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EM techniques for archaeological laboratory experiments: preliminary results

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The electromagnetic techniques (EM) are based on the investigation of subsoil geophysical parameters and in the archaeological framework they involve in studying contrasts between the buried cultural structures and the surrounding materials. Unfortunately, the geophysical contrast between archaeological features and surrounding soils sometimes are difficult to define due to problems of sensitivity and resolution both related on the characteristic of the subsoil and the geophysical methods.
For this reason an experimental activity has been performed in the Hydrogeosite laboratory addressed on the assessment of the capability of geophysical techniques to detect archeological remains placed in the humid/saturated subsoil. At Hydrogeosite Laboratory of CNR-IMAA, a large scale sand-box is located, consisting on a pool shape structures of 230m3 where archaeological remains have been installed . The remains are relative to a living environment and burial of Roman times (walls, tombs, roads, harbour, etc.) covered by sediments. In order to simulate lacustrine and wetland condition and to simulate extreme events (for example underwater landslide, fast natural erosion coast, etc.) the phreatic level was varied and various acquisitions for the different scenarios were performed.
In order to analyze the EM behavior of the buried small archaeological framework, ground penetrating radar (GPR) and electrical resistivity tomographies were performed. With GPR, analysis in time domain and frequency domain were performed and coupled to information obtained through resistivity analysis with the support of numerical simulations used to compare the real data with those modeled. A dense grid was adopted for 400 and 900 MHz e-m acquisitions in both the directions, the maximum depth of investigation was limited and less than 3 meters. The same approach was used for ERT acquisition where different array are employed, in particular 3D configuration was used to carry out a 3D resistivity model.
The integration of electric and electromagnetic data allowed us to overcome the limits of each technique, especially in terms of resolution and depth, in humid/saturated conditions was investigated and the effectiveness of three-dimensional acquisitions was studied to better explore archeological sites and reduce the uncertainties related on the interpretation of geophysical analysis.
The complexity of the relationship between archaeological features in the subsoil and their geophysical response requires efforts in the interpretation of resulting data.

Reference

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