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EDITORIAL

“Olhares Milenares”

Foi o subtítulo escolhido para a exposição sobre os Ídolos peninsulares da Pré-História Recente. Uma exposição, idealizada por Primitiva Bueno Ramírez e Jorge Soler (seus comissários), que percorreu o MARQ, em Alicante, o Museu Regional de Madrid e está actualmente no Museu Nacional de Arqueologia em Lisboa (até Outubro), como que recreando antigas rotas e interações de larga escala que marcaram o 3º milénio a.C.. Uma exposição notável e que, sendo prejudicada pela pandemia que nos acompanha há ano e meio, conseguiu atravessá-la com inegável sucesso.

Evocada na capa e Editorial desta edição da Apontamentos por figurinhas oculadas antropomórficas e estilizadas dos Perdigões, esta exposição reuniu pela primeira vez um conjunto assinalável de peças de várias regiões de Espanha e Portugal. Objectos que falam ao grande público sobre antigas cosmologias do Neolítico, sobre as suas visões do mundo partilhadas, ao mesmo tempo que mostra a sensibilidade estética e a qualidade técnica destas comunidades.

Os Perdigões estiveram nela muito bem representados, com 16 peças (figuras antropomórficas, ídolos almerienses, betilo oculado, báculo, recipiente com decoração simbólica), sendo um dos expoentes da “participação portuguesa”.

Um momento marcante da investigação e da divulgação da Pré-História Recente peninsular.

António Carlos Valera

VARIOUS CONSIDERATIONS ON THE APPROACH TO THE TOPOGRAPHY OF THE ARCHAEOLOGICAL COMPLEX OF PERDIGÕES (REGUENGOS DE MONSARAZ, PORTUGAL)

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Resumo:

Várias considerações sobre a abordagem à topografia do Complexo Arqueológico dos Perdigões (Reguengos de Monsaraz, Portugal)

O trabalho de microtopografia realizado no Complexo Arqueológico dos Perdigões (Reguengos de Monsaraz, Portugal), por uma equipa da Universidade de Málaga (UMA), produziu uma poderosa ferramenta cartográfica ao serviço da gestão da sua informação arqueológica, permitindo o aprofundamento da análise geográfica do sítio, do impacto de recentes construções, do diagnóstico do estado de preservação actual e do seu potencial para a investigação futura.

Abstract:

The microtopographic work carried out at the *Complexo Arqueológico dos Perdigões* (Reguengos de Monsaraz, Portugal), by a team from the University of Malaga (UMA), yielded a powerful cartographic tool serving to manage its archaeological data, leading to deepening the geographic analysis of the site, assess the impact of recent construction work, diagnose its current state of preservation and evaluate its potential for future research.

1. Introduction

The University of Malaga (UMA) has from 2008 to 2016 carried out a number of archaeological activities at the archaeological complex of *Perdigões* (Reguengos de Monsaraz). These include geophysical surveys (Márquez-Romero *et al.* 2011), extension excavations and several trial trenches in Sector L (Suarez-Padilla *et al.* 2014; 2015). The 2011 campaign, following one of the general objectives of the initial collaboration between the UMA and the *Programa Global de Investigação Arqueológica dos Perdigões* (INARP), focused on an exhaustive micro-topographic survey of the entire site (Márquez *et al.* 2008). This more precise topographical mapping not only served the needs of the UMA but all the site's future research projects³. This article presents the method applied by the UMA surveyors and archaeologists as well as several Digital Terrain Models (DTM) gleaned from the new topographic data. It likewise offers a list of considerations as to the heritage of the site garnered from reconstructions of its palaeo-terrain.

2. Methodology

The micro-topographic project carried out at the site benefitted from two prior lines of action. The first was a campaign of high-quality aerial photographs conducted in 1997 (Lago *et al.* 1998a) leading to a topographic map with one meter equidistant contour lines (Lago *et al.* 1998). The second consisted of geophysical surveys in 2008 and 2009 serving to map the site's underground anomalies (Márquez-Romero *et al.* 2011). In spite of these records, it was necessary to go further and develop a more precise microtopographic survey to assist both spatial analyses in the short term and future medium and long-term patrimonial actions.

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² Topographical Engineers

³ The DWG autocad georeferenced digital micro-topographic files as well as the orthophotos of the 2011 campaign were made available to the NIA of the ERA for free creative common use.

