Original Study

Francesca Buscemi, Marianna Figuera*

The Contribution of Digital Data to the Understanding of Ritual Landscapes. The Case of Calicantone (Sicily)

https://doi.org/10.1515/opar-2019-0029
Received February 28, 2019; accepted September 9, 2019

Abstract: P. Militello (University of Catania) and A. M. Sammito (Superintendence of Cultural Heritage, Ragusa) directed excavations around a necropolis of at least 90 rock-cut tombs at Calicantone (RG) in south-eastern Sicily, which until then had only partially been investigated. As well as providing new archaeological data about the corresponding village in terms of its area, the research team also discovered the remains of an isolated bi-apsidal hut dated to the late Sicilian EBA (XVIIth–XVIth century B.C.). The hut is presumed as a funerary building primarily intended for the preparation of corpses for burial. Its position, directly between the village and the necropolis, demonstrates its crucial role in the sacral landscape, while spatial distribution analyses indicate that other commemorative rituals were conducted in specific spaces in, and around, the actual tombs. The paper presents a reconstruction of the ancient cultural landscape highlighting the possible passageway that connected life in the village with death in the necropolis, through the interceding funerary hut, and the location of potential ritual areas in the necropolis. Digital spatial datasets and visualization tools (e.g. topographic maps, shaded Digital Elevation Model (DEM), visibility analyses, 3D virtual models, animations, etc.) proved to be fundamental in the reconstruction of funerary activities.

Keywords: Bronze Age, Sicily, Funerary Landscape, 3D Virtual Models, Visibility Analysis

1 Introduction

Calicantone is an archaeological site set along the gorge of Cava d'Ispica in south-eastern Sicily. It is known for its Early Bronze Age necropolis, which was later reused in the Medieval period (Picone, 1975, 2006; Rizzone & Sammito, 1999, pp. 37–56, 2002, pp. 137–144, 2010, pp. 49–64; Messina et al., 2019).

In the recent years (2012–2015), excavations directed by the University of Catania and the Superintendence of Cultural Heritage of Ragusa have revealed a Bronze Age hut near the necropolis, and have also led to the determination of the area covered by the corresponding prehistoric village (Militello & Sammito, 2014, 2015, 2016; Militello, 2015; Militello et al., 2018a; Militello et al., 2018b).

These new discoveries provide a more complete picture of the organization of a Bronze Age settlement and a deeper understanding of how the physical characteristics of the landscape would have shaped the relationship between the realm of the living and that of the dead.

Article note: This article is a part of the Special Issue on Unlocking Sacred Landscapes: Digital Humanities and Ritual Space, edited by Giorgos Papantoniou, Apostolos Sarris, Christine E. Morris & Athanasios K. Vionis

***Corresponding author: Marianna Figuera,** DISUM (Dipartimento di Scienze Umanistiche), University of Catania, via Biblioteca 10, Catania, 95124, Italy, E-mail: mariannafiguera@hotmail.it
Francesca Buscemi, CNR-ISPC (Istituto di Scienze del Patrimonio Culturale) Catania, via Biblioteca 10, Catania, 95124, Italy, E-mail: francesca.buscemi@cnr.it

A 1970's surface survey covering approximately 0.6 ha uncovered six hearths and a certain density of pottery fragments and lithic materials, and revealed the location of the village on the raised section of a plateau (Picone, 1975; Rizzone & Sammito, 1999; Militello et al., 2018b, p. 260). Some structures were identified during the survey. However, they were lost later in modern building activities.

The main set of tombs extends over a 100×200 m area along the rock face of the gorge, which presents several ledges along its steep descent from the plateau (397 m a.s.l.) to the valley floor (299 m a.s.l.). There are 93 rock-cut chamber tombs (Fig. 1), many of which had suffered looting early in their history, but nonetheless retain some evidence of their prehistoric layers. The tombs consist of one or two rooms (the antechamber and the funerary chamber), often with an external courtyard (Fig. 2; online supplementary material), and same examples had façades with decorations or frames.

Figure 1. Calicantone. The rock-cut chamber tombs of the necropolis.

Figure 2. Tomb 69. Plan and framed façade.

The funerary complex dates to the middle and final stage of the Sicilian Early Bronze Age, with the C14 analysis of the bones from tomb n. 86 (led by Prof. Marek Krąpiec, Lab. of Geology and on Human Bones Geophysics of Cracow) indicating a chronological range between 2148 and 1744 B.C. (4098–3694 cal. BP 2σ). This chronology is consistent with the types of pottery found in the tombs (hourglass beakers, one-handled jars with a slightly biconical body, carinated cups and conical cups) (Militello & Sammito, 2014, p. 110; Militello et al., 2018b, pp. 269–271).

The hut, located in the higher sections of the plateau between the necropolis and the village, witnessed two architectural phases (Militello et al. 2018b, pp. 274–280) (Fig. 3), the second of which, saw its enlargement and the addition of two apsidal endings (12.5×4.5 m). The destruction of the building is dated to the final phase of the EBA, 1570±70 Cal. B.C. (3852–3547 cal. BP 2σ) according to the C14 analyses conducted on three human bone samples taken from the hut (Fig. 4). This estimate is confirmed by the rich and abundant pottery found in the hut, including dippers, high-pedestal vases, hourglass beakers, handleless bowls, ollae, juglets and pithoi, chronologically dated between the cultures of Castelluccio (EBA) and Thapsos (MBA) (III^rd^ and IV^th^ phase in the classification of Cultraro, 1996, p. 168, 2004, p. 106, 2007, pp. 64–69) (Militello et al., 2018b, pp. 281, 287).

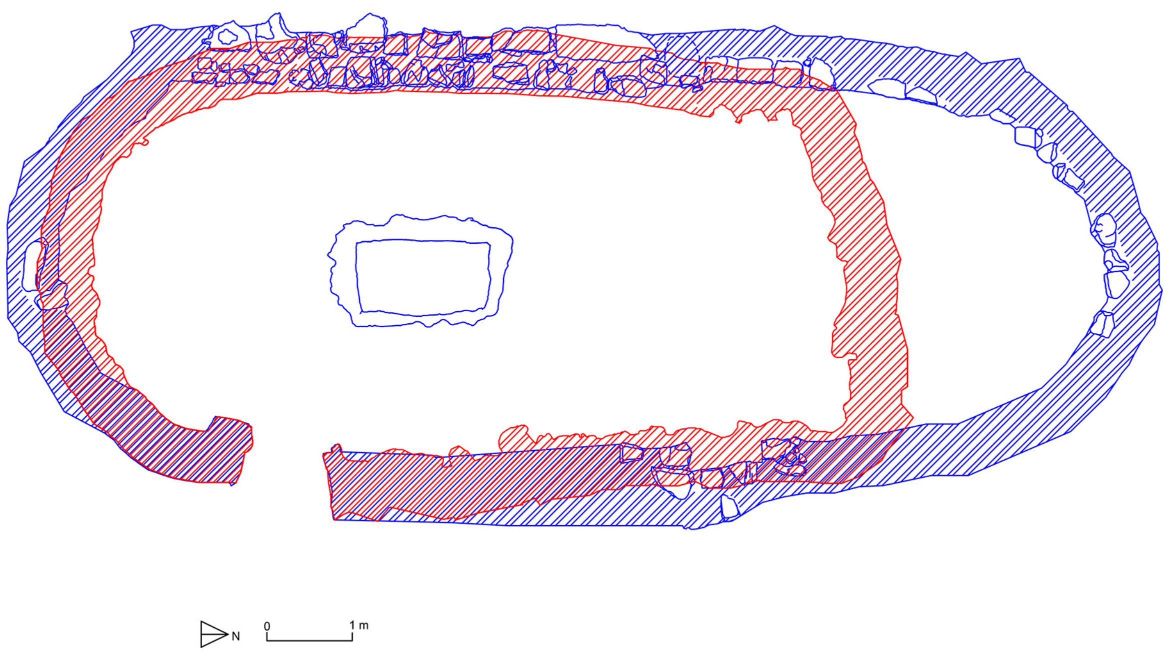

Figure 3. Calicantone. The two phases hut.

