

# Using Technical Expertise at Ostia Antica (Leiden University & TU Delft)

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**Figure 1** Photogrammetric model of Insula IV. Parts of the extant structures are partially overgrown.

A combination of prospection techniques was applied in an intensive geophysical and archaeological fieldwork experience at Ostia Antica, Italy, to link vacant and unexcavated areas to excavated quarters of the principal port-town of the Roman Empire. These techniques included ground-penetrating radar to expose the subsurface features, topographic studies and micro-UAS (commonly known as drones) for photogrammetric analysis.

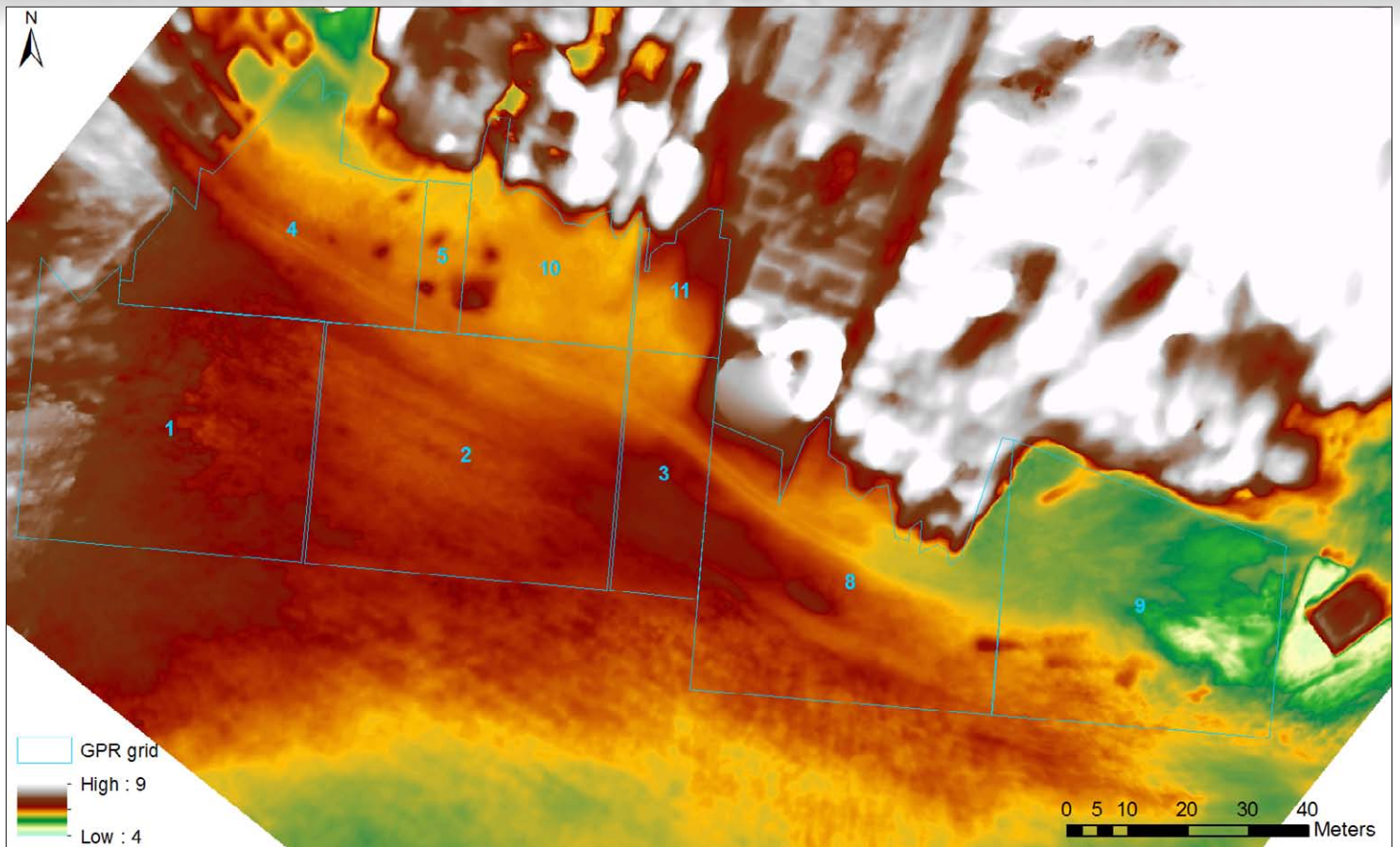
## Ostia Antica

Numerous studies of the archaeological site of Ostia Antica revealed the many faces of the once important port city of the Roman Empire (Meiggs 1973, Pavolini 1986, Descoëudres 2001). Scholarly publications range from the

city's early beginnings as Rome's gate to the Mediterranean (Belotti et al. 2011, Vittori et al. 2015), to becoming an economic powerhouse, and, after the regression of the sea and siltation (Goiran, 2011), losing its significance to the neighbouring Portus (Ogden et al., 2009, Keay et al., 2014), and finally leading to the abandonment in the 8th century.

## The study

The surveys form part of the 'Neighbourhoods of Roman Ostia' study conducted by Hanna Stöger (Stöger 2011, 2014). The project is committed to non-invasive methods in archaeology and aims to reconstruct urban neighbourhoods from a long-term perspective. The Leiden-Delft collaboration is part of a larger co-operation agreement between the Universities sharing expertise centres and facilities. The collaboration provided students from Leiden, Delft and Augsburg with the opportunity



**Figure 2 (above)** Photogrammetric DEM of the area, highlighting slight topographic changes.

**Figure 3 (below)** GPR survey results (depth ~70-100cm), overlaying the UAS orthophotographs; highlighted in red are the structures identified so far.



to get hands-on experience in different field techniques, and to collect data for theses on topics ranging from geosciences to civil engineering and architecture.

The goal was to analyse the connection of the built-up insula IV, a set of city blocks in the southeast part of Ostia Antica, with the adjacent vacant, lower lying plots to the south that are now covered by grass. Under strict time constraints it was decided to survey about one hectare using the towing system of an S&S 250MHz antenna. The grid was set up in an angle to the orientation of the buildings. Starting from approximately 50 meters distance to the insula, using 50 cm row spacing over a 250 meters width, the survey terminated in front of the remaining structures. In addition, UAS flights for photogrammetry, processed using Agisoft Photoscan software, and DGPS surveys were conducted to create detailed topographic maps and orthophotographs of the area.

The 250MHz antenna received data to about 120cm, possibly caused either by a cover of rubble remaining from the once spread out city, or diffused by salt intrusion of the close sea. Data processing, using ReflexW software, included start time fix, max. phase correction, background removal and applying median filters and gain. Deep plowing has significantly affected the top soil, nevertheless the collected GPR data shows a number of significant features. Below an elevated area in the west (grids 1 & 2 - fig. 2), linear features give evidence of remains of built structures. To the east (particularly in grids 8 & 9) there is additional evidence of human landscape modifications; linear features speaking for masonry walls, and rectangular features indicating potential floors or cisterns. Further research is required to clarify whether the missing evidence is due to the environmental circumstances or the actual lack of built structures in this area.

The results of the surveys were processed as part of two jointly supervised bachelor theses at TU Delft and serve as the base for a master thesis at the University of Leiden. This multi-disciplinary research will hopefully lead to further successful collaborations in the near future.

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