

Investigating the Mount Oxa

Archaeological and technological methodology's adaptation to complex contexts

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Introduction

The paper presents an overview of the main research activities undergoing on a hardly accessible mountainous site in Eastern Crete (Greece), the Mount Oxa, in the framework of the homonymous archaeological research project. Particular focus is given to the employment of digital technologies, their adaptation to complex contexts and how this technological adaptation affects and is affected by ad hoc methodological approach to peak sites.

Main pillars of the research project have been so far: remote sensing, surface survey and GIS-based spatial analysis. Although these are not new technologies neither new entries in modern archaeological research, the geographical background and the environmental parameters associated with the hostile and isolate character of the site imposed specific documentation strategies, selection of specific equipment and methods adaptations. For instance, remote sensing consisted of the integration of satellite imagery analysis, aerial archaeological survey and drone-aided photogrammetry, while surface survey was undertaken with differential-GNSS systems to map each single find in place; remote sensing material was then employed for the creation of high-resolution digital elevation model which was instrumental for the GIS spatial analysis.

Mount Oxa project just closed its third year of research and although this preliminary phase was devoted to the documentation of the current status of the site, still a lot needs to be discovered in digital curation and field activities, and challenges still need to be overcome. Nevertheless, the preliminary results contribute to shed new light on a barely known and under-explored mountain archaeological site.

The archaeological research project

On the Northern coast of Crete (Greece) is located the largest bay on the Greek islands, Mirabello Bay, at the point where the island is the narrowest. The western edge of this bay is defined by the Mount Oxa, a narrow and long mountain (about 500-600 m in length and 50-100 m in width) with steep hillsides and a rugged topography crowned by steep and rocky cliffs (Fig 1).

The natural setting of this overlooking mount, makes it a natural stronghold which often served as a refuge for the population of the surrounding areas across time, as attested from prehistory (Wallace and Mylona, 2012) to byzantine times in other mountainous sites on the island (Fig.2). The prominent location of this particular peak makes it an excellent observation post for controlling the surrounding area and more specifically the whole Mirabello bay to the South-East and the town of Elounda (ancient Olous) (Fig. 3).

Declared as archaeological site in 1976 (Government Gazette (ΦΕΚ) 699 / B / 26-05-1976), Mount Oxa is little known to the scientific community so far. Indeed, due to the steepness of its landscape, no systematic archaeological research has been carried out at the site. Furthermore, only few bibliographical references could be found about Oxa and they mainly deal with the natural defensive character of the location and the possible existence of Classical or Hellenistic fortification (Coutsinas, 2013). As matter of fact, the extant archaeological remains on the summit of the mountain, made up of a fragmentary preserved fortified circuit

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wall, water towers, cisterns and numerous buildings, are possibly dated to the Byzantine centuries and more specifically to the end of the Early Byzantine period.



Fig 1. Aerial photograph of the Mount Oxa with its numerous water reservoirs and the orthodox chapel (roofed structure in the centre of the frame). (Ph: G. Cantoro - © Mount Oxa Project).

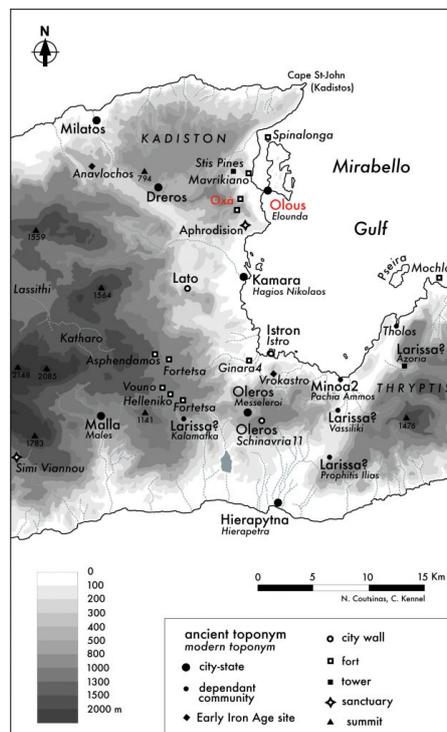


Fig. 2. The Mirabello Bay on North-Eastern Crete, Greece. In red the location of Mount Oxa and of Elounda (ancient OIous). (© Nadia Coutsinas)