The topographic work was divided into several phases of field and laboratory work. A digital photogrammetric flight was undertaken in June 2011 by Municipia, EM, S.A., a Portuguese company specialised in capturing information through high-resolution images. Their aerial photographs served to develop a continuous orthophoto of the area at a very high resolution (5 cm. Pixel size) (Figure 1). This orthophoto was indispensable to the second phase of the project.

The next phase consisted of measuring the position of the support points in the field, a task necessary to align the new photogrammetric data with existing records. This was carried out by aligning the Perdigoes points with respect to the main regional geodetic vertices. The tools serving for this task to complement to GPS readings were a Topcon, HiperPro GPS with a precision of one centimetre (to collect the vertices and support point data) and a Topcon GPT 6003 total station with an angular precision of 10" and a measurement of distance of $\pm (2 \text{ mm} + 2 \text{ ppm})$. The measurements of each of the support points were complemented by listing the coordinates on a technical sheet, photographs and field sketches (Figure 2).



Figure 1 – Orthophoto of the Perdigoes complex (UMA, campaign of 2011).

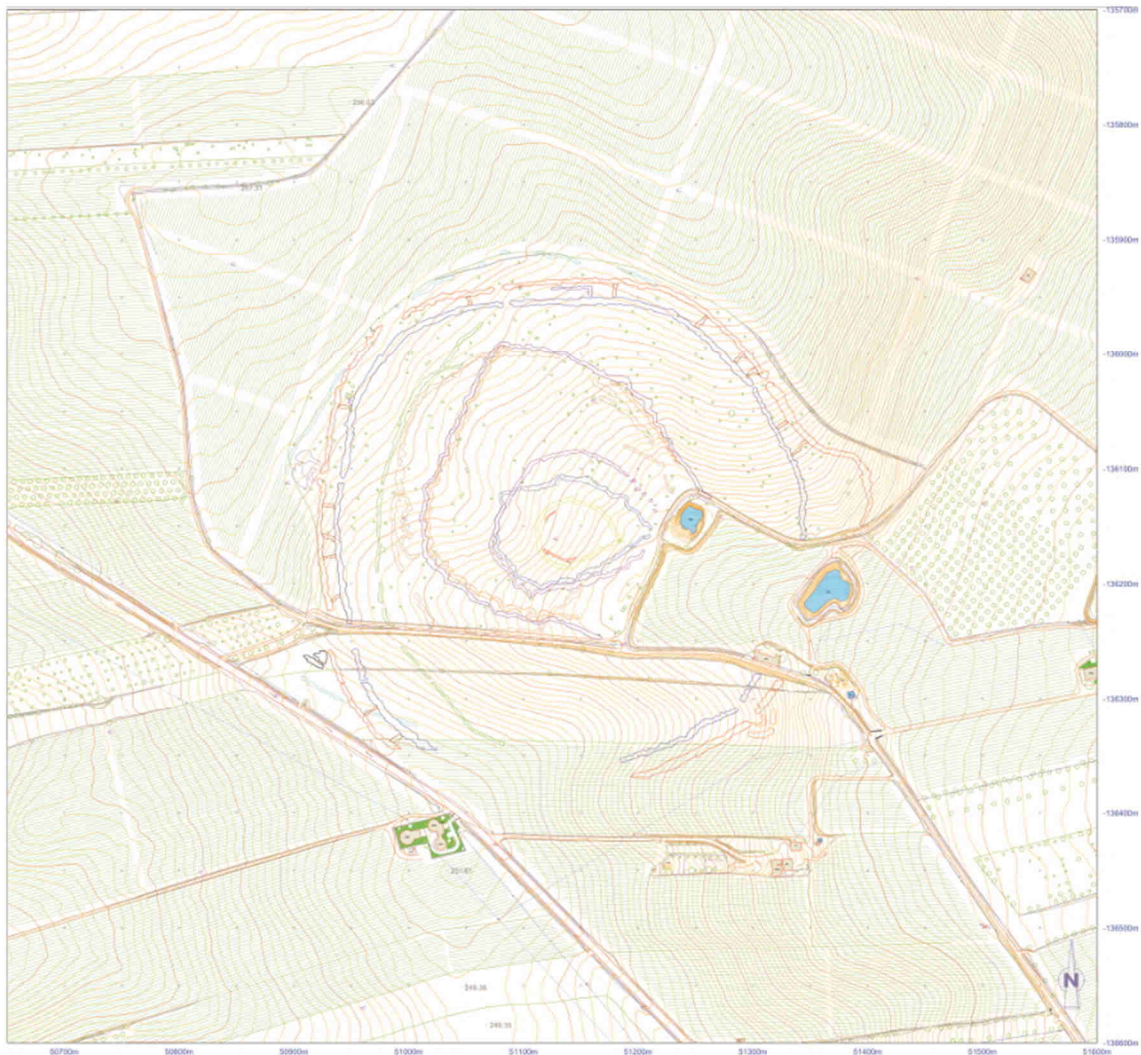


Figure 2 – Microtopography of the Perdigoes complex with contour line intervals of 50 cm and location of the main prehistoric enclosures (UMA, campaign of 2011).

Three geodesic vertices (Pego Lobo, Ramo Alto and Pipas 1) served to connect site's aerial photographs and topographical measurements with the Portuguese cartographic system.

The photogrammetric draft was then cleaned and redrawn generating a new digital cartographic map of the site made up of a tighter network of contour lines (spaced every 50 cm). This map and its corresponding orthophoto and hybrid models is

3. Topographic analysis

The main topographic characteristic of the Perdigões complex is its altimetric uniformity. Its very smooth relief renders it very arduous to observed geographical differences. Graphic studies of terrains characterised by little slope, as is this case, require techniques to enhance their orography. A technique put to use here consisted of manipulating the 3D view gleaned from the aerial images by increasing the vertical scale data both 5 and 10 times to highlight even the slightest elevations of a few metres over a distance of hundreds of metres. This yielded a model of the site characterised by a gradual eastward leaning ravine flanked by a series of gentle mounds to the N, W and S, and two spurs bordering the ravine to the E.

