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Preliminary results of the application of high-resolution geophysical techniques in the Sibari Archaeological Park (Southern Italy)

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During the last years, the application of non-invasive electromagnetic techniques for archaeological investigation became an almost usual tool to help the archaeologists to limit the areas to be excavated, in such a way to reduce the time and cost of archaeological campaigns. In this framework, high resolution techniques for data acquisition and processing procedures are increasingly applied in near-surface geophysics for archaeology. In fact, they provide non-destructive and broad range of application means of exploring for the archaeological purpose, especially because they are non-invasive and prompt techniques.

The most suitable geophysical investigation techniques employed for archaeological purposes are the magnetic method and the geoelectrical method. In particular, the joint application of electric and magnetic methods for the localization of buried structures has become a standard approach to solve some archaeological problems, because the electric method is applied to estimate the shape and the depth of buried structures, while the magnetic method is applied to detect the presence of buried objects characterised by a magnetic susceptibility contrast in respect of the surrounding ground or with a remnant magnetization.

We present the preliminary results of geophysical measurements campaigns aimed to the investigation of buried remains in the archaeological site of Sibari (Southern Italy). Since 2006 we started a systematic geophysical exploration in a wide area of the Sibari's archaeological park. Nowadays we have explored more than 120.000 sqm by the use of magnetic method. In some areas we carried out also 2D geoelectrical high-resolution tomographies to better estimate some uncertainness coming from the magnetic surveys. Where both geoelectrical and magnetic were available we attempted also an inversion procedures as in the following: the geoelectrical data were inverted by means of the standard RES2D inversion software, while for the interpretation of the magnetic data we applied a new tomographic inversion approach able to give information about the probability distribution of the magnetic dipoles in the investigated surface, as sources of the surface magnetic anomalies.

It is to remark that Sibari site presents a very difficult hydro-geological condition because the presence of a stable water table at depths often less than 1.50 m respect to the average depths of the archaeological targets (between 2.5m and 6m). These conditions severely limit both archaeological and geophysical explorations all over the Sibari area. In the early stage of our systematic exploration, we attempted also the use of the Ground Probing Radar (GPR) but due to the presence of the water table at very shallow depths, as expected, no results were obtained. For this reason taking into account the extension of the un-explored area, the time, the costs and the geological settings we choose to proceed the wide exploration with the magnetometry and to integrate its results with 2D geoelectrics in case of uncertainness.

The results obtained at this early stage of data processing confirm some archaeological hypothesis about the investigated areas and that the use of geophysical methods, especially in the case of wide extended areas, allows the archaeologists to reduce the time and the costs of their surveys especially in case of difficult geological conditions.