Remote sensing geoarchaeology of extensive sites

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Extensive archaeological sites are important archives of past human activities on timescales of centuries to millennia. These complex sites are the result of continuous settlement in areas that, for diverse reasons, proved to be particularly advantageous. If the settlement was vast and articulated in terms of productive, economic, political, and social organization, it resulted in the formation of proto-urban or urban sites. Sites hosting long-lasting human communities typically produce artifacts, buildings, and infrastructure, one strata over another representing the different cultural and functional phases. Specific sedimentary basins such as ditches, canals, wells, cisterns and sewer systems are often embedded in the archaeological stratigraphy and they can provide valuable information on the urban environment, including data on population diet and sanitary conditions.

However, the scientific investigation of such archaeological sites, typically extending for several to hundred hectares, can be difficult. Carrying out large, extensive excavations can be extremely resource-consuming and bring the need for detailed and costly post-excavation projects of analysis, conservation and exposition of the excavated artefacts and structures. Current scientific approaches tend to favour the application of non-invasive techniques, mostly remote sensing and, in more limited areas, geophysical prospection. Such methods are able to produce overall maps of a site, with varying degrees of uncertainty that can be assessed and controlled. In a following step, specific targets of interest can be aimed at through coring, trenches and small test excavations.

The PhD project focuses on the application of remote sensing to the geoarchaeological investigation of large archaeological sites. Some land cover and agricultural practices are known to provide better visibility than others. As well, climatic conditions may control the appearance of crop and soil marks in very short time windows of some days to few weeks. Exceptional weather configuration that change the average balance between precipitation and evapotranspiration, leading to, e.g., excessive soil humidity or dryness, can also control the punctuated appearance of geoarchaeological traces in remote sensing images. Main aim of the project is to understand how the visibility of archaeological and palaeohydrographic traces in multispectral images relates with the fluctuating ground conditions that are typical of cultivated terrains in temperate, mid-latitude climates.

The PhD student will process and analyze multispectral satellite and aerial images and LiDAR data from pre-existing data sets. She/he will manage the acquisition and processing of new images of selected sites with Unmanned Aerial Vehicles (UAVs), through flights carried out in different seasons and varying land use. She/he will carry out statistical analysis of weather data related to the periods of best visibility detected in archive images. She/he will carry out ground controls through field walking and coring. Where available, data will be contrasted with geophysical prospections and post-image-acquisition archaeological excavations. Study areas will comprise, but not necessarily limited to, major sites from the Venetian and Po plain and coastal area.

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