The densification of the contour lines reducing their intervals from 50 to only 10 cm also led to generating a very precise likeness of the relief highlighting the irregularities of the terrain. The new enhanced ground plan clearly reveals the gradual eastward sloping valley cited above, flanked by a series of low mounds, and two bordering spurs (Figure 3).

4. Reconstruction of the site's palaeo-terrain

The micro-topographic survey also served to map the palaeo-terrain of the site, that is, the form of the terrain's surface in prehistoric times. This consisted of first identifying the modern features (vehicle tracks, boundaries, crops, water tanks) whose fills or diggings over the years, in one way or another modified the original terrain. The result was surprising as this view offers compelling first-rate data applicable to patrimonial aspects of the site.

The new map in the first place reveals that the recent constructions threatening the site's buried features are relatively few and they did not affect about three-quarters of the site's surface. This specifically relates to the parcels owned by Finagra S.A. corresponding to a vast area where the geomagnetic survey carried out in 2009 yielded vital archaeological data. Thus, the only relevant modification to this area is the E-W track (c1) exiting the town of Reguengos de Monsaraz and crosses the interior of the site. This track in fact separates a portion of the site to the south (in the form of an arch) from its larger remaining area.

Other greater modifications, on the other hand, were observed in the site's southeastern quadrant (Figure 4). This corresponds to a sector where the owners did not grant access to our teams impeding field work and geomagnetic survey. It is an area clearly delimited by the layout of track c2 which at its junction with c1 proceeds to the NE and before abruptly turning to the SE forming a very well defined quadrangular space. Inside this perimeter, currently serving for agricultural

