Combining teaching and research: a BIP on geophysical and archaeological prospection of North Frisian medieval settlement patterns (Part 1)

Revisiting the terp site of Tofting. 2000 years of settlement history explored with geophysical methods

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Introduction

The protected monument site of Tofting is located on the North Frisian peninsula of Eiderstedt, which borders the Wadden Sea and the Eider River estuary [1] (Fig. 1). At the beginning of the 2nd century, the first agricultural communities in Tofting built their longhouses on flat turf platforms at an old Eider bend. A series of probings and excavations by Bantelmann (1948-1952) indicate the formation of a village mound of about 200 m in diameter from the amalgamation of individual dwellings [2]. The mound gradually grew through layers of debris and alluvium, but remained constant in position until it was abandoned at the beginning of the 5th century BC. The site was repeatedly re-inhabited from the Middle Ages until the 19th century.

Figure 1: *The Eiderstedt peninsula with the location of the site and the excavation of house III [1].*

Methods

In summer 2022, the site was investigated in a joint research project of the Universities of Kiel, Ghent, Vienna and Bratislava (Fig. 2). During the one-week fieldwork an area of 4.3 ha was surveyed using magnetometry (Foerster fluxgate gradiometer, 6 probes 50 cm horizontal spacing), electromagnetic induction (EMI, Dualem-21HS) and ground penetrating radar (GPR, Sensors & Software Pulse EKKO 500 MHz).

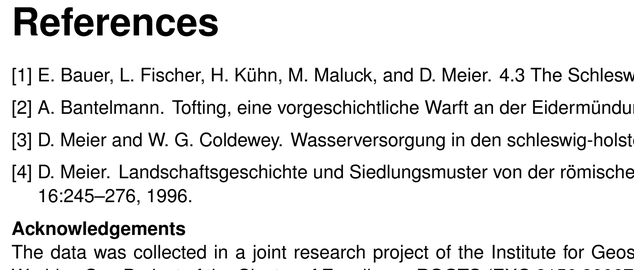

Figure 2: *Electromagnetic interference (EMI) measurements and soil sampling near the Tofting terp.*

In order to relate the geophysical data to the local stratigraphy, sediment cores (5 cm) and vibracores were drilled. The local subsurface structures were also investigated using reflection seismic profiling. As part of the integrated interpretation, the results of the high-resolution datasets were combined with additional archaeological information based on traditional sources such as archaeological excavations and historical maps.

Results

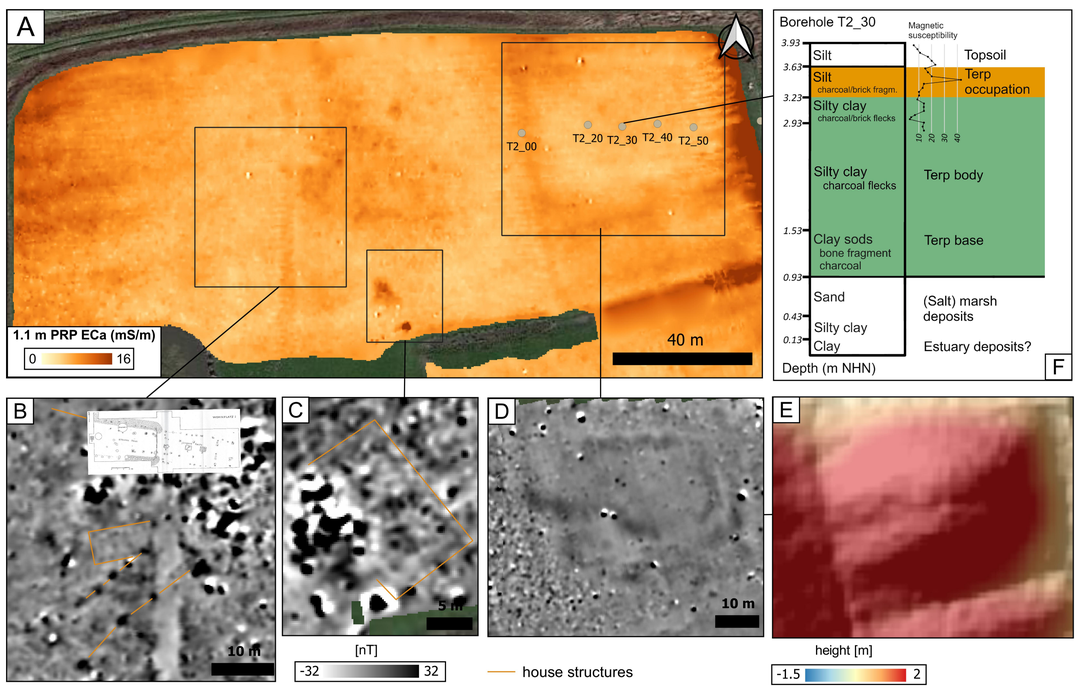

Figure 3: *Archaeological and geological structures in the northern part of Tofting. Electromagnetic induction data (A) compared to the excavation plan (B), magnetometry (B-D), DEM (E) and coring results (F).*