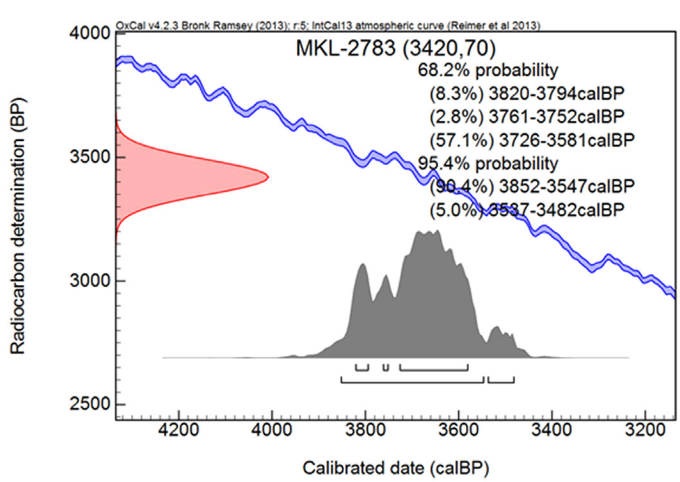

Figure 4. Calicantone. The C14 analysis of the individual n. 29 from the hut (sample n. MKL-2783). Chronology: 1570 ± 70 Cal. B.C. (3852–3547 cal. BP 2σ).

Even if the Calicantone settlement is comparable with other Bronze Age settlements in Sicily, some aspects render it unique. While both the Castelluccio (Voza, 1996, 1999; Voza & Crispino, 2014; Crispino, 2016) and Tornambé (Giannitrapani, 2013; Giannitrapani et al., 2014) sites represent articulate settlements with a village and/or monumental hut and necropolis, there are some aspects such as certain architectural features, the funerary function of the hut, and elaborate decoration of the vessels that render Calicantone unique in Sicily (Militello et al., 2018b, pp. 274–280, 287). However, the plan of the hut is comparable with other bi-apsidal or rectangular structures with rounded angles (Militello et al., 2018b, pp. 277–280) such as Manfria (Orlandini, 1962), Mursia in the 1st and 2nd phases (Ardesia et al., 2006; Nicoletti, 2009; Nicoletti & Tusa, 2012; Cattani et al., 2016), Tornambé (Giannitrapani, 2013, pp. 72–73), and Castelluccio.

The hut was either deliberately destroyed or levelled in an earthquake, provoking several deaths (at least 11 skeletons were unearthed inside) (Fig. 5) (Militello et al., 2018b, pp. 294–296) and sealing its rich assortment of furniture under a layer of earth, stones and even pottery that probably fell from niches and scaffolding around the external wall when it collapsed. Most of the wall stones have disappeared due to modern agricultural activity in the area.

The sudden destruction of the hut is evidenced by tell-tale signs in the skeletons, such as burned or crushed bones, composed bodies, and the various positions and orientations of the dead.

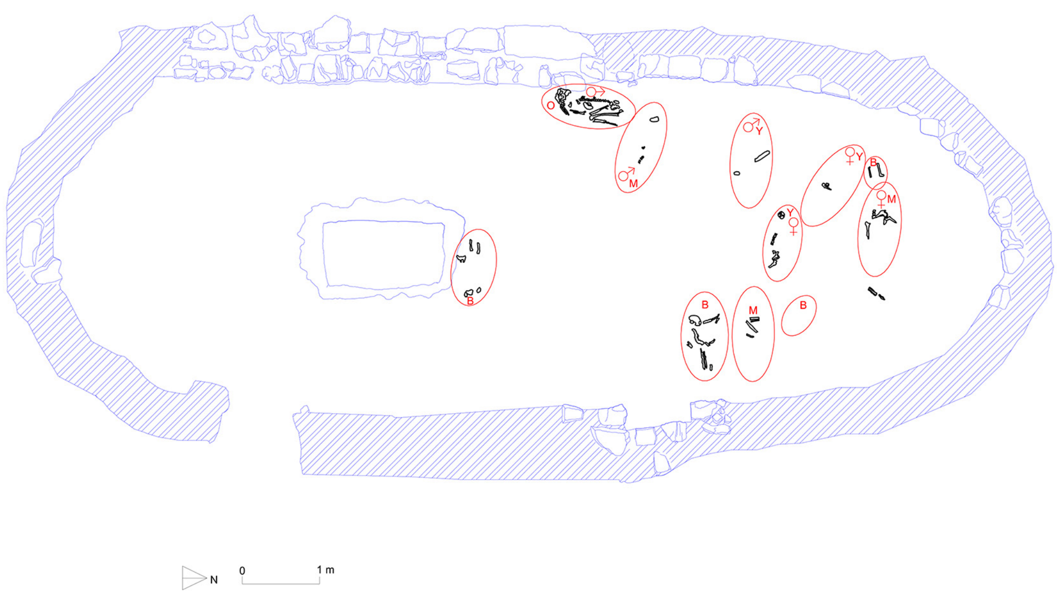

Figure 5. Calicantone. Distribution of the best-preserved skeletons. When possible, the gender and the age (B: Baby < 20 years; Y: Young adult 20–30 years; M: Mature adult 30–40 years; O: Old adult > 40 years) were indicated.

One skeleton of a baby at the center of the hut differed from the others: it lays supine in a relatively tidy arrangement by a shallow basin with a nearby pedestal vase, miniature one-handled dipper with painted decoration, and andiron, seemingly destined for communal ritual use associated with the preparation of the body for burial. This theory is further supported by the coarse lime plaster material of the basin suggesting that it contained a liquid other than water, and the spindle-whorls without loom-weights also found near the infant, which were perhaps used for stitching leather. The complexity of already dead specimens mixed with spontaneous victims in the same structure is reminiscent the Minoan building of Anemospilia at Arkhanes (Crete) (Sakellarakis & Sakellaraki, 1992; Müller Celka, 2016).

The geomorphology of Calicantone is particularly relevant for the study of the settlement dynamics and funerary practices. Digital research activities were carefully planned in order to manage several complexities, including various archaeological evidences (Fig. 6), each with their own documentation requirements. A gathering of digital data was fundamental for the core archaeological surveying and digging activities.

Therefore, this paper focuses on two aspects: the first concerns the identification of a ritual funerary space covering the entire cemetery and the area around it, while the second relates to the role of digital tools in surveying, understanding and communicating this authentic "funerary landscape".

