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Integrating GPR geophysical prospection and UAV's for the study of the Chã da Mourisca Neolithic Mound (Northwest Portugal)

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Abstract In this work we present an integrated study comprising a GPR (Ground Penetrating Radar) geophysical survey integrated with UAV's (Unmanned Aerial Vehicle) aerial photography, applied to the study of Chã Mourisca Neolithic mound, located in Ponte de Lima, NW Portugal. The North of Portugal is a mountainous region with hundreds of funerary megalithic mounds dating back from the Middle/Later Neolithic. This heritage is not fully inventoried, nor studied, and therefore susceptible of destruction due to urban, agriculture and forest expansion, roads construction or enlargements, etc. The excavation of this type of monuments is time consuming and its conservation or later valorisation for different purposes (educational, touristic, etc.) becomes a difficult task. The aim of this work is to study the mound internal structure, through the use of non-invasive technologies, in order to obtain relevant information about the monument architecture, which can be used scientifically and/or integrated into tourist-didactic projects. In this study photogrammetry by UAV enabled the accurate mapping of the mound and adjacent areas, with the production of high-resolution RGB orthomosaics and DSM's (Digital Surface Models). This data was useful for the topographic correction of GPR data and will allow the 3D modelling of the monument and surrounding areas. The GPR survey was conducted over the mound and adjacent areas, with parallel profiles acquired over a grid with 25 cm of separation. The equipment used was the GSSI SIR 3000 with a 400 MHz antennae. The data enabled the definition of the monument stratigraphy, its degree of perturbation, and was important to detect and map the location of the funeral chamber and the presence of a stone corridor and its geometry. The data obtained is an important auxiliary for the archaeological investigation, as resulting maps and other images, can be used to direct future excavations, or to digitally reconstruct the archaeological structures, without the need of excavation, and therefore test ideas about the past. The combination of these methodologies is inexpensive, and quick to perform in the field, and can be systematically applied in the knowledge, safeguard and valorisation of other prehistoric archaeological heritage.

Keywords Geophysical prospection, GPR, UAV, Neolithic Mound, NW Portugal