



## Evaluation of the GPS errors influence on the resistivity in ERT investigation of funeral mounds

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During the 7th century BC, Vetulonia (Tuscany, Italy) was one of the most important cities in northern Etruria and its powerful princes commissioned monumental tumuli that reached more than 90 metres in diameter, among the largest in the ancient world. Between the end of 1800 and the beginning of 1900, many of these funeral mounds have been investigated. The one of Poggio Pepe (eastern side of the Vetulonia hill) has never been thoroughly investigated. Therefore, the internal structure is still unknown and, given the absence of a depression at the top of the mound, the inside of the chamber could be still well preserved, with the roof intact.

A joint project among three different departments of the University of Florence, lead to a new investigation campaign on this tumulus. Four radial 2D- electrical resistivity tomography (ERT) were carried out. The main aims were to verify the structures conservation state and to identify the ancient tomb access. The roof conservation status is of great importance for the excavation strategy: if research will ascertain that the roof is still preserved, the excavation of the funeral chamber will start from the corridor and appropriate works will have to be planned to support the central cover. On the contrary, excavation will begin from the top of the mound. Moreover, since the exploration of tumuli is a challenging geophysical problem, other goal was to evaluate the influence, on the acquired 2D-ERT data, of the error in collecting electrode coordinates (GPS error). It is well known that the final results resolution and accuracy depend on the spatial distribution of the acquisition points on the ground surface. The precision in locating these points plays a key role, too. Nevertheless, it is hard to find in literature papers that discuss the influence on the final results of the errors in locating acquisition points.

The geophysical surveys identified remains of the wall that originally surrounded the great tumulus, and intercepted radial surface structures that have been interpreted as the highest part of the sidewalls of the tomb access corridor. Moreover, an anomaly that could represents the walls of the funeral chamber (3 m - 4 m per side) was recognized. Further development of the investigation and data analysis will allow a greater definition of the internal structures and particular attention will be given to the state of the tomb roof.

The results of the preliminary analysis of the influence of GPS error on the apparent resistivity

data suggest that, in case of consistent GPS uncertainty, caused by physical and atmospheric conditions, the shallow apparent resistivity is strongly influenced by a wrong deployment of electrodes. Therefore, in case of archaeological application, where the investigation depth is limited to the first meters below the ground surface, the measurement campaign should be rescheduled in a different period, when different conditions will occur. This leads to an improvement of ERT data quality and, consequently, to a better accuracy in the localization of the archaeological target, with a minimization of the excavation cost.