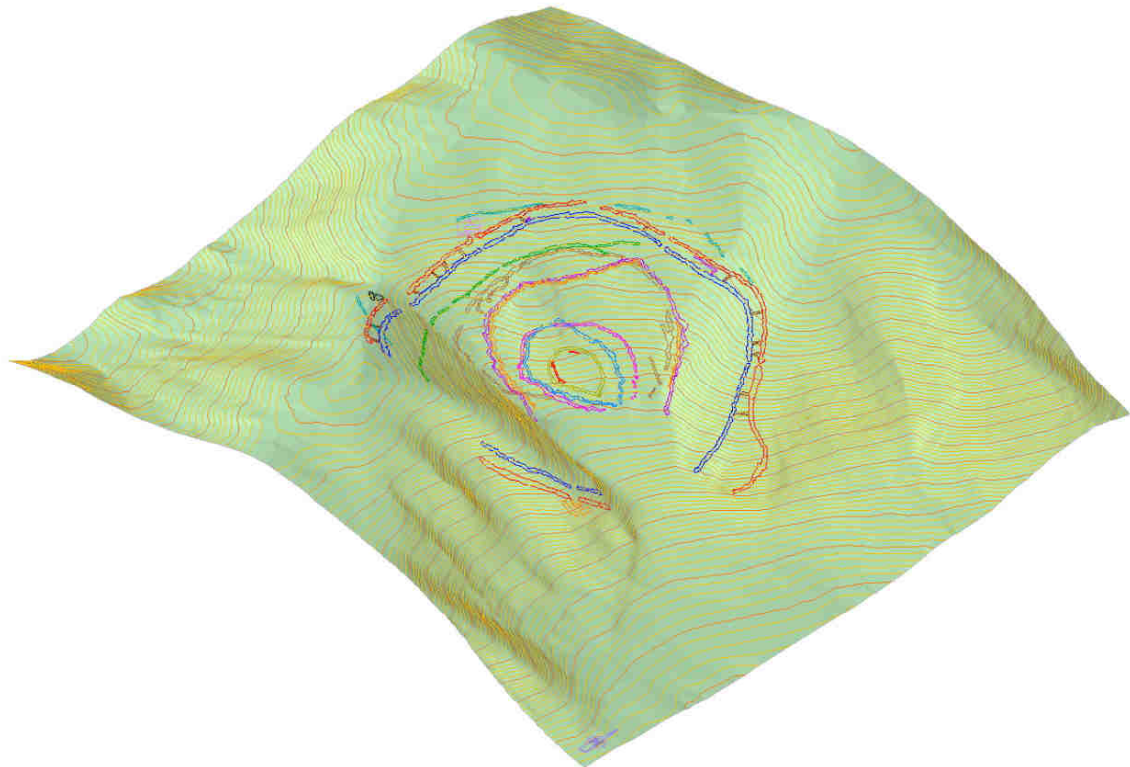


Figure 3 – Digital terrain model (DTM) of the Perdigões complex and its prehistoric enclosures generated by enhancing its data height 5 times.

work, the owners dug two water tanks (b1 and b2). The smaller of the two (b1) is adjacent the abrupt bend of track c2 while the larger (b2) is farther to the SE.



Figure 4 – Detail of the southeastern sector of Perdigões where the main recent constructions (tracks, water tanks, embankments) are concentrated.

It is compelling that the perception from ground level of the southeastern sector is misleading when observed from track c2, the road that delimits the parcels of the different owners. This impression is erroneous because the observer assumes that track c2 corresponds to the terrain's original level which leads to interpreting the abrupt gradient (forming a sort of large step separating the two properties) to be the result of a deep excavation in the parcel with the two water tanks. If this were the case, then this work would have destroyed the subjacent archaeological layers.

Hence the first step to assess the real effect of the modern remodellings was to draft a theoretical profile to determine the original level of the terrain. This profile (Figure 5, nº 9-10) was aligned along the slight W-E slope of the ravine observed in the micro-topographic map. It took into account track c2 as the original level of the terrain and the adjacent terrains. This was followed by generating a series of topographic sections or profiles oriented parallel and perpendicular to the first main theoretical profile (Figure 5) in order to verify the supposed continuity of the original terrain and detect potential extractions and fillings that could have modified the sector's orography. It must be noted that the term extraction as any mechanical or manual action lowering of the surface of the original terrain, whereas a filling or embankment raises the surface.



Figure 5 – Position of the different sections serving to evaluate the modifications to the palaeo-terrain in the southeast sector of Perdigões.

