ÖAW AUSTRIAN ACADEMY OF SCIENCES

ARCHAEOLOGY AT THE DANUBE

>>USING NON-INVASIVE GROUND AND AERIAL PROSPECTION METHODS TO DOCUMENT PREHISTORIC SETTLEMENT TRACES AT THE BISAMBERG NEAR VIENNA, AUSTRIA<<

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Within the framework of the project „Archaeology at the Danube - Pilot Study Bisamberg“ conducted by the Austrian Archaeological Institute (ÖAI) of the Austrian Academy of Sciences (ÖAW) a survey of the archaeological monuments on the Bisamberg (an approximately 360 m high elevation north of Vienna) was carried out in 2021/22 using modern non-invasive aerial and terrestrial prospection methods.

Fig. 1 LiDAR drone DJI Matrice 600 Pro (© OeAW-OeAI/J. Kreuzer)

Fig. 2 Sensys Magneto MXPDA (© OeAW-OeAI/F. Reiner)

Fig. 3 ABEM Terrameter LS2 device (© GeoSphere/J. Gallistl)

Fig. 4 The Bisamberg from the west (© OeAW-OeAI/K. Rebay-Salisbury)

The geomagnetic measurements were carried out with a 5 - channel fluxgate gradiometer system Magneto MXPDA from Sensys (survey width 1.0 - 2.0 m, sensor spacing 0.25 - 0.5 m). The total area surveyed was approx. 1 ha around the Elisabethhöhe and 1.6 ha south of the Gamshöhe to yield information about the current state of the archaeological monuments and prehistoric settlement activities. The data was processed using Terra Surveyor and afterwards georeferenced and analysed in ArcGIS Pro in form of digital greyscale images (-5/+5 nT).

Geoelectric measurements of profiles 2 and 3 were conducted in cooperation with Geosphere Austria using the ABEM Terrameter LS2 multi-channel device. Two profiles à 40 and 50 m length with an electrode spacing of 0.5 m could be laid out in order to gain information about the internal structure of the rampart. The processing of the data was performed with Python packages developed at Geosphere Austria. The inversions were performed with the open source software ResIPy using a smoothness-constraint regularization.

The system used for the aerial survey consisted of the miniVUX-SYS mounted on the DJI Matrice 600 Pro, using the miniVUX-2UAV laser scanner and the APX-20 UAV IMU/GNNS. A total area of 50 ha was surveyed. The LiDAR data was processed so that any vegetation was filtered out in several processing steps to obtain the pure digital elevation model (DEM) of the rampart and the surrounding area.

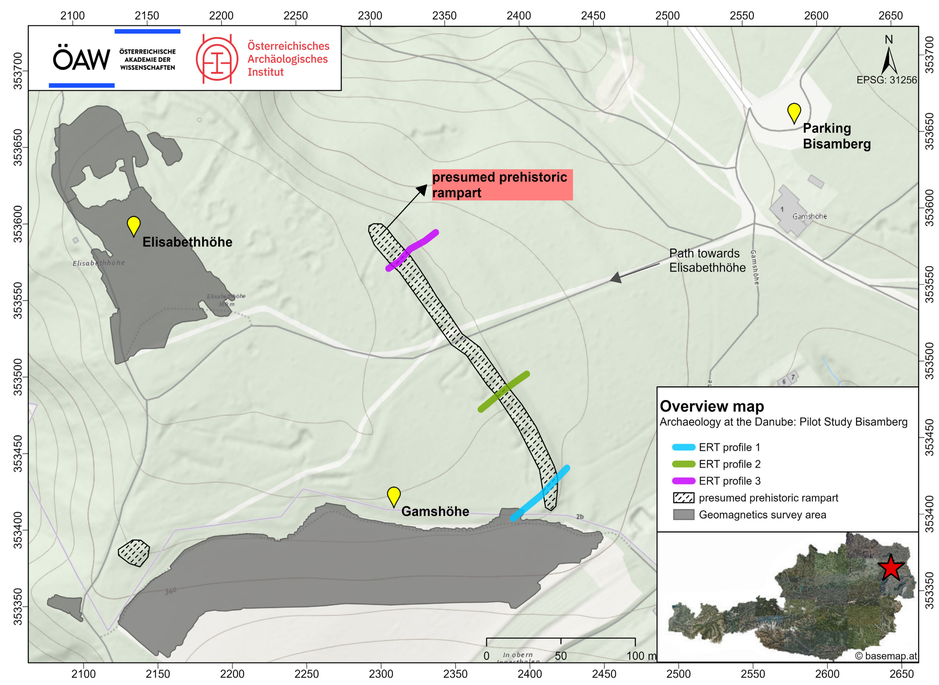

Fig. 5 Overview map of the geomagnetic survey area and the geoelectric profiles (© OeAW-OeAI/F. Reiner)

