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Analysis and interpretation of geophysical surveys in archaeological sites employing different integrated approach.

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Non-destructive ground surface geophysical prospecting methods are frequently used for the investigation of archaeological sites, where a detailed physical and geometrical reconstructions of hidden volumes is required prior to any excavation work. All methods measure the variations of single physical parameters, therefore if these are used singularly, they could not permit a complete location and characterization of anomalous bodies.
The probability of a successful result rapidly increases if a multhimethodological approach is adopted, according to the logic of objective complementarity of information and of global convergence toward a high quality multiparametric imaging of the buried structures. The representation of the static configuration of the bodies in the subsoil and of the space-time evolution of the interaction processes between targets and hosting materials have to be actually considered fundamental elements of primary knowledge in archaeological prospecting.
The main effort in geophysical prospecting for archaeology is therefore the integration of different, absolutely non-invasive techniques, especially if managed in view of a ultra-high resolution three-dimensional (3D) tomographic representation mode.
Following the above outlined approach, we have integrated geophysical methods which measure the variations of potential field (gradiometric methods) with active methods which measure the variations of physical properties due to the body's geometry and volume (GPR and ERT).
In this work, the results obtained during the surveys of three archaeological sites, employing Ground Penetrating Radar (GPR), Electrical Resistivity Tomography (ERT) and Fluxgate Differential Magnetic (FDM) to obtain precise and detailed maps of subsurface bodies, are presented and discussed. The first site, situated in a suburban area between Itri and Fondi, in the Aurunci Natural Regional Park (Central Italy), is characterized by the presence of remains of past human activity dating from the third century B.C. The second site is always in suburban area and is part of the ancient acropolis Etruscan town of Cerveteri (central Italy). The third site is part of Aizanoi archaeological park (Cavdarhisar, Kutahya, Turkey).
To have a better understanding of the subsurface, we performed a different integrated approaches of these data, which consists in fusing the data from all the employed methods, to have a complete visualization of the investigated area.
For the processing we have used the following techniques: graphical integration (overlay and RGB colour composite), discrete data analysis (binary data analysis and cluster analysis) and continuous data analysis (data sum, product, max, min and PCA).

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