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# ARCHAEOASTRONOMICAL STUDY OF THE PROTOHISTORIC SHAFT TOMBS NECROPOLEIS OF THAPSOS (SICILY)

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## ABSTRACT

Thapsos is a settlement located on the Magnisi peninsula, a triangular strip of land between the gulfs of Syracuse and Augusta. Here it developed a remarkable Middle Bronze Culture (1440-1250 BC), with a village with proto-urban character for the influence of import and know-how from the Aegean, Cyprus and Malta. The necropoleis of Thapsos are arranged in 3 areas of the peninsula. For our analysis we considered the two groups of rectangular shaft tombs with underground chamber necropolis, widespread on the limestone plateau to the North and South of the peninsula.

A first partial study about the orientation of the Thapsos' shaft tombs was realized at the beginning of the third millennium on 25 tombs in the North necropolis; in this first analysis it was observed that there were two privileged orientations: one of astronomical character, linked to the sunrise at the summer solstice, and the other of topographical character, connected to Mount Etna (North direction).

The new archaeoastronomical analysis on the Thapsos' shaft tombs was started by the authors in 2016 and involved 70 tombs located on the peninsula. The opportunity to study the orientations of these tombs allowed to realize the first mapping of the necropoleis and the numbering of the tombs. The proposed study is therefore of great scientific importance, as it was previously thought that in the Bronze Age had lost cultic tradition of building shaft tombs necropoleis with astronomically oriented entrance. The study thus opens new scenarios as part of the funerary rituals and religious needs, showing a discontinuity with the previous phases.

**KEYWORDS:** Thapsos, shaft tomb necropoleis, Paolo Orsi, Middle Bronze Age, topographic orientation, Etna mount, summer solstice, astronomical orientation.

## 1. INTRODUCTION

In Sicily, the research on the astronomical orientation of monuments, megaliths and funerary hypogea during Prehistory and Protohistory still represents a poorly explored field, which is slow to take off. Excluding the most recent attempts to develop this interpretation in the island context (Orlando, 2015; 2016; 2017), the first and only study dedicated to the orientation of rock necropoleis in Sicily was realized at the end of the 20th century (Tusa and Foderà Serio, 2001). The archaeoastronomical study involved:

- the rock-cut and shaft tombs of the Copper Age (IV-III millennium BC);
- the rock-cut tombs of the Early Bronze Age (Castelluccio Culture, late III – mid II millennium BC);
- the chamber tombs with "dolmenic" corridor of south-western Sicily, also of the Early Bronze Age (end III - beginnings of the II millennium BC);
- "pseudo-dolmenic" evidence (end 3rd - beginnings of the II millennium BC).

This study did not take into consideration the shaft tomb necropoleis of the subsequent phase of the Middle Bronze Age.

The Eneolithic shaft tombs were generally built on flat rocky terraces. On these lithic tables a shaft was dug and then it was possible to direct the tomb towards a predetermined or desired point of the horizon, without any kind of conditioning. It has therefore been thought, therefore, that in the sepulchral orientation there could be the possible compliance with religious beliefs connected to the stars, first of all our star, the Sun.

As for the Eneolithic shaft tombs, in the study of Tusa and Foderà Serio (2001), the sites of *Roccazzo* (Mazara del Vallo) and *Tranchina* (Sciacca) were investigated to see if there was a preferential choice in the orientation of the cell.

In the Eneolithic settlement of *Roccazzo* the orientations of 34 rock-cut tombs were measured. Of these:

- 5 fall into the I quadrant (0°-90°);
- 22 in the II (90°-180°);
- 7 in the III (180°-270°);
- none in the IV (270°-360°).

While in *Tranchina*, on a total of 30 rock-cut tombs, it was possible to measure the orientations of 28 of them. Of these:

- 3 fall into the I quadrant;
- 22 in the II;
- 3 in the III;
- none in the IV.

The azimuth values found indicate that the orientation of the tombs of the two sites is framed in the typical pattern widespread in the Mediterranean, which often sees prehistoric sepulchres oriented between the rising of the sun and its maximum height (Hoskin et al., 1994; Hoskin and Zedda, 1997; Hoskin and Palomo y Perez, 1998; Hoskin, 1998). So in the hypogeal tombs examined in the sites of *Roccazzo* and *Tranchina* the cell was dug, in the great majority of cases, in such a way that the axis of the opening (from the inside to the outside) fell into the II quadrant (90°-180°).