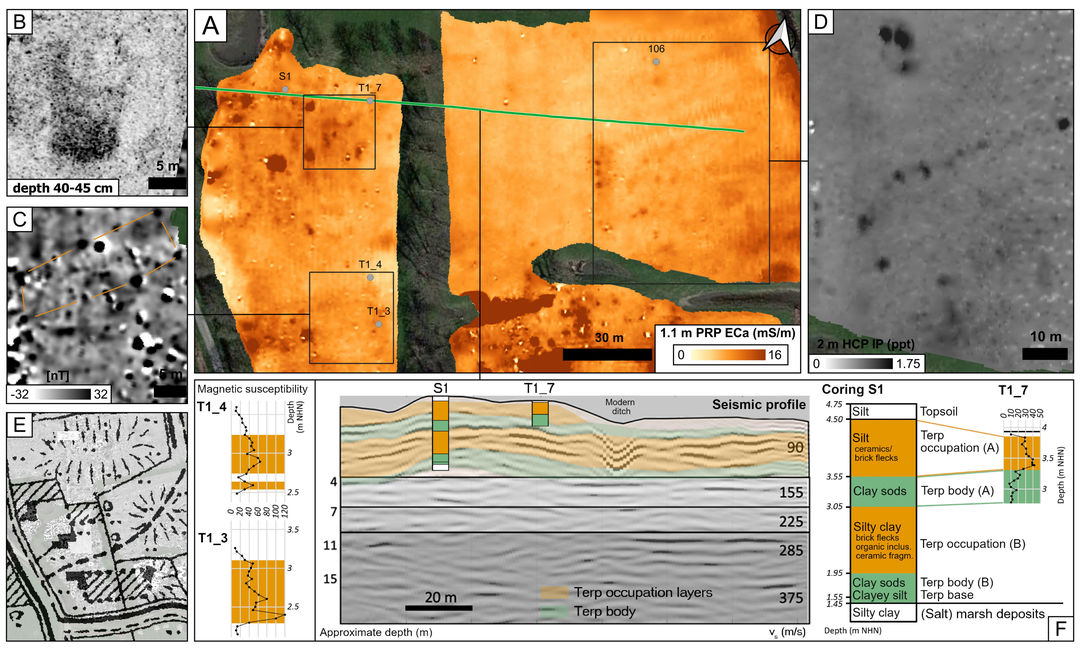

Figure 4: *Medieval to modern settlement structures in the southern part of the site as seen in the EMI (A), GPR (B), magnetometry (C), magnetic susceptibility (D), the historical map from 1878 (E), seismic profile and coring results (F).*

Northern part. Bantelmann's trench is clearly visible in the EMI and magnetic data (Fig.3/A-B). The anomalies adjoining the partially excavated older house may represent additional posts. [1] A series of anomalies southwest of the section may be part of previously unknown house structures. Several linear anomalies in the central area indicate the remains of two post buildings with outlines of 28×8 m and 10×4 m (Fig.3/B). Here, numerous dipole anomalies of modern rubble seem to overlie older structures.

On the southern edge wall trenches of a building with outlines of 16×8.5 m are identified (Fig.3/C). An adjacent high conductive and magnetic anomaly may be related to this structure. The eastern terp shows larger anomalies, representing older tidal creeks or the internal terp structure (Fig.3/D-E). This terp contains thinner cultural layers compared to the southwestern zone (Fig.3/F).

Southern part. Strong (dipole) anomalies seen throughout the southwest (Fig.4/A,C) mainly correspond to the remains of modern buildings (Fig. 4/E, Prussian Land Survey map 1878). Two EMI anomalies may represent deeper pits such as cellars, wells or cisterns (Fig. 4/A). Additionally, with GPR a circular area of 20 m is seen with highly reflective and absorbent material (approx. depth 40 - 100 cm, Fig.4/B). This could be a fething, partially backfilled with rubble [3]. In the south some remarkable anomalies form a rectangular structure (24×8 m) (Fig. 4/C), typical for medieval longhouses in the Eiderstedt area[4].

To the west, at boreholes T1_3 & T1_4, magnetic susceptibility is highest at a depth range of 70-100 cm, corresponding to the depth of Bantelmanns early medieval cultural layers [2].This part of the terp contains multiple cultural layers, seen on the seismic profile and S1 coring (Fig. 4/F). To the east, the different datasets show multiple anomalies with a high magnetic susceptibility (Fig. 4/D). A rectangular structure measuring approximately 85 m^2 showed heated soil and charcoal in borehole 106 and may be the remains of a building. Other anomalies of unknown purpose ranging in size from 1.5 to 3 m lie linearly in a U-shape over a length of 80 m.

Conclusion

Trouble with rubble. The combined application of different geophysical methods has yielded a wealth of information that improves our understanding of the large village terps and their internal structure. Despite the fact that large areas were covered with modern rubble, several previously unknown archaeological structures have been revealed, including at least five buildings. Based on the physical characteristics and shape of the recorded anomalies, an attempt was made to infer the function and chronological classification of the structures. The work presented is highly relevant for future targeted investigations (e.g. archaeological prospection or excavation) and provides an important basis for the reconstruction of the settlement history.

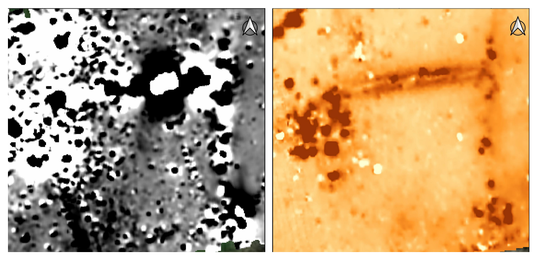

Figure 5: *Highly magnetic rubble overlying archaeological structures in the southeastern part. Magnetometry (32nT) and EMI data (0.5 m HCP ECa).*

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