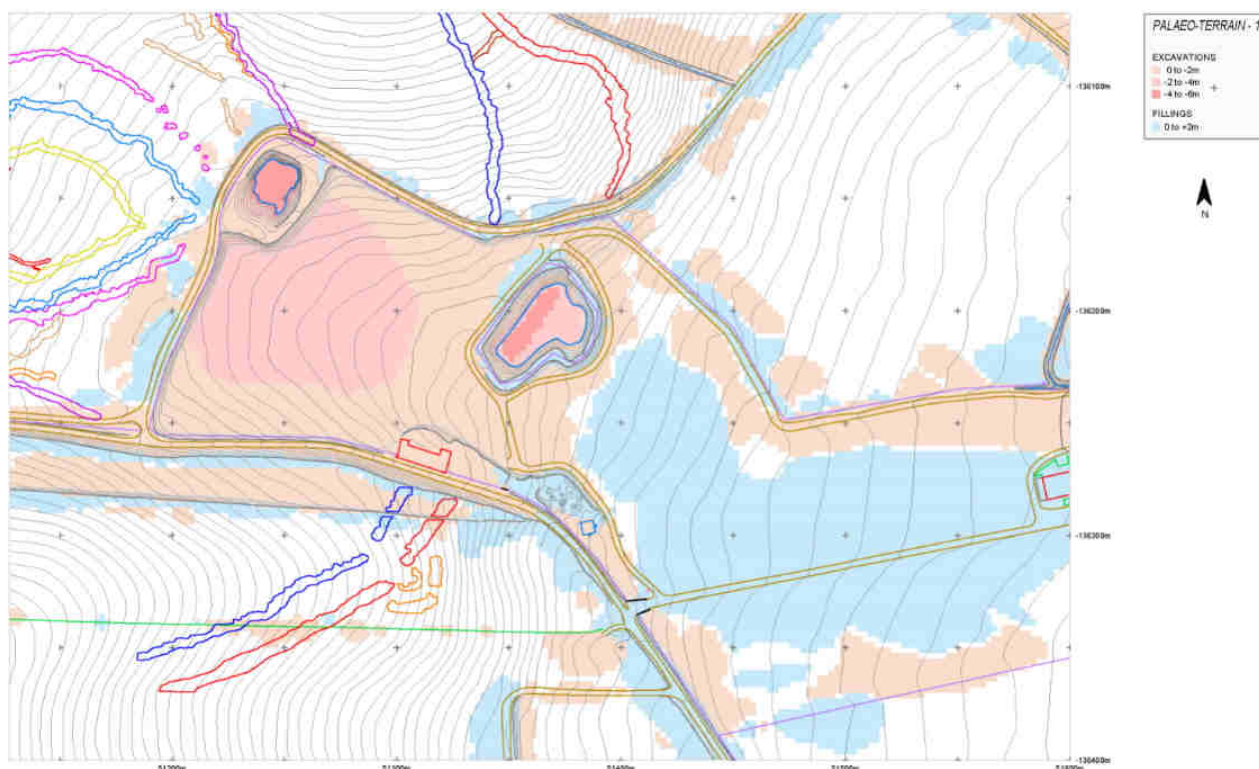


Figure 6 – Map indicating the position of the recent levellings and fillings in the southeastern sector of Perdigões.

The information gleaned from these sections led to a considerable rectification of the theoretical profile of the plot with the water tanks. This led to generating a new DTM revealing clear differences between the quantity of earth moved during the digging of the water tanks and raising of their embankments. And what is of great interest regarding the site's preservation is the evidence indicating that the depth of the moderns excavations is less than previously thought, and that the small volume of earth displaced up the ravine generated an embankment which served as the base of the track. The track therefore never corresponded to the real level of the terrain.

Furthermore, an estimation of the volume of earth of the diggings and fillings serving to fashion the water tanks and their surrounding features confirmed the great mismatch between the volume of material extracted and filled with that recorded on in the plot. This led to designing a map to accurately reflect the amount of earth moved at each point.

This plan reveals that the excavations of the water tanks attained depths of between 2 and 6 m and that the earth from the plot's remaining area was only dismantled to a depth between 0 and 2 m (Figure 6). The first inference is that the earth extracted was intended, as already indicated by the topographic profiles, as fill for track c2, which yielded the false presumably "natural" step. Secondly, and more important, the volume of extracted earth from the neighbouring parcel is

much less than that perceived while at ground level. These indications therefore suggest that the site in this area suffered much less deterioration than initially thought. This new hypothesis could be verified by a test trench adjacent to the track to confirm the presence of a fill and the level of the original terrain. Moreover, if this micro-topographic study confirms the conservation of the original surface, then the heritage value of Perdigões increases significantly as 100% of it can be recovered in the near future.

FINAL CONSIDERATIONS

The value of the *Complexo Arqueológico dos Perdigões* is beyond doubt. The knowledge it offers to the understanding of the Prehistory of both Portugal and the Iberian Peninsula justifies applying a combination of traditional and novel technologies, as well contributions by different types of researchers. The micro-topographic work by the UMA presented here is just an example of this interdisciplinary work. Furthermore, the reconstruction of the palaeo-terrain offers data suggesting that the site is very well preserved, even in the private plots previously deemed lost to research. This bolsters the patrimonial value of a complex that is already declared as a site of national heritage (Valera 2017), and should encourage administrations to pursue its protection and the recovery of the private plots where archaeological research has not been possible.

Acknowledgements

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