In 2017, the “Mount Oxa – Archaeological Research Project” was build up with the joined effort of the Institute for Mediterranean Studies (Foundation for Research and Technology Hellas, Greece) and the Ephorate of Antiquities of Lassithi (Hellenic Ministry of Culture, Greece). Main focus of the project was the investigation of this under-explored area of the Cretan Mountains with the aim to understand the function, form and character of a fortified space in the island using a range of innovative interdisciplinary approaches.

The objectives of the Mount Oxa project included:

- The documentation, mapping and thorough study of surface findings;
- The investigation of the connection between settlement patterns, political authority and economy;

- A comparative study of Mount Oxa with similar sites to move from the local to the regional and, eventually, to the inter-regional context;
- The preservation and protection of the archaeological site of Oxa from future interventions;
- The establishment of a conceptual framework for the discussion and holistic examination of the fortified sites in Crete as a whole.

As said, the investigation of the above aspects and objectives required quite some adaptation to the specific geographic and micro-topographic conditions.

Methodological and technological adaptations

In order to better understand the different phases of the site's occupation and, possibly, the various functions of the space in the long term (fortification, habitation, religious monuments, pastoralist, agricultural or artisanal activities), the surface survey was undertaken with the use of GNSS system. Indeed, given the specific micro-topography, a traditional gridded survey could not be undertaken, but it would have provided a distorted clustering of heterogeneous materials. On the contrary, the possibility to record the exact position of each find (on a surely eroded but limitedly human-disturbed surface) provided a better picture of ceramic distribution. Obviously this approach could be undertaken because of the manageable number of surface finds and because of the almost complete absence of high vegetation and trees' coverage, which would otherwise impede the employment of differential GNSS systems.

The same system was also employed for the documentation and mapping of the main architectural remains on the Mount Oxa. When specific areas of buildings were hardly accessible, in danger of collapsing or too close to the steep slopes, their documentation was achieved with the use of high resolution low-altitude images. This operation, nowadays quite routinary in most archaeological (and not only) contexts, became more challenging because of the gusty strong wind which is typical of abrupt mountains' top. Indeed, the absence of ideal conditions for safe flying with unmanned system over large areas (i.e. with autopilot for planned grid area survey), imposed the collection of aerial images in small groups and for limited areas, to be merged and processed in blocks of rapid flights (also to minimize the presence of blurry images due to shaking camera).

Peaks, and Mount Oxa specifically, can also be considered as "bridges" because of their capabilities of putting in communications two worlds. Indeed, while defensive works, walls, towers, *phryctoriae*, cisterns constitute the material monumentality of the mountainous landscape, by being the static remains of periods of intense militarization of the highlands, they also work as hubs for the emission of visual signs based on inter-visibility, connecting the mountainous sites, interweaving a highly dynamic control system of both highlands and lowlands (Fig. 3). Such localized and interconnected complexity can be better visualized and analysed through aerial remote sensing. Hence the integration of satellite imagery, aerial archaeological survey and high resolution low-altitude photographs (Cantoro et al., 2015).

Ultimate goal of the project is two folded: from one side the promotion of under-explored site with great potential and from the other the protection of its nature for the future. The latter is indeed a crucial element since the neighbouring area of Elounda attracts the major wave of tourism development on Eastern Crete with predictable consequences on landscape and local economy modifications.

Acknowledgments

The surface survey at Mount Oxa started in 2017 under the auspices of the Byzantine and post-Byzantine Department of the Ministry of Culture and Sport. This deliberation granted the permission to the Ephorate of Antiquities of Lassithi to begin a new surface survey on Mount Oxa in collaboration with the Laboratory of Geophysical Satellite Remote Sensing and ArchaeoEnvironment at the Institute for Mediterranean Studies (FORTH), in a program articulated in three years (2017-2019).

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Fig. 3. Panoramic view from Mount Oxa over Elounda and the Mirabello bay to the East. (© Mount Oxa Project)