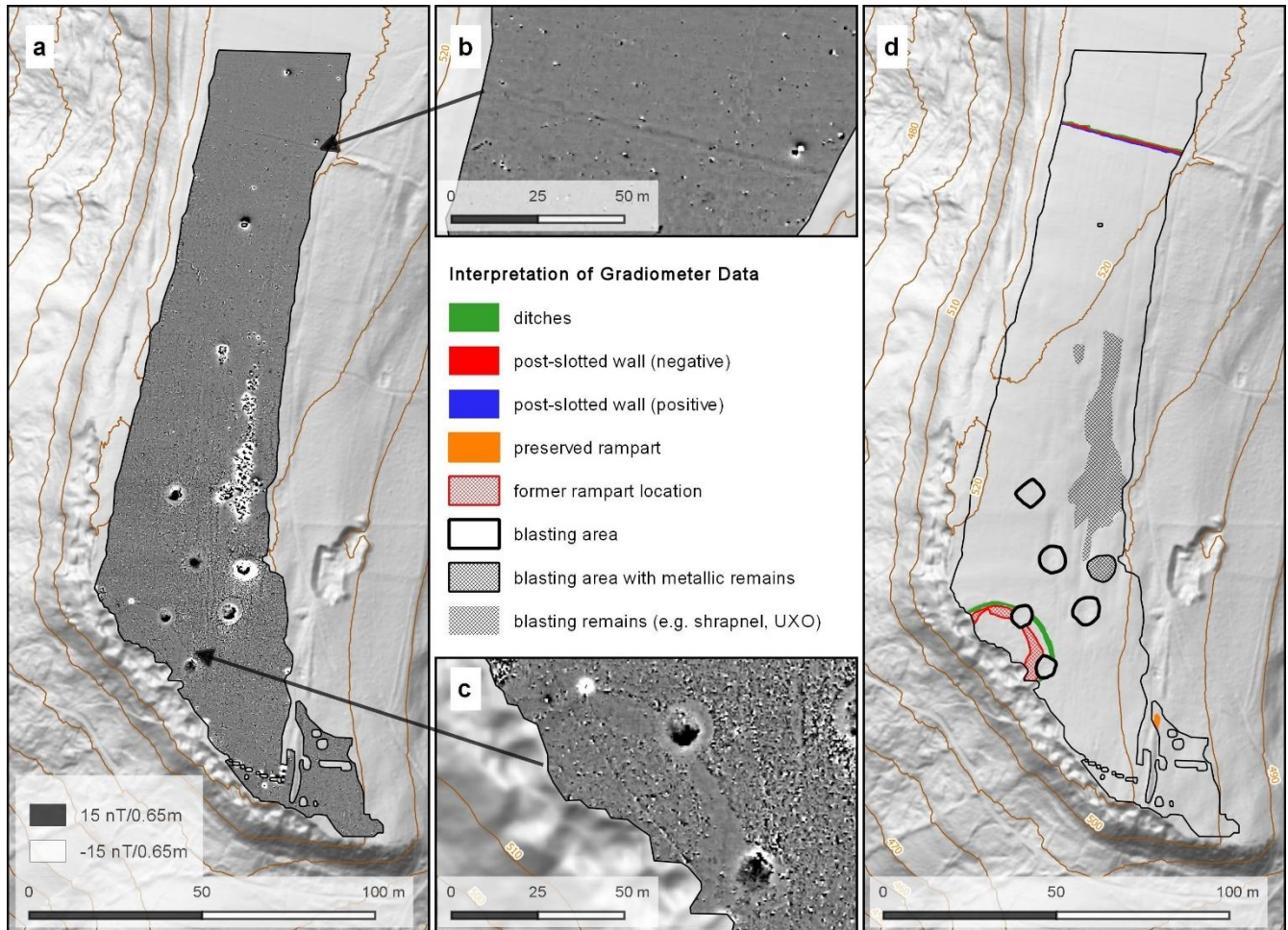


Figure 2: Survey results. 2a: Magnetic gradiometer data; 2b and c: Detail of relevant areas; 2d: Interpretation. Sensys MXPDA five-channel gradiometer in GNSS mode, measurement point density 0.01 m x 0.5 m, interpolated to 0.25 m x 0.25 m. North to top. (Project No.: Fri24f; GIS-Plan No.: L 6130 005).

The ditch in front of the northern Celtic post-slot wall extends across the entire northern measurement area, appearing as a weakly positive anomaly with a maximum width of 1.7 m over a total span of 105 m. This feature aligns well with the excavation results from 1980 (Abels 1990). In the present-day tree-free area, the remains of the post-slot wall have been completely levelled but can still be identified in the magnetogram as two parallel linear anomalies - one weakly positive and the other negative. The negative anomaly, up to 2.5 m wide, is located directly adjacent to (south of) the ditch, while the positive anomaly, with a maximum width of 1 m, runs along the

southern edge of the negative anomaly. The exact cause of this representation in the magnetogram remains uncertain based on the available data and excavation findings. However, it is hypothesised that the positive anomalies result from the ditch infill and the remnants of the post-slot structure, while the negative anomaly likely corresponds to the exposed limestone between the ditch and the post positions. In the southeastern part of the site, a small section of the collapsed Celtic rampart was detected as a weakly positive anomaly in the magnetogram (compare Figures 2a and 1b). Additionally, in the northern section, former field boundaries are visible as weakly positive anomalies (Figure 2).

The remains of the fortifications of the Carolingian-Ottonian castle are also almost entirely levelled, with no visible traces of the former rampart remaining on the site. However, in the magnetogram, its largely dipole-free foundation trace is clearly identifiable (Figures 2a and 2c). We suppose that the levelling of the rampart was done after deposition of the dipolar features in the area. While the semi-circular ditch of the castle fortification is partially visible in the DTM1 data (Figure 1b), the magnetogram reveals the ditch through clusters of small, dipolar anomalies (Figure 2c). This pattern suggests the use of the area as a site for waste armaments disposal; this has not been documented in historical sources or archaeological records, although the hypothesis is supported by a final report commissioned by the Bavarian State Ministry for Regional Development and Environmental Issues, which is available online (IABG 2000).

It is presumed that dipolar material entered the partially open (medieval) ditch during the post-WWII period, when the area was used for munitions disposal. This material likely consists of shrapnels, blasting fragments, and other remnants of munitions. Strong evidence for munitions disposal is visible in the magnetogram, which reveals six distinct blasting areas, all exhibiting varying degrees of thermoremanent and, in some cases, additional dipolar or shock remanent behaviour. It appears that pits for explosives were dug into the landscape, forming round, oval, and sub-square depressions. They were presumably created to dampen the effect of the explosion and to prevent fragments from being ejected over a wide area. Additionally, relatively large quantities of iron objects are present within the blasting areas and former depressions. However, whether these deposited iron objects also originate from munitions disposal or have a different source cannot be determined

solely based on the gradiometer survey. On the other hand, some presumed blasting remains exhibit extremely high dipolar or shock remanence intensities (in excess of ± 2000 nT). This would suggest that unexploded ordnance (UXO) and other munitions remnants cannot be ruled out.

Using the available aerial photographs, we can establish and discuss a rough chronology of the surface-forming processes on the Warte since the end of the Second World War:

- In early 1945, shortly before the end of the war, the ramparts of the Celtic fortifications and the medieval embankment were still intact (see Figure 1c).
- By the early 1960s, aerial photographs show the first blasting areas and parts of the ramparts had been levelled.
- After 1975, additional blasting areas are visible, some of which had become overgrown, while the ramparts in the treeless areas of the Warte had been completely levelled.
- A 1982 aerial photograph by Otto Braasch (BLfD) reveals only a shallow depression at the site of the most recent blasting. The northern La Tène period wall is identifiable solely as a vegetation mark in the open area and the visible part of the Carolingian-Ottonian castle is reduced to a section of the ditch (see Figure 1b).

Conclusion

The results of the magnetic gradiometer survey at the Friesener Warte provide crucial new insights into the site's development. While previous studies had already established the presence of La Tène and medieval fortifications, the survey confirmed the extent of their destruction over time, particularly due to munition disposal activities and subsequent landscape modifications. The identification of dipolar anomalies and blasting areas strongly suggests that the site was used for munitions disposal, a hypothesis further supported by historical aerial imagery and official reports.

Despite extensive levelling, the magnetogram data reveal that key archaeological structural features - such as the Celtic post-slot wall and associated ditch, and the remnants of the medieval fortification - remain detectable. These findings not only contribute to refining the historical narrative of the Warte, but also underscore the importance of non-invasive

methods in reconstructing lost landscapes. Ultimately, the study highlights the necessity of preserving and documenting heritage sites that have been subject to significant post-war transformation.

References

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