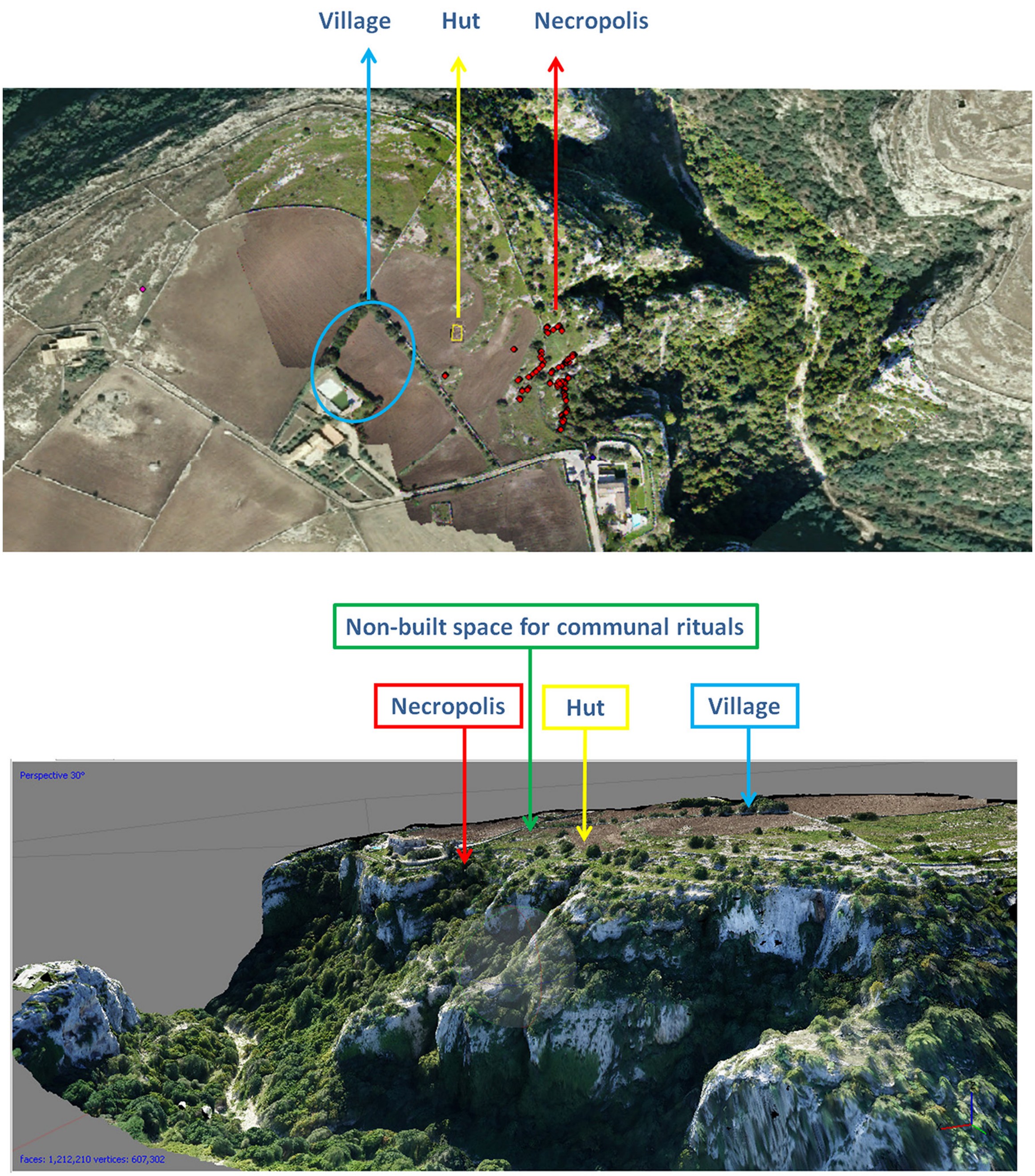

Figure 6. Calicantone. Ritual landscape: distribution of the archaeological evidences.

2 Calicantone. Digital Documentation for a Landscape Approach[1]

Recent discussions surrounding archaeological landscapes have moved on from musing over the meaning of "landscape", once at the center of the debate between processual and post-processual criticism (Fleming, 2006). The question of whether "landscape" should be interpreted as a paleoenvironment, a natural framework of human interaction, or as traces of ancient settlements and activities in modern spaces (Francovich & Patterson, 2000; Fleming, 2006; Thomas, 2008; Cambi, 2011; Burgers et al., 2016; David & Hamacher, 2017; Volpe, 2019), has finally been replaced by other considerations. An emphasis is now placed on the complexity of landscape, from the notion of landscape archaeology as an "archaeology of complexity and of relationships" (Brogiolo, 2007, 2014) to the recent definition of the landscape as "the context of contexts" (Carandini, 2017).

From a surveying perspective, the simultaneous employment of several data collection techniques is a challenging aspect of research and represents a component of "landscape archaeology" (Renfrew & Bahn, 2016; Parcak, 2017).

The reconstruction of an ancient landscape, as it was perceived by its inhabitants, is an aspect that has instead been the subject of less attention, especially with respect to the Prehistoric and Classic periods. This branch of the cognitive archaeology (Coolidge et al., 2015) is not as consolidated as topographical and spatial analyses, but nevertheless plays a fundamental role in the interpretation of past cultures.

As previously indicated, "*cemeteries are integral part of the social landscape, but their appearance and the psychological relation with the world of the living can be very different, starting from the ideological relation which each society has with the death*" (Militello et al., 2018a, pp. 392–393). Burials can be located inside dwellings and urban landscapes (home burials), or situated in separate cemeteries, so the relationship between the abodes of the living with those of the dead can range from high integration to total segregation (Militello et al., 2018a, p. 393).

Our work in Calicantone considers all these aspects in the endeavor to provide insight into how the funerary landscape might have appeared and how it may have been perceived.

2.1 The Territorial Scale

In terms of territorial scale of the analysis, the goal of the graphical documentation is on one hand, to create a basis for scientific analysis of the settlement, the necropolis, and the distribution of human actions at the site, while on the other hand, to reconstruct a space where virtual reality could be hosted and developed.

Our attention focused on the following aspects of the archaeological landscape:

- the extraordinary impact of the natural environment, characterized by certainly permanent morphological features that are effectively independent of any historical time frames;
- the peculiar topography of the site: a deep and extensive gorge with a substantially flat area around the hut and a steep slope along which the cemetery winds (Fig. 6);
- the rock-cut tombs.

Three outputs were generated: a topographic map, a 3D model and a shaded Digital Elevation Model (DEM).

The topographical elaboration (Fig. 7) presented some initial difficulties due to the lack of cartography in sufficiently small scale. In our case, the only available map was the Regional Technical Map (1:10.000), which required enhancement in order to include the hut and the rock-cut tombs, which are of course firmly associated with the geomorphology of the site.

We used a Rover TRIMBLE R6 II series satellite receiver with TSC3 TRIMBLE controller (accuracy 8 mm + 0.5 ppm RMS) to record 521 points along the ledges and we then generated a contour map to a 1 m height resolution using GeoPro Meridiana Office 2017 software. Moreover, some ground georeferenced points were fixed through the GPS, and used as station points for a pulse total station Topcon GPT 1004 in order to associate the tombs with the topographical survey. Finally, thanks to a rigid roto-translation process performed by AutoCad Map 3D 2013, the points of the tombs were linked to the topographical survey.

1 For a multimedia file see the supplementary material.

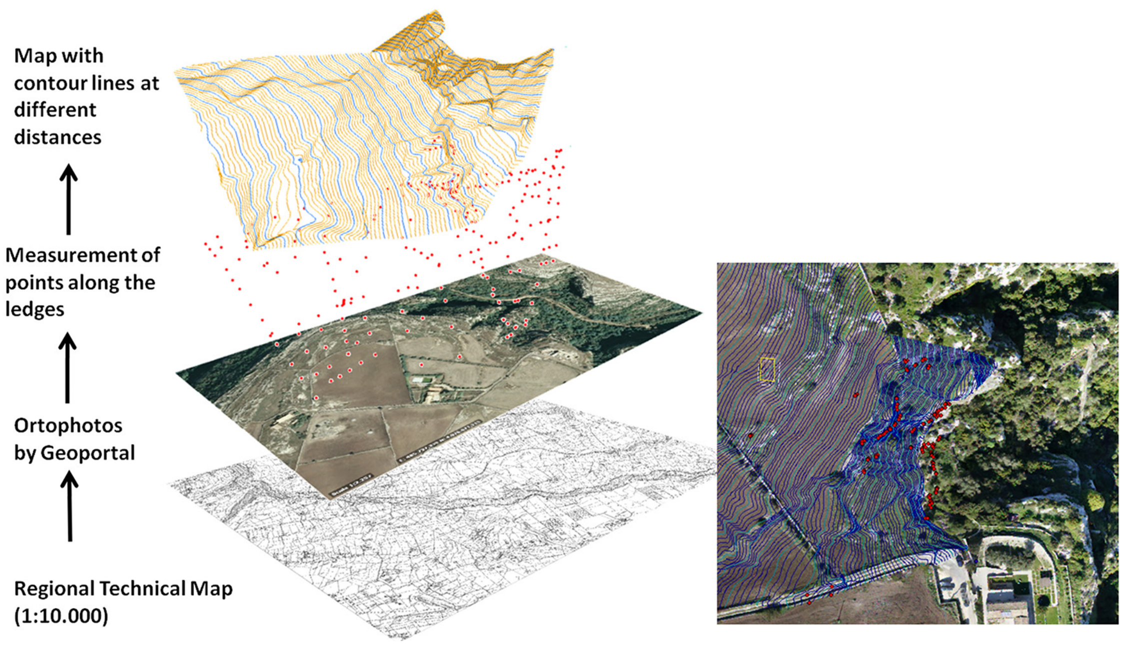

Figure 7. Topographical outputs of the research.

The 3D model was created using a popular image-based 3D modelling technique (Pierrot-Deseilligny et al., 2011; De Reu et al., 2014; Trinks, 2017), both on a territorial scale (sites and excavated areas) and on a smaller scale (archaeological material, vases, statues, etc.). We employed this technique not only for modelling the site, but also for the tombs and the excavation area (Buscemi et al., 2014).

This method is based on the use of a camera, and on the matching of points in common between groups of two or three photos. The shooting must be accurately planned; the fundamental requirement of the photos is to generate overlapping and side-lapping (60% or 70% approx.) between two close photos and the subsequent identification of common points. The direction followed during photo shooting is along the perimeter of the area to be covered, or from the top, along contiguous lines; the latter being particularly useful for obtaining orthophotos of a site or of an excavation.

For the 3D site model of Calicantone, photographic shooting was performed using a professional drone. Before the flight, 9 ground control points (GCP) or markers where placed inside the shooting area and their position was registered by a GPS (Rover TRIMBLE R6 II series satellite receiver and TSC3 TRIMBLE controller). In order to obtain a highly accurate 3D model, the processing engine only considered 4 GCP with the least error (0.0134 ÷ 0.0645 m) (Fig. 8). These data are fundamental for depth and scale computation by the software, and above all for georeferencing the virtual 3D model.

The Photoscan Professional 1.2 software was used for post-processing the photos (Fig. 9) thanks to its flexibility and ability to generate various outputs, including DEM (Fig. 10), orthophotos, contour lines, and 3D models.

In order to obtain a wider perspective of the space surrounding the investigated area, in line with more recent applications of 3D models in archaeology, a KML file was generated and overlaid on Google Earth (Datum WGS84). This is the first program able to view and graphically edit such files, and now the standard format for virtual globes (Luo et al., 2018, p. 6) (Fig. 11). The 3D model can be imported into other software environments for further processing, such as the Blender graphics software that we used to render the hut and reconstruct the funerary pathways (Messina et al., 2019).

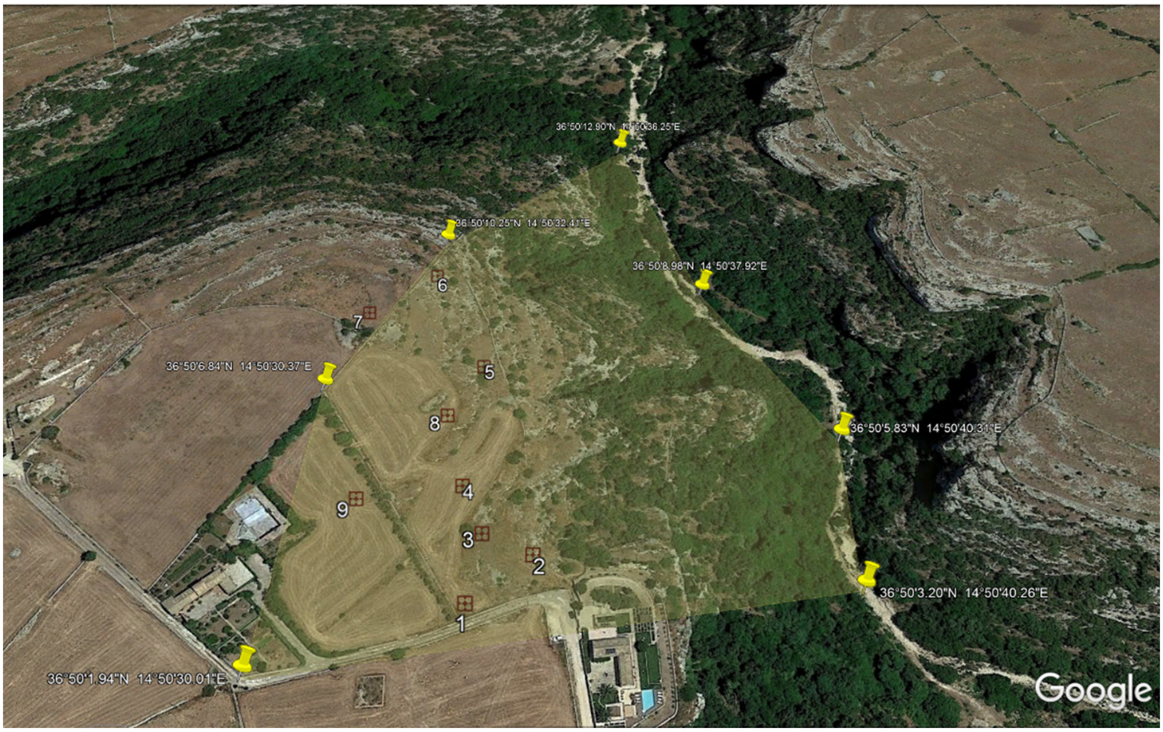

Figure 8. Preparation of the shooting scene for the UAV flight through the positioning of 9 ground control points.

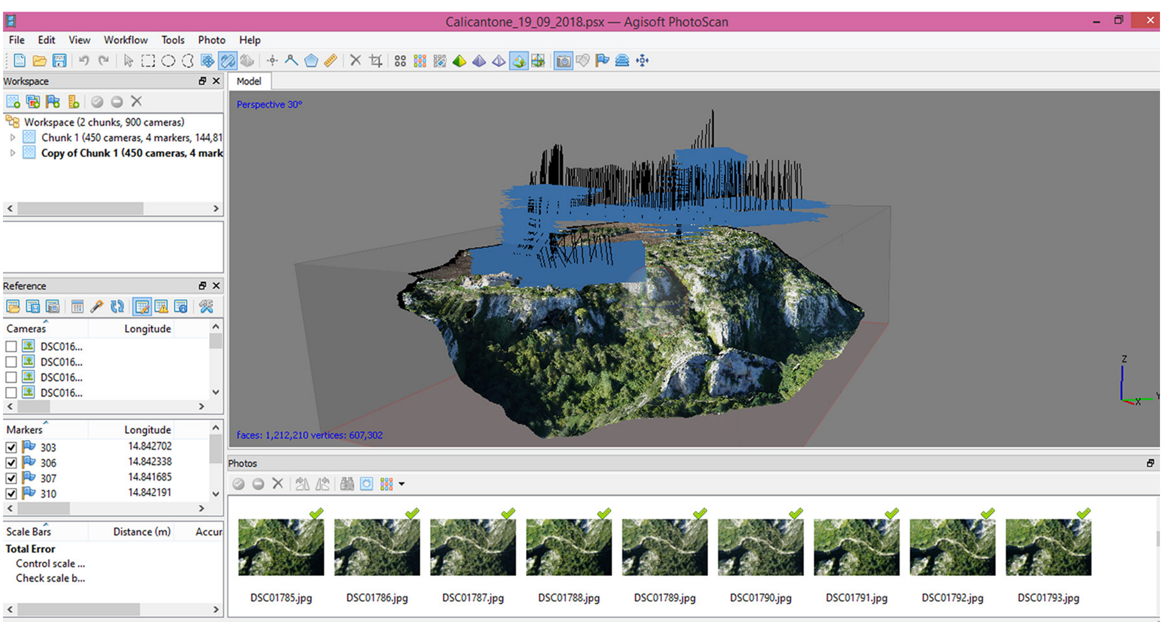

Figure 9. Photoscan Professional 1.2 postprocessing of the UAV and GPS data.

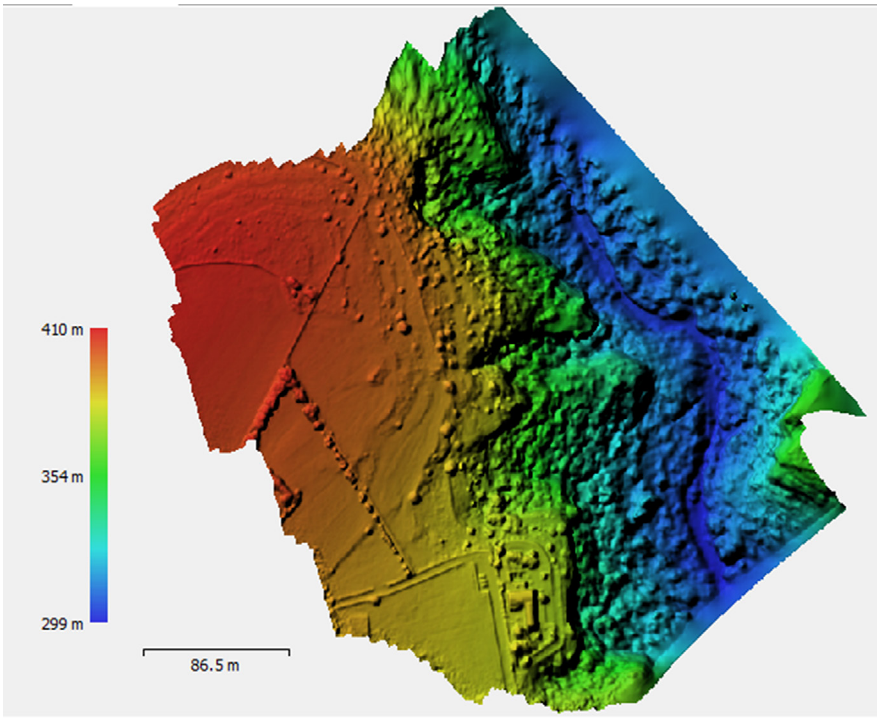

Figure 10. Shaded Digital Elevation Model (DEM).

Figure 11. The gorge of Calicantone. The 3D georeferenced model (KMZ file) overlaid on Google Earth.

2.2 The Detail Scale

A systematic fieldwork was carried in the necropolis to define the precise location of all the tombs and elaborate a map of the site.

The image-based modelling technique used to document the complex necropolis system provided several advantages:

- the creation of numeric models allowing the querying of all the metric information;
- the study of the excavation process;
- the elaboration of 3D models revealing spaces otherwise not accessible to the public.

When spatial or lighting conditions did not allow for the adequate photographic documentation of tombs, traditional hand plans and sections were created and then elaborated in CAD to generate vector images, especially for stratigraphic information.

All the digital documentation described in this section allowed for the profound analysis of the landscape of Calicantone, improving the available topographical information and in some cases generating knowledge and information well beyond anything that typical approaches can provide.

A ritual space divided at least into two different areas can be identified in the archaeological site of Calicantone. The first one consists of the necropolis, where analysis of the spatial distribution of the tombs revealed certain spaces reserved for ritual activities, probably associated with commemorating the dead. The second ritual area relates to the hut, which laid directly between the village and the necropolis and held a crucial role in funerary activities.

The traditional survey highlighted the absence of any natural or artificial elements separating the necropolis from the settlement. The rocky steps on the surface of the gorge do not create a natural barrier, a couple of tombs were cut away from the main necropolis, and there is no evidence of walls (although this does not exclude rubble walls built using the dry technique).

On the other hand, the digital survey, allowed for a better focus on the importance of spatial features of the site. A profile of the slope of Calicantone (Fig. 12) and a visibility analysis (Fig. 13) gave certain insights regarding inter-visibility between the functional areas of the settlement, the village, the hut and the necropolis.

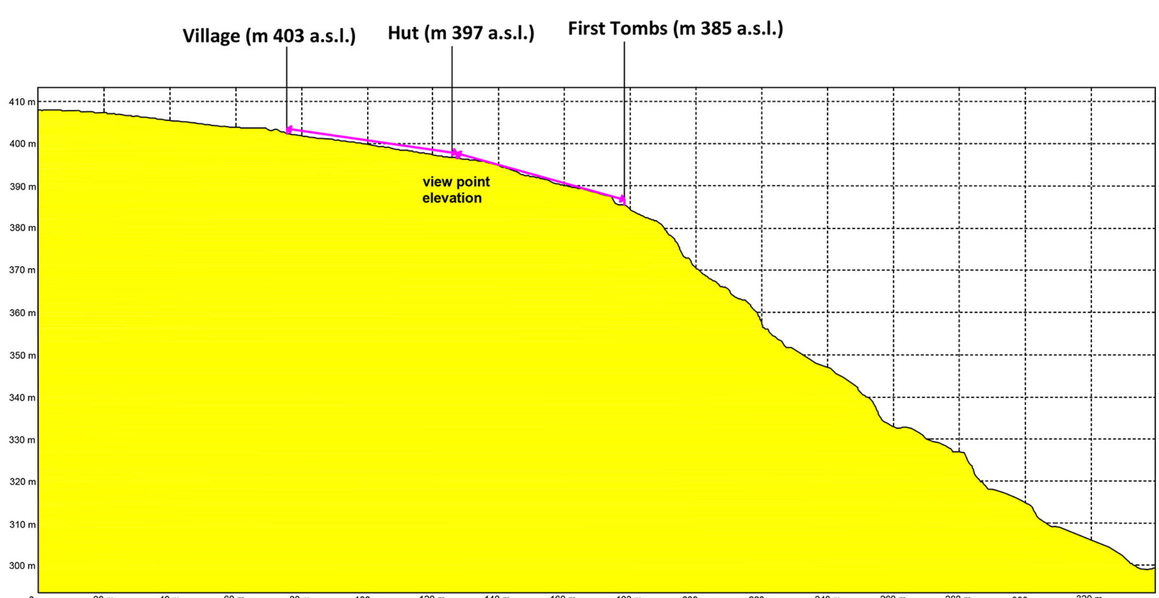

Figure 12. Profile of the slope with the height of villages, hut and necropolis, based on DEM.

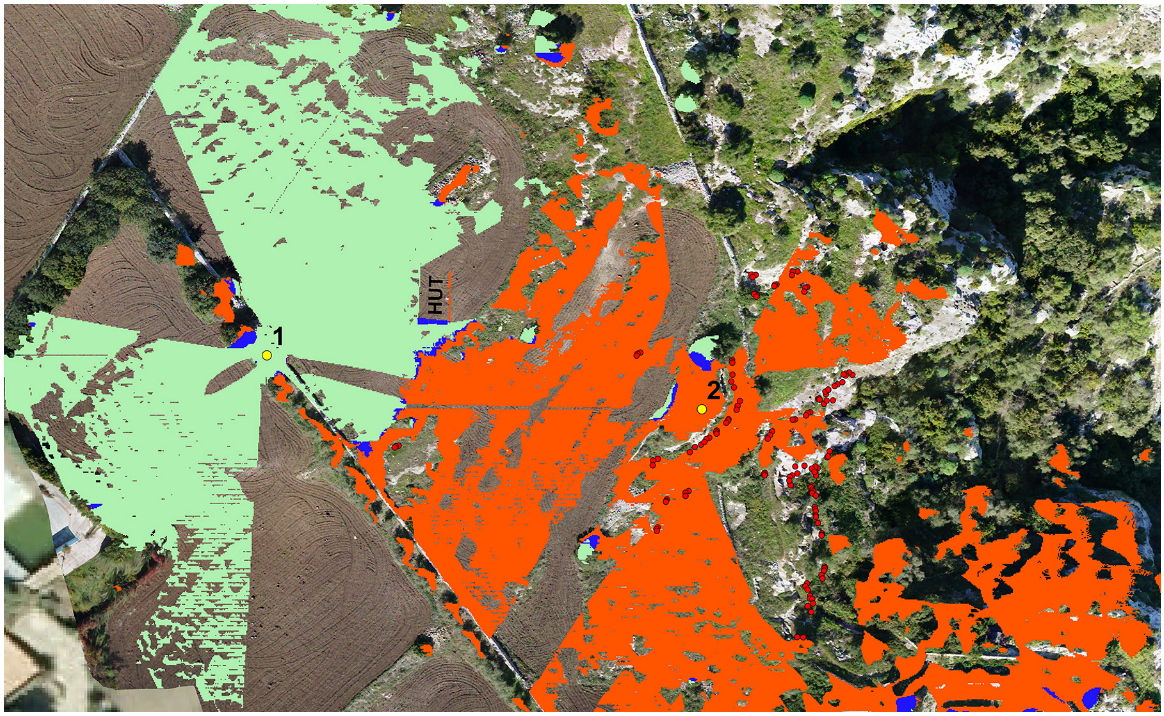

Figure 13. Inter-visibility analysis from two observer points. Observer 1 = village; observer 2 = tombs.

The first analysis was performed using Photoscan Professional 1.2 and the second with ArcGis 10.5; both based on a DEM with a 5.86×5.86 m grid (resolution: 17.1 cm/pix; point density: 34.3198 points per sq. m.). The DEM was interpolated attributing to the cells in the hut area a z-value increased by 3.00 m, that is the supposed height of the building. We performed an inter-visibility analysis from two observer points, the first placed in the village area and the second in the necropolis, with the following set parameters: Offset A = 1.4 m; Azimuth = 0°-360°; Vert = +90°/-90°; Radius = 0-35.000.

The analyses revealed that the village and the necropolis were not visible to each other while the hut formed a clear reference point within the settlement system, as it was visible from both the village and from parts of the necropolis. In fact, as shown in the viewshed, the observer 1 (village) sees the green area and the western side of the hut; the observer 2 (necropolis) sees all the red area, some tombs and the eastern side of the hut, while the southern one is visible both from point 1 and 2 (blue).

Therefore, the area where the hut was built might have been perceived as a border or demarcation zone between life and death.

3 Spatial Distribution Analysis and Ritual

The GIS platform highlighted certain features of the spatial distribution of the tombs, such as the fact that they form at least 14 clusters of between 2 and 11 tombs, probably corresponding with different social groups based on parental or clan relationships. This hypothesis is predominately based on the architectural features of the tombs, as virtually none of the grave goods survived due to looting and no DNA analyses were performed. However, some tombs show monumental characteristics, like pillars in the façade or a more articulate plan with an antechamber.

In some cases, a single cluster of tombs occupied a single ledge, while in other cases, several clusters resided on the same ledge, and separation would have depended on the ephemeral architecture such as wooden or stone demarcation elements, as suggested by the presence of holes in some of the courtyards. Even if internal paths and steps carved into the rock connect the groups of tombs, the general impression is that interconnection was not the principal aim of the necropolis layer. A study and mapping of the clusters derived from specific research is forthcoming (Żebrowska, in press).

Figure 14. Tombs 71–73.

Figure 15. Courtyards of the tombs 37(a), 26(b), 73(c), 69(d).

Regarding accessibility, the tombs with a more elaborate façade are concentrated in the most accessible and central cliffs, such as the tomb with pillars (n. 73, so-called "Tomba del Principe"), placed at the center of the necropolis in a dominant and scenic position (Fig. 14). Another group of tombs is on the other hand cut into a vertical wall along the gorge and is virtually inaccessible.

Some courtyards are wider, suggesting that they were used by groups of people as opposed to individuals; in any case, no more than 8 people (Fig. 15). Due to the lack of archaeological evidence regarding how these courtyards were used, we cannot specify whether they were reserved for funerary rituals or simply for practical aspects of burial.

While larger courtyards have a direct relationship with larger tombs, there is often an inverse relationship between elaborate façades and the very narrow courtyard areas in front of them, as well as the generally smaller chambers.

Almost all of the courtyards feature some minor rock-cut niches that were either associated with ritual activities, (as a kind of ritual facility, for example, the deposit of microlithic flint blades in niche n. 81) or used to store perishable materials.

4 Conclusions: Reconstructing the Funerary Landscape of Calicantone

4.1 Digital Tools

With respect to the second goal of the research concerning communication of the funerary landscape, a virtual reconstruction of the landscape was developed by the research group of the University of Catania and the CNR-IBAM of Catania, which includes a rendering of the hut positioned in the georeferenced 3D model of the site (Fig. 16). The purpose was both the scientific analysis of the spatial and ritual patterns of the site, and data sharing with the public in order to promote communication of the research results.

Figure 16. Virtual 3D scenario with the Blender rendering of the hut.

4.2 Spatial Interpretation

Our reconstruction of this ancient funerary landscape proposes the identification of a possible path linking the world of the living (the settlement) with the world of the dead (the necropolis), through an intermediate area (the hut).

The animation of the virtual reconstruction shows a supposed route between life and death, from the hut to the tombs (Fig. 17). The ritual itinerary begins in the hut, where funerary activities such as the preparation of the body for the burial were performed. Then, the procession continues to the unbuilt space separating the hut from the main necropolis area (Fig. 6), where all the funeral participants would have once gathered. From there, a route leads to the necropolis through still existent paths and steps carved into the rock. We believe that only a few of those involved in the earlier ritual activities completed the entire journey into the necropolis. In fact, the courtyards in front of the tombs would have hosted no more than 8 people. Therefore, the actual burial was not attended by the whole community, whose presence would have been limited to the rituals performed in, or around, the hut.

The recording and processing of digital data has become fundamental to increase the scientific knowledge, and to share and communicate it with scholars and as well as with the wider public. Our data does not simply form a numeric database of spatial values, but rather allows us to develop meaningful queries and visual renderings in multiple outputs, such as topographic maps, shaded DEM, 3D virtual models, renderings and animations, with the power to encourage and inspire the study of ritual behavior of ancient communities.

Figure 17. Funerary procession from the hut to the necropolis.

Authors' Contributions: Francesca Buscemi contributed to sections 2 and 4. Marianna Figuera contributed to sections 1, 3 and 4.

Acknowledgments: This research was carried on within the F.I.R. project “Tecnologie innovative e metodologie diagnostiche per l’approccio territoriale in archeologia: la Sicilia Orientale dalla Preistoria alla Tarda Antichità”, Università degli Studi di Catania.
Authorizations:
Calogero Rizzuto, Soprintendente BB.CC. di Ragusa
Technical contribution to the research:
Graziana D’Agostino (Università di Catania, DICAR; 3D image-based modeling)
Vincenzo Adorno (UAV flight)
Salvatore Russo (CNR-IBAM Catania; post-processing support)
Angelo La Cognata (GPS survey)
Carmelo Monaco (Soprintendenza BB.CC. di Ragusa; GPS survey)
Michele Di Vicenzo (Università di Catania, DMI; 3D virtual model)

References

Ardesia, V., Cattani, M., Marazzi, M., Nicoletti, F., Secondo, M., & Tusa, S. (2006). Gli scavi nell’abitato dell’età del Bronzo di Mursia, Pantelleria (TP). Relazione preliminare delle campagne 2001-2005. *Rivista di Scienze Preistoriche*, LVI, 293–367.
Brogiolo, G. P. (2007). Dall’archeologia dell’architettura all’archeologia della complessità. *Pyrenae*, 38(1), 7–38.
Brogiolo, G. P. (2014). Nuovi sviluppi nell’archeologia dei paesaggi: l’esempio del progetto APSAT (2008-2013). *Archeologia Medievale*, XLI, 11–22.
Burgers, G. L. M., Kluiving, S. J., & Hermans, R. A. E. (Eds.). (2016). *Multi, Inter and Transdisciplinary Research in Landscape Archaeology: Proceedings of the 3rd International Landscape Archaeology Conference in Rome, Italy*. Vrije Universiteit Amsterdam: University Library.
Buscemi, F., Militello, P. M., D’Agostino, G., & Sammito, A. M. (2014). Tecniche di fotomodellazione per la documentazione e la comunicazione in archeologia: il sito di Calicantone (Rg). *Archeologia e Calcolatori*, 25, 131–156.
Cambi, F. (Ed.) (2011). *Manuale di archeologia dei paesaggi. Metodologie, fonti, contesti*, Roma: Carrocci Editore.
Carandini, A. (2017). *La forza del contesto*. Roma-Bari: Editori Laterza.
Cattani, M., Debandi, F., Magrì, A., Peinetti, A., & Tusa, S. (2016). Mursia, Pantelleria (provincia di Trapani). *Notiziario di Preistoria e Protostoria*, III.2, 87–90.
Coolidge, F. L., Wynn, T., Overmann, K. A., & Hicks, J. M. (2015). Cognitive Archaeology and the Cognitive Sciences. In E. Brune (Ed.), *Human Paleoneurology* (pp. 177–208). New York: Springer.
Crispino, A. (2016). Castelluccio (Noto, provincia di Siracusa). Nuovi dati sull’abitato. *Notiziario di Preistoria e Protostoria*, III.2, 84–86.
Cultraro, M. (1996). Sicilia. La facies di Castelluccio: articolazione cronologica e definizione culturale. In D. Cocchi Genick (Ed.), *L’Età del bronzo in Italia* (pp. 163–174). Firenze: Octavo.
Cultraro, M. (2004). Spazi geometrici e paesaggi simbolici: codici di rappresentazione e variabilità stilistica nella produzione ceramica della cultura di Castelluccio. In N. Negroni Catacchio (Ed.), *Miti, simboli, decorazioni. Ricerche e scavi*. Atti del VI Incontro di Studi Preistoria e Protostoria in Etruria, Pitigliano-Valentano 13-15 settembre 2002 (pp. 103–118). Milano: Centro Studi di Preistoria e Archeologia onlus.
Cultraro, M. (2007). La regione etnea fra Neolitico ed antica età del Bronzo: dinamiche culturali e sviluppo crono-tipologico. In F. Privitera & V. La Rosa (Eds.), *In ima tartara. Preistoria e leggende delle grotte etnee.* Catalogo della Mostra (Catania 2008) (pp. 57–79). Palermo: Regione siciliana, Assessorato dei beni culturali, ambientali e della pubblica istruzione, Dipartimento dei beni culturali, ambientali e dell’educazione permanente.
David, B. & Hamacher, D. W. (2017). Environment and Landscape. In H. Blasco (Ed.), *SAS Encyclopaedia of Archaeological Sciences* (pp. 1–7). Society of Archaeological Sciences.
De Reu, J., de Smedt, Ph., Herremans, D., Van Meirvenne, M., Laloo, P., & De Clercq, W. (2014). On introducing an image-based 3D reconstruction method in archaeological excavation practice. *Journal of Archaeological Science*, 41, 251–262.
Fleming, A. (2006). Post-processual landscape archaeology: a critique. *Cambridge Archaeological Journal*, 16(3), 267–280.
Francovich, R. & Patterson, H. (Eds.). (2000). *Extracting Meaning from Ploughsoil Assemblages*. The Archaeology of Mediterranean Landscape, 5. Oxford: Oxbow Book.
Giannitrapani, E. (2013). Dalla capanna alla casa. Architettura domestica nella preistoria della Sicilia centrale. In C. Bonanno & F. Valbruzzi (Eds.), *Mito e Archeologia degli Erei. Museo Diffuso Ennese. Itinerari Archeologici* (pp. 69–75). Palermo: Regione Siciliana.
Giannitrapani, E., Iannì, F., Chilardi, S., & Anguilano, L. (2014). Case Bastione: a prehistoric Settlement in the Erei Uplands (Sicily). *Origini*, 36, 181–212.
Luo, L., Wang, X., Guo, H., Lasaponara, R., Shi, P., Bachagha, N., Li, L., Yao, Y., Masini, N., Chen, F., Ji, W., Cao, H., Li, C., & Hu, N. (2018). Google Earth as a Powerful Tool for Archaeological and Cultural Heritage Applications: A Review. *Remote Sensing*, 10(1558). doi:10.3390/rs10101558

Messina, T., Militello, P. M., Sammito, A. M., Di Vicenzo, M., & Di Carlo, N. (2019). *Identifying and communicating ritual: the case of Calicantone (Modica)*. Manuscript submitted for publication.
Militello, P. M. (2015). Un villaggio dell'Età del Bronzo: Calicantone. *Quaderni di Cava d'Ispica. Archeologia*, 1, 15–23.
Militello, P. M. & Sammito, A. M. (2014). Calicantone. Campagne di scavo 2012-2013. *Rivista di Scienze Preistoriche, Notiziario Preistoria e protostoria*, I(IV), 109–111.
Militello, P. M. & Sammito, A. M. (2015). Calicantone. Campagna di scavo 2014. *Rivista di Scienze Preistoriche, Notiziario Preistoria e protostoria*, II(2), 66–69.
Militello, P. M. & Sammito, A. M. (2016). Calicantone (Modica, RG). Campagna di scavo 2015. *Rivista di Scienze Preistoriche, Notiziario Preistoria e protostoria*, III(2), 80–82.
Militello, P. M., Sammito, A. M., Figuera, M., Gianchino, M., & Messina, T. (2018a). Calicantone: a Funerary Landscape in Sicily. In E. Herring & E. O'Donoghue (Eds.), *The Archaeology of Death, Proceedings of Seventh Conference of Italian Archaeology, National University of Ireland, Galway, April 16-18, 2016* (pp. 388–395). Oxford: Archaeopress Archaeology.
Militello, P. M., Sammito, A. M., Buscemi, F., Figuera, M., Messina, T., Platania, E., Sferrazza, P., & Sirugo, S. (2018b). La capanna 1 di Calicantone: Relazione preliminare sulle campagne di scavo 2012-2015. *Rivista di Scienze Preistoriche*, LXVIII, 255–304.
Müller Celka, S. (2016). Caring for the Dead in Minoan Crete: a Reassessment of the Evidence from Anemospilia. In E. Alram-Stern, F. Blakolmer, S. Deger-Jalkotzy, R. Laffineur, & J. Weilhartner (Eds.), *Metaphysis: Ritual, Myth and Symbolism in the Aegean Bronze Age. Proceedings of the 15th International Aegean Conference, Vienna, Institute for Oriental and European Archaeology, Aegean and Anatolia Department, Austrian Academy of Sciences and Institute of Classical Archaeology. University of Vienna, 22-25 April 2014,* Aegaeum, 39, (pp. 547–556). Leuven-Liege: Peeters.
Nicoletti, F. (2009). Mursia. Un emporio nel canale di Sicilia alle soglie della preistoria. In R. Panvini, M. Congiu & L. Sole (Eds.), *Traffici, commerci e vie di distribuzione nel Mediterraneo tra Protostoria e V sec. a.C.*, Convegno Gela 2009. Palermo: Regione siciliana, Assessorato dei beni culturali e dell'identità siciliana, Dipartimento dei beni culturali e dell'identità siciliana.
Nicoletti, F. & Tusa, S. (2012). L'insediamento del Tardo Bronzo di Mokarta (strutture e scavi 1994-1997). In *Dai Ciclopi agli Ecisti. Società e territorio nella Sicilia preistorica e protostorica*, Atti XLI Riunione Istituto Italiano di Preistoria e Protostoria, San Cipirello 2006 (pp. 905–916). Firenze: Istituto Italiano di Preistoria.
Orlandini, P. (1962). *Il villaggio preistorico di Manfria, presso Gela*. Palermo: Fondazione per l'incremento economico, culturale e turistico della Sicilia "Ignazio Mormino".
Parcak, S. H. (2017). *GIS, remote sensing, and landscape archaeology GIS, Remote Sensing, and Landscape Archaeology*. Online Publication. DOI: 10.1093/oxfordhb/9780199935413.013.11
Picone, E. G. (1975). Ispica (contrada Calicantoni). *Rivista di Studi Preistorici. Notiziario*, XXX, 397.
Picone, E. G. (2006). *Stanziamenti preistorici nel territorio dell'alta Cava d'Ispica*, Siracusa: Lombardi Editore.
Pierrot-Deseilligny, M., De Luca, L., & Remondino, F. (2011). Automated image-based procedures for accurate artifacts 3D modeling and orthoimage generation. *Geoinformatics FCE CTU Journal*, 6, 291–299.
Renfrew, C. & Bahn, P. (2016). *Archaeology: Theories, Methods and Practice* (seventh edition). London: Thames and Hudson.
Rizzone, V. G. & Sammito. A. M. (1999). Censimento dei siti dell'antica età del Bronzo nel territorio modicano. *Archivum Historicum Mothycense*, 5, 37–56.
Rizzone, V. G. & Sammito, A. M. (2002). Tombe dell'antica età del Bronzo con prospetto decorato nel territorio modicano: nuovi dati. *Sicilia Archeologica*, 35, 137–144.
Rizzone, V. G. & Sammito, A. M. (2010). Indagine topografica dei siti dell'Antica Età del Bronzo nel territorio modicano. *Aitna. Quaderni di Topografia Antica*, 4, 49–64.
Sakellarakis, Y. & Sakellaraki, E. (1992). 'Archanes-Anemospilia.' 'Archanes-Phourni.' 'Archanes-Tourkoyeitonia'. In J. Wilson Myers, E. Emlen Myers & G. Cadogan (Eds.), *The Aerial Atlas of Ancient Crete* (pp. 51–53, 54–58, 59–62). Berkeley: University of California Press.
Thomas, J. (2008). Archaeology, landscape, and dwelling. In B. David & J. Thomas (Eds.), *Handbook of Landscape Archaeology* (pp. 300–306). Walnut Creek: Left Coast Press.
Trinks, I., Wallner, M., Kucera, M., Verhoeven, G., Torrejón Valdelomar, J., Löcker, K., Nau, E., Sevara, C., Aldrian, L., Neubauer, W., & Klein, M. (2017). Documenting Bronze Age Akrotiri on Thera using laser scanning, image-based modelling and geophysical prospection. *ISPRS International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, XLII(2/W3), 631–638.
Volpe, G. (2019). Il paesaggio tra giacimento e progetto. In G. Morbidelli & M. Morisi (Eds.), *"Il paesaggio" di Alberto Predieri, Atti del Convegno Firenze, 11 maggio 2018* (pp. 215–217). Firenze: Passigli Editori.
Voza, G. (1996). Castelluccio (Siracusa). In A. M. Bietti Sestieri, M. C. Lentini, & G. Voza (Eds.), *Guide archeologiche. Preistoria e Protostoria in Italia. Sicilia Orientale e Isole Eolie* (pp. 330–337). Forlì: Abacus.
Voza, G. (1999). *Nel segno dell'antico. Archeologia nel territorio di Siracusa*. Palermo: Arnaldo Lombardi Editore.
Voza, G., & Crispino, A. (2014). Castelluccio (Noto, Prov. di Siracusa). *Notiziario di Preistoria e Protostoria*, 1.IV, 109–111.
Żebrowska, K. (in press). EBA necropolis at Calicantone: internal planning and visual features. In D. Panagiotopoulos & P. M. Militello (Eds.), Modelling Archaeological Landscapes, in press.

Supplemental Material: The online version of this article (DOI: 10.1515/opar-2019-0029) offers audio supplementary material.