## 2. HYPOGEAN TOMBS IN THE BRONZE AGE

With the beginning of the Early Bronze Age (end of the III millennium BC), the hypogeal tomb typology changes radically. The most macroscopic change is the disappearance of the shaft and the consequent position of the tomb no longer on a flat surface, but on a slope or in a wall. It is a typology with a very wide and widespread diffusion in the island territory, so much so that it became an intrinsic element of the landscape, especially in the countryside of the provinces of Syracuse, Ragusa, Enna, Caltanissetta and Agrigento. This is what the current archaeological bibliography called "tomba a forno" or "tomba a grotticella", due to the effective analogy with domestic ovens used in the countryside and in the farming villages of Sicily (Orsi, 1892).

The tomb with a small chamber is intrinsically linked to the spread of the most typical culture of prehistoric Sicily, that of Castelluccio from the Early Bronze Age (2200-1450 BC) (Alberti, 2013). The existence of intentionality in the positioning of the entrance of the tombs is very problematic. In fact, they are always placed on almost vertical walls on the sides of river valleys (the famous "Cave" of the Iblei Mountains) or of hills (Caltanissetta, Enna, Agrigento, Catania areas) receiving, therefore, a strong environmental conditioning. However, it cannot be excluded that certain intentionality has existed in the choice of the wall to be "drilled" according to its orientation. In this regard, the study by Tusa and Foderà Serio took into consideration two emblematic sites of the most typical Castelluccio culture of the Iblea area: *Cava Lazzaro* and *Castelluccio di Noto*.

In the tombs of *Cava Lazzaro* the homogeneous orientation (towards the North) is not enough to highlight a very strong environmental conditioning due to the orientation of the rock face where the caves were dug. However, it is interesting to note that on the opposite wall to that used for the necropolis there are no rock-cut tombs. If this clear intentionality is evident in *Cava Lazzaro*, this does not happen for *Castelluccio di Noto*, where the tombs are arranged indifferently on either side of the small valley. It would seem therefore that in Sicily, during the Early

Bronze Age, the Eneolithic tradition of building tombs with astronomical orientation had been lost.

On the other hand, new and significant indications could be drawn from the study of the orientations of the shaft tombs of the Thapsos necropoleis (Orlando and Veca, in press). Thapsos is the eponymous site that fully represents the events of the Middle Bronze Age (XV-XIII century BC), a period of Sicilian Protohistory not held in consideration from the aforementioned archaeoastronomical studies.

## 3. THE ARCHAEOLOGICAL SITE OF THAPSOS

Thapsos is a settlement located on the peninsula of Magnisi (lat. 37.15° N, long. 15.23° E), a strip of land with a triangular shape (2300 × 800 meters, about 20 masl) between Syracuse and Augusta, linked to the mainland of the eastern coast of Sicily by a narrow sandy isthmus (Figure 1).

*Figure 1. The Magnisi Peninsula viewed from satellite (Google Earth).*

The Magnisi peninsula represents a calcareous structural high (Horst) within the distensive tectonic (NW-SE orientation) of the Iblean Avampaese (Carta geologica, 1986). The main lithology is characterized by cenozoic limestone rocks of the Monti Climmiti Formation (Miocene middle-Inf.), and in particular by the Calcari di Siracusa Member composed of white-greyish calcarenites and algals calcirudites, irregularly layered and notably karst. There are also sand, calcarenites and fossiliferous conglomerates at Strombus bubonius constituting Tirreniano's terraced deposits (Pleistocene sup.).

In this settlement developed a very remarkable and articulated Middle Bronze culture (Veca, 2016b). The inhabited area has at least three development phases (Figure 2B):

- the first (oldest), characterized by circular-shaped huts;
- the next, characterized by a spatial distribution of a proto-urban type with quadrangular plan settings around a central courtyard, served by roads and wells;
- the most recent one from small quadrangular or rectangular-shaped buildings that interfere with the proto-urban installations of the previous phase.

The culture of Thapsos follows to that of Castelluccio and is contemporary with that of Milazzese of the Aeolian Islands. Its chronological limits are XV-XIII centuries BC. The influence of the Aegean civilization is particularly sensitive in this period (La Rosa, 2004), with numerous Mycenaean imports (Myc. III A-B). Gold, ivory, amber and precious stone are also imported; locally produced, instead swords and daggers (Veca, 2016a; 2017). More disputed is the Aegean influence exerted on architectural forms, both domestic and funerary although in this last case the ancient tradition of rock-cut tomb goes through a process that will lead to the creation of the chamber tomb with a tholoid profile (Tomasello, 1995-96, page 222).


***Figure 2. Penisola Magnisi: (A) 1, protohistoric settlement; 2, distribution of the rock-cut and shaft tombs necropoleis; 3, area of the enchytrismòs tombs; 4, city walls. B) Thapsos, planimetry of the protohistoric settlement (from Voza, 1985).***

The ceramic repertoire of the Thapsos culture is characterized by grey monochrome pottery with a brown surface. The shapes are new and varied with respect to the previous culture: cups and basins on high tubular feet with bifid plate handles, bowls on high feet and with long handles, globular orbs with cylindrical neck, globular pyxis on the foot or cylindrical apode. The decoration is plastic, with low horizontal cords; but it is also engraved raw, and presents simple geometric patterns (bundles of lines, zigzag, festoons), or more rarely phytomorphic and zoomorphic figures, especially volatiles. There is a case of depiction of a human figure standing on a boat (Orsi, 1895). Relations with the Maltese culture of Borġ in-Nadur, and with the Cypriot cultures of the same period are attested by numerous ceramic imports (Tanasi, 2011; 2015; Alberti, 2015).

## 4. THE PROTOHISTORIC NECROPOLEIS OF THAPSOS

The rock-cut and shaft tombs necropoleis of Thapsos are arranged in three areas of the peninsula, and consist, according to the literature (Orsi, 1895), in about 300 tombs (Figure 2A).

The largest group is located in the North and North-West, between the lighthouse of the Navy and

the posts of the Second World War. The tombs are presented in two different types:

• tombs with quadrangular shaft entrance and hypogeum chamber, diffused on the calcareous plateau of the peninsula (Figure 3);

• rock-cut tombs with a pavilion entrance carved into the low cliff wall near the sea (Figure 3).

*Figure 3. Types of tombs visible at Thapsos: shaft tomb (up) and rock-cut tomb (down).*

The area of the prehistoric necropoleis of Thapsos has been destroyed in antiquity by metal seekers. The excavations of the Thapsos necropoleis were conducted by the archaeologist Paolo Orsi in 1894. In his work the scholar describes the architecture and the funeral goods of only five shaft tombs, marked by numbers (Orsi, 1895): 51, 52, 53, 65 and 66 (Figure 4). Orsi, even though he numbered some tombs, did not make a plan for the necropoleis. The archaeological site of Thapsos was investigated with the exca-

vation of the settlement and the necropoleis (Bernabò Brea, 1970; Voza, 1972; 1973; 1980- 81; 1984-85). Most chamber tombs are characterized by a narrow entrance corridor (dromos) that gave monumentality to the tomb and allowed an easy flow of water. In both types, the funeral chamber, sometimes preceded by a small vestibule, has a circular plan with an arched or flat profile, and often presents a series of perimeter niches.

Another group of shaft tombs, with a smaller extension than the one in the North, is located in the southern portion of the peninsula, immediately south of the fortifications (Figure 2A).

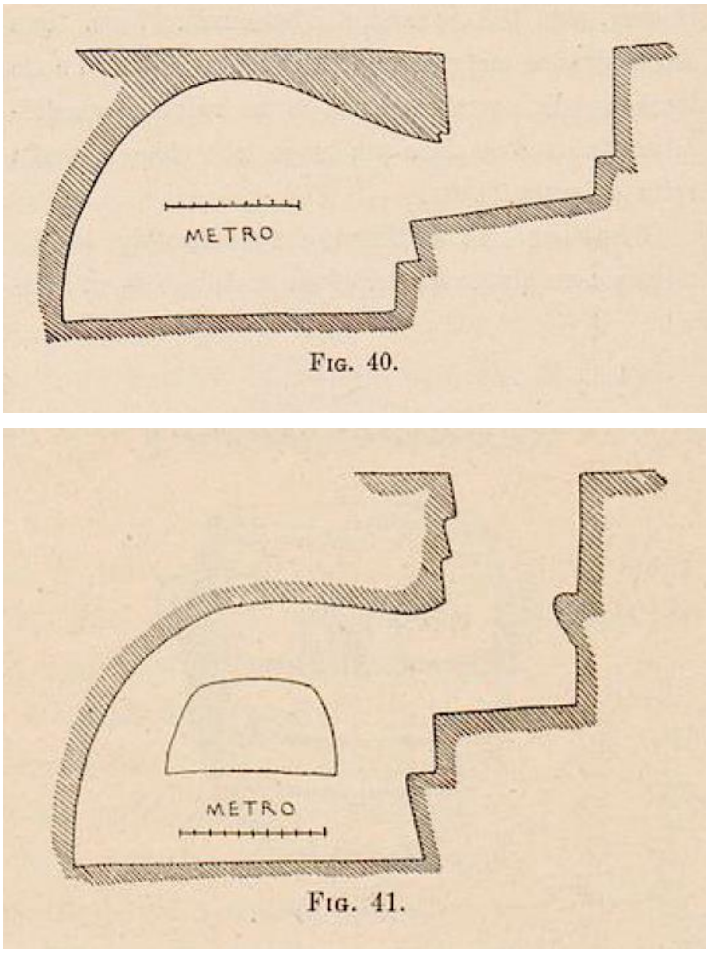


*Figure 4. Sections of the shaft tombs marked with numbers 51 (left) and 52 (right) (from Orsi, 1895).*

In general, depositions are collective burials; the bodies, in a crouched position, disposed radially with the skulls on the periphery of the cell and the lower limbs towards the centre, curled up or stretched out with only the legs bent (Veca, 2016b).

Another burial typology found at Thapsos, called "a enchytrismòs", is present in a reduced number com-pared to the tombs dug into the rock. It consists in the deposition of bodies within large "pithoi" deposited in small ravines or depressions of the rock (Veca, 2014). This burial ground is located in a small cave in the middle part of the peninsula (Figure 2A). Although it is interesting from a funeral archaeology point of view, the burial ground to enchytrismòs is not part of our treatment, and is mentioned here as additional information.

## 5. AEROPHOTOGRAMMETRIC ANALYSIS

The areophotogrammetric technique was used to realize the first map of shaft tombs necropoleis of Thapsos. High-resolution georeferenced ortophotos of these necropoleis have been produced. Subsequently, these images were digitized to produce distribution maps of shaft tombs (Figure 5). For the first time it was possible to enumerate the tombs, also identifying not yet discovered tombs (at least 4). It is not excluded, in fact, that there may be other tombs not yet identified. For the future, a not-invasive instrumental survey (e.g. georadar or other) could be performed.

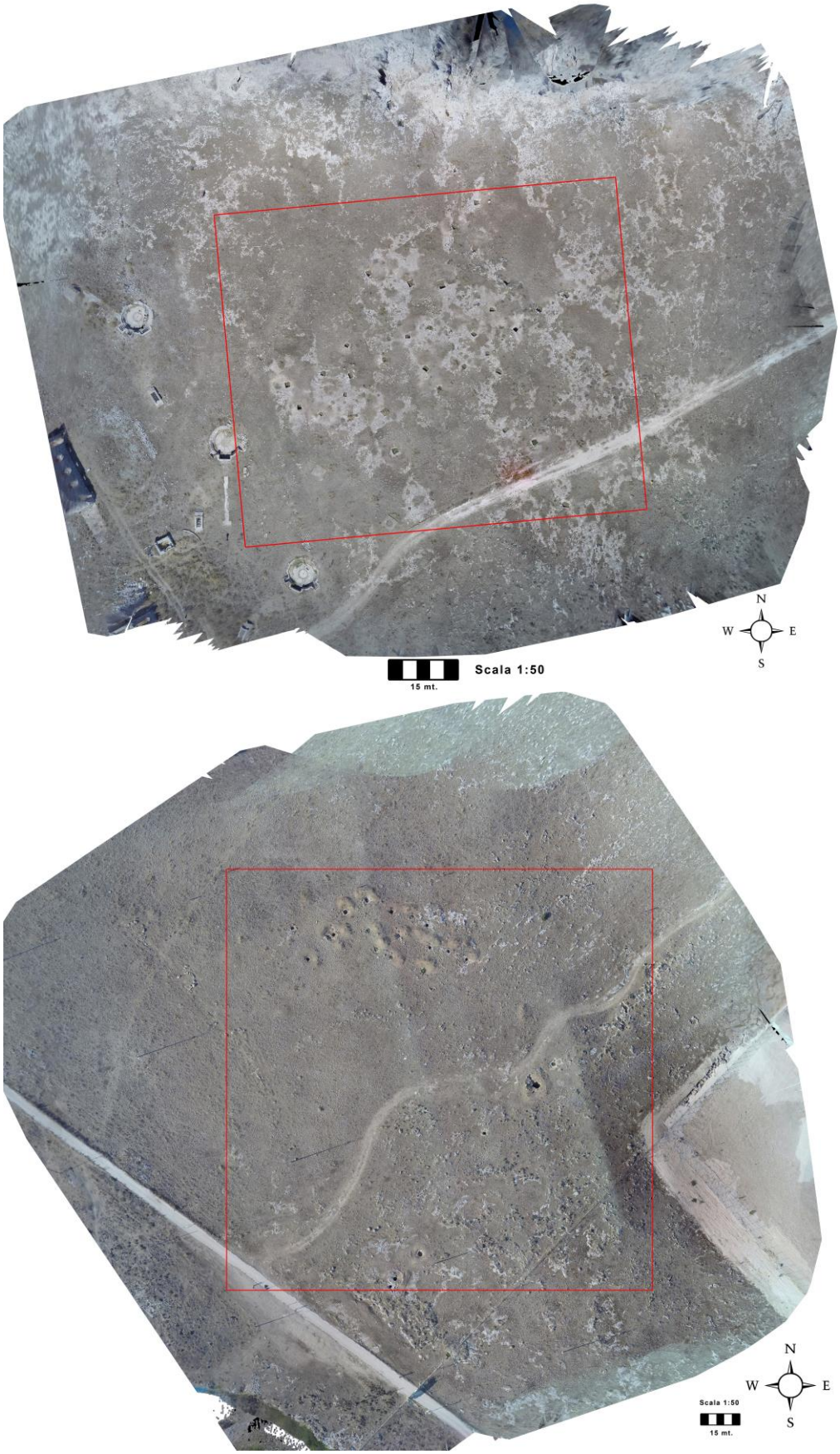


*Figure 5. Maps of the North (up) and South (down) shaft necropoleis.*

## 6. ARCHAEOASTRONOMICAL ANALYSIS

Very few scholars, especially in Italy, know the study that professors Belmonte and Hoskin realized at Thapsos following a brief survey on the Magnisi peninsula carried out in January 2001. During the visit, the scholars were able to measure the orientation of about 25 shaft tombs of the Northern necropolis (Belmonte and Hoskin, 2002). The results of their partial study are summarized in Figure 6. Data clearly show a double preference in orientation, that is one for the dawn at the summer solstice (SV) and the other for the silhouette of the volcano Etna, which stands out on the northern horizon.

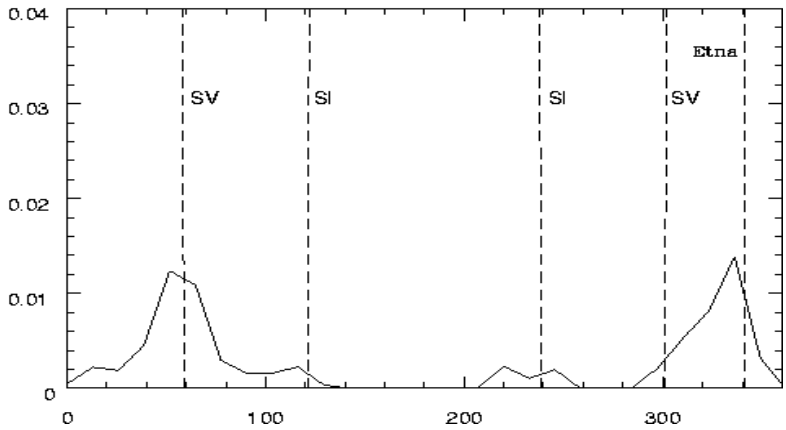


*Figure 6. Histogram of the orientation of the 25 shaft tombs analysed in 2001 (from Belmonte and Hoskin, 2002).*

The study started by the authors in 2016, concerning the archaeoastronomical analysis of the Thapsos shaft tombs necropoleis, focuses on the orientation of about 70 tombs. There are 2 tombs that have a double entrance. We have also identified 4 probable tombs still predominantly covered with soil. Therefore, compared to the previous study, it was possible to investigate a larger and complete sample. The first survey was conducted in situ with a Wilkie-type geologist compass. A double measurement was carried out. The azimuth measurements with heights and declinations are shown in Table 1.

Since the sea is eastward, the eastern horizon is flat, that is the height is equal to 0°. The compass readings were corrected for magnetic declination using the calculator kindly provided by NOAA (http://www.ngdc.noaa.gov/geomag-web/#declination) (magnetic anomalies are not to be expected at Thapsos). Our corrected compass readings are fully consistent with transit readings, as the latter all fall within the nominal error band of the corresponding compass readings (±½°). We calculated declinations using the program GETDEC kindly provided by Clive Ruggles.

***Table 1.***

| Tomb number | Azimuth (°) (average) | Height (°) | Declination (°) | Note |
|---|---|---|---|---|
| 1 | 76,5 | 0 | +10,35 | - |
| 2 | 68 | 0 | +17 | - |
| 3 | 92 | 0 | -0,05 | solar orientation |
| 4 | 12 | 0 | +50,65 | *partially buried tomb* |
| 5 | 62 | 0 | +21,6 | solar orientation |
| 6 | 60,5 | 0 | +22,7 | solar orientation |
| 7 | 338 | 1,5 | +48,6 | topographic orientation (Etna Volcano) |
| 8 | 35 | 0 | +40,3 | - |
| 9 | 53 | 0 | +28,25 | lunar orientation |
| 10 | 49 | 0 | +31,1 | - |
| 11 | 24 | 0 | +46,2 | - |
| 12 | 92 | 0 | -0,05 | solar orientation |
| 13 | 52 | 0 | +29 | lunar orientation |
| 14 | 43,5 | 0 | +34,9 | - |
| 15 | 15 | 0 | +49,8 | - |
| 16 | 357,5 | 0,5 | +52,8 | topographic orientation (Etna Volcano) |
| 17 | 27 | 0 | +44,75 | - |
| 18 | - | - | - | *probable tomb* |
| 19 | 82 | 0 | +6 | - |
| 20 | 24 | 0 | +46,2 | - |
| 21 | 62 | 0 | +21,6 | solar orientation |

| | | | | |
|---|---|---|---|---|
| 22 | 122 | 0 | -24,5 | solar orientation |
| 23 | 34 | 0 | +40,9 | - |
| 24 | 65 | 0 | +19,3 | lunar orientation |
| 25 | 66 | 0 | +18,5 | lunar orientation |
| 26 | 8,5 | 0 | +51,45 | - |
| 27 | 74,5 | 0 | +11,9 | - |
| 28 | 82 | 0 | +6 | - |
| 29 | 26 | 0 | +45,25 | - |
| 30 | 100,5 | 0 | -7,3 | - |
| 31 | 73 | 0 | +13,1 | - |
| 32 | 45 | 0 | +38,9 | - |
| 33 | 62; 332 | 0; 1 | +21,6; +45,2 | tomb with double entrance/solar orientation and topographic orientation (Etna Volcano) |
| 34 | 75,5 | 0 | +11,15 | - |
| 35 | 72 | 0 | +13,9 | - |
| 36 | 62 | 0 | +21,6 | solar orientation |
| 37 | 62 | 0 | +21,6 | solar orientation |
| 38 | 75 | 0 | +11,5 | - |
| 39 | 108,5 | 0 | -15 | - |
| 40 | 8 | 0 | +51,5 | - |
| 41 | 83 | 0 | +5,2 | - |
| 42 | 24 | 0 | +46,2 | - |
| 43 | 65,5 | 0 | +18,9 | lunar orientation |
| 44 | 76,5 | 0 | +10,35 | - |
| 45 | - | - | - | *totally covered tomb* |
| 46 | 200,5 | 1 | -46,25 | topographic orientation (Pizzo Belvedere) |
| 47 | - | - | - | *partially collapsed tomb* |
| 48 | 28 | 0 | +44,25 | - |
| 49 | 70,5 | 0 | +15,05 | - |
| 50 | 55 | 0 | +26,8 | lunar orientation |
| 51 | 304,5 | 1 | +26,95 | lunar orientation |
| 52 | 61; 320,5 | 0; 0 | +22,35; +37,5 | tomb with double entrance/solar orientation |
| 53 | 58,5 | 0 | +24,2 | solar orientation |
| 54 | 57 | 0 | +25,3 | - |
| 55 | 74 | 0 | +12,3 | - |
| 56 | 33 | 0 | +41,5 | - |
| 57 | 62 | 0 | +21,6 | solar orientation |
| 58 | 231 | 2,5 | -27,5 | lunar and/or topographic orientation (Hyblaean Mountains) |
| 59 | 2 | 0 | +52,2 | - |
| 60 | 104 | 0 | -10,5 | - |
| 61 | 336,5 | 1 | +47,5 | topographic orientation (Etna Volcano) |
| 62 | 335,5 | 1 | +47 | topographic orientation (Etna Volcano) |
| 63 | 61 | 0 | +22,35 | solar orientation |
| 64 | 41 | 0 | +36,5 | - |
| 65 | 313 | 0 | +32,5 | - |
| 66 | 122 | 0 | -24,5 | *tomb full of soil*/solar orientation |
| 67 | - | - | - | *probable tomb* |
| 68 | 323 | 0 | +39,1 | - |
| 69 | 324 | 0 | +39,7 | - |
| 70 | 352 | 0,5 | +52,1 | topographic orientation (Etna Volcano) |
| 71 | 233 | 2,5 | -26,9 | lunar and/or topographic orientation (Hyblaean Mountains) |
| 72 | 44 | 0 | +34,5 | - |
| 73 | 231 | 2,5 | -27,5 | lunar and/or topographic orientation (Hyblaean Mountains) |
| 74 | 43 | 0 | +35,2 | - |

The measures allow us to present the following first considerations. In this preliminary analysis we did not consider possible stellar orientations. This check will be carried out in the near future, when the study will be completed.

As we can see from Table 1 more than 70% of the azimuths falls in I (0°-90°) and in the II quadrant (90°-180°). So the eastern direction is therefore privileged. In that direction there are 14 shaft tombs that have a solar orientation, so the axis of the entrance of the shaft tombs (from the inside towards the exterior) is directed towards: a) summer solstice (10 tombs); b) winter solstice (2 tombs); c) equinoxes (2

tombs). So we have 20% of the shaft tombs that presents a solar orientation.
Another group of 10 tombs presents a topographic orientation, and in particular their entrance is oriented towards: a) Etna volcano (North, 6 tombs); Hyblaean Mountains (West, 3 tombs); Pizzo Belvedere (South-West; 1 tomb). We must remember that Etna dominates the North horizon and the northern landscape. In the southern part of the Etna volcano, the one visible from Thapsos, there are numerous important archaeological sites, such as that of the Sicel village of Mendolito (territory of Adrano). Similarly, the Iblei Mountains are an integral part of the western horizon. The Iblei preserve important archaeological sites, such as that of Pantalica, a UNESCO heritage site since 2005. So we have a 14% of the shaft tombs that presents a topographic orientation.
The three tombs whose entrance is directed towards a particular point on the western horizon, where the Iblei Mountains form a stairway, could however also have a lunar orientation; in fact, the calculated declinations suggest this possibility. However, the analysis shows that at least 7 tombs have a lunar orientation, since the declinations are close to those connected to the so-called lunistices. So we have a 10% of the shaft tombs that presents a lunar orientation.
In total, therefore, for this first analysis, 44% of the shaft tombs seem to have a non-random orientation.

## 7. CONCLUSIONS

This preliminary study about the orientation of the Thapsos' shaft rock necropoleis is quite interesting, as up until now it was assumed that during the Bronze Age, the cult and tradition of building rock-cut shaft tomb necropoleis with astronomically or topographical oriented entrance was lost. From the preliminary analysis we have found that almost half of the rock-cut shaft tombs are orientated, both astronomical (solar and lunar) and topographical. Particularly in this phase we have considered only the solar and lunar orientation, but the next step will be to check possible stellar orientations.

From our study it is clear that it is not possible to confirm the existence of only two privileged directions, an affirmation that we find in the work of Belmonte and Hoskin (2001), which, it should be remembered, considered only a group of 25 shaft tombs.

Thapsos' tombs, characterized by collective depositions, represent a further evolution of Sicilian funerary hypogeism, already of a clan type with the spread of the multi-chamber hypogeal sepulchre during the Copper Age (Malpasso's horizon, half of the III millennium BC). This study thus opens up new scenarios in the funerary rituals and needs of worship, highlighting, during the Middle Bronze Age, a discontinuity with previous Castelluccio culture of the Early Bronze Age.

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