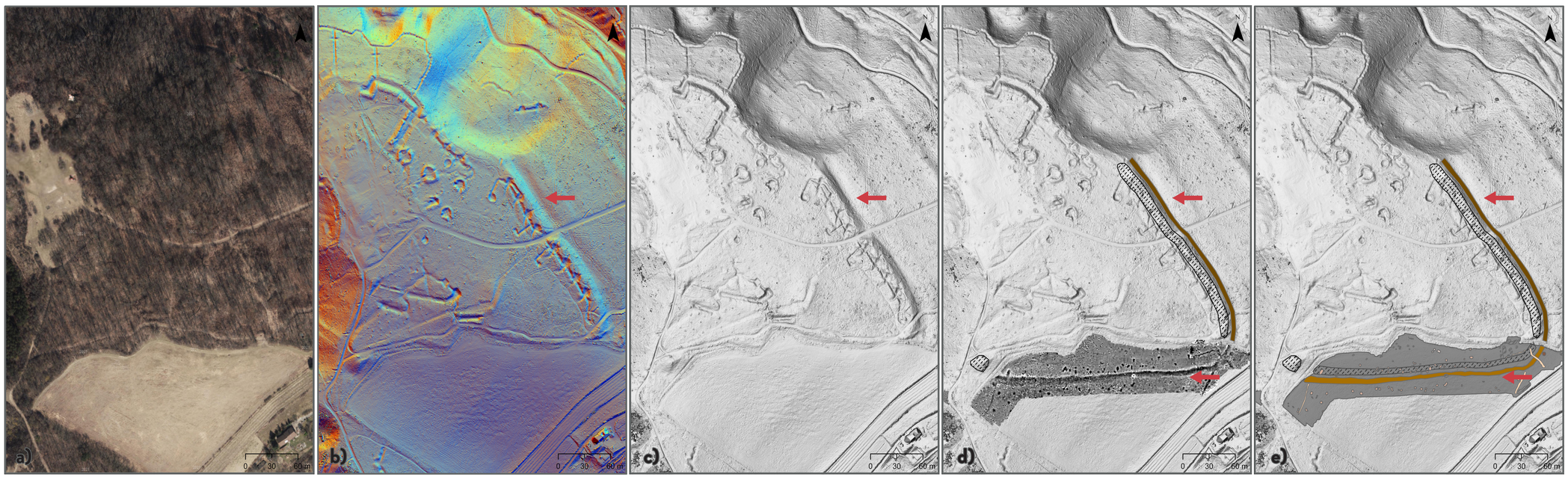

Fig. 6 **a) aerial photo** of 2021 of the survey area (© basemap.at) **b)** DEM textured with **multi-hillshade c)** DEM textured with **hillshade d) geomagnetic greyscale image** of the Gamshöhe combined with hillshade model imaging the course of the rampart (black) with its ditch (brown) **e) interpretation** of the geomagnetic data and imaging the course of the rampart (black) with its ditch (brown) (© OeAW-OeAI/F. Reiner) (high-resolution, vegetation cleared DEM © OeAW-OeAI/C. Kurtze)

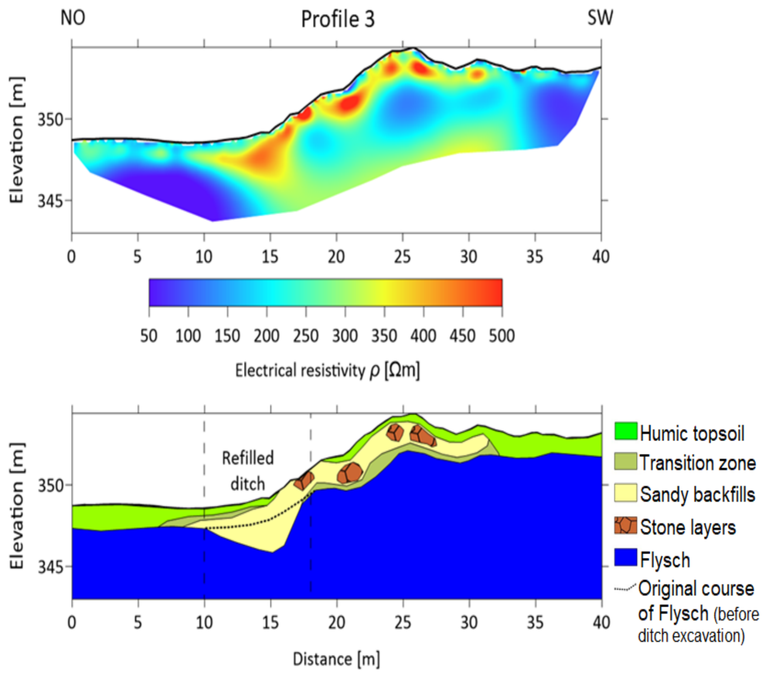

Fig. 7 Result of the 2D geoelectric inversion (top) and lithological and archaeological interpretation of the resistivity model (bottom) for Profile 3 north of the path towards Elisabethhöhe (© GeoSphere/J. Gallistl)

The DEM reveals the course of the presumed prehistoric rampart (**Fig. 6b-c**) which is highlighted in black in **Fig. 6d** and **e**. The rampart is running from NW to SE over a length of 230 m.

The geomagnetic measurements display, among other things, the course of a 250 m long (presumed prehistoric) ditch (**Fig. 6d**) highlighted in light brown in **Fig. 6e**. The greyscale image shows a massive ditch coming from the northeast and bending towards the west after about 30 m (**Fig. 6d**). It can be assumed that the rampart in the meadow area is no longer present due to the slope and the advanced erosion over time. However, the course of the rampart can be reconstructed (**Fig. 6e**) on the basis of the ditch identified in the magnetometry survey in this area.

The ERT measurements reveal the inner construction of the rampart (**Fig. 7**). In all three profiles areas with low resistivity values up to 100 Ωm can be associated with fissured sandstone and mudstone layers from the Flysch zone. Within the wall zones with even higher resistivity values of more than 300 Ωm could be identified. These zones can be interpreted as stone layers or block material of the rampart construction. The stone layers are approx. 1 m thick and at a depth of 0.5 m